

# **AQUATIC SETTLEMENT AGREEMENT**

**A Settlement Agreement in Support of the  
Measures identified within the:**

**White Sturgeon Management Plan  
Bull Trout Management Plan  
Pacific Lamprey Management Plan  
Resident Fish Management Plan  
Aquatic Nuisance Species Management Plan  
and  
Water Quality Management Plan**

**Wells Hydroelectric Project  
FERC Project No. 2149**

October 2008

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**AQUATIC SETTLEMENT AGREEMENT**  
**Wells Hydroelectric Project**  
**FERC License No. 2149**

**1.0 PARTIES**

This Aquatic Settlement Agreement (Agreement) is entered into by and between the Public Utility District No. 1 of Douglas County, Washington (Douglas), a Washington municipal corporation, the United States Fish and Wildlife Service (USFWS), the Washington State Department of Fish and Wildlife (WDFW), the Washington State Department of Ecology (Ecology), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), the Bureau of Indian Affairs (BIA), and the Bureau of Land Management (BLM). The above entities who have executed this Agreement, herein collectively referred to as the “Parties” and individually as “Party,” have actively participated in the development of this Agreement and associated Aquatic Resource Management Plans.

This Agreement shall be binding on, and inure to the benefit of, the above-listed Parties and their successors and assigns, unless otherwise specified in this Agreement.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of this Agreement, but declined to be a signatory Party because its interests are currently satisfied by the measures within the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP). Additional entities may become Parties to this Agreement following unanimous consent of all the existing Parties to the Agreement and after executing a signature page and submitting it to Douglas and the Federal Energy Regulatory Commission (FERC).

**2.0 RECITALS**

2.1 The Wells Hydroelectric Project (Wells Project) is located at river mile 515.6 on the Columbia River in the State of Washington. Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers, and 42 miles upstream from the Rocky Reach Hydroelectric Project, owned and operated by Chelan County Public Utility District. The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from Wells Dam.

2.2 The Wells Project is the chief generating resource for Douglas. It includes ten generating units with a nameplate rating of 774,300 kilowatts (kW) and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Adult fish

passage facilities reside on both sides of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a crest elevation of 795 feet in height. Juvenile fish passage facilities are located across the powerhouse of the dam. The system was developed by Douglas and uses a barrier system to modify the intake velocities on spillways 2, 4, 6, 8, and 10. The Wells Project fish bypass system is the most efficient juvenile fish bypass system on the mainstem Columbia River. The bypass system on average collects and safely passes 92.0 percent of the spring migrating salmonids (yearling Chinook, steelhead, and sockeye) that arrive at Wells Dam and 96.2 percent of the summer migrating subyearling Chinook that arrive at the dam (Skalski et al., 1996).

- 2.3 The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends approximately 1.5 miles up the Methow River and approximately 15.5 miles up the Okanogan River. The normal maximum surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet (ac-ft) and usable storage of 97,985 ac-ft at elevation of 781 feet above mean sea level (MSL).
- 2.4 Douglas has various reservoir and surface water rights associated with the operation of the Wells Project including the following certificates (S3-00362, R3-00363, R4-26075, and S4-26074). These certificates provide reservoir impoundment rights for 331,200 ac-ft of water and power generation rights for 220,000 cubic feet per second (cfs) of water.
- 2.5 In March 1979, in response to petitions from tribes and other entities, FERC initiated a consolidated proceeding on juvenile fish protection for the Mid-Columbia hydroelectric projects, including the Wells Project.
- 2.6 In 1990, following the installation of 10 new high-efficiency turbine runners and the installation and preliminary testing of a new and highly effective juvenile fish bypass system, Douglas entered into a long-term fisheries settlement agreement with NMFS, USFWS, WDFW, Colville, Yakama, and Confederated Tribes of the Umatilla Indian Reservation (CTUIR).
- 2.7 On June 21, 2004, FERC approved the HCP. The HCP superseded the 1990 long-term fisheries settlement agreement. The HCP represents the culmination of over 10 years of negotiations between Douglas, NMFS, USFWS, WDFW, Colville, Yakama, CTUIR, and American Rivers. The HCP is the first hydropower HCP for anadromous salmon and steelhead. The HCP is a 50-year agreement included as an amendment to the Original Operating License. The HCP addresses Project related impacts to spring Chinook, summer/fall Chinook, steelhead, sockeye and coho, collectively referred to as Plan Species. With respect to Plan Species, the HCP parties have agreed to be supportive of Douglas's long-term relicensing efforts. The HCP also provides Endangered Species Act (ESA) coverage for all of the permit species (spring Chinook, summer/fall Chinook, sockeye and steelhead). The HCP also is intended to constitute the HCP participants' terms,

- conditions and recommendations for Plan Species under Sections 10(a), 10(j), and 18 of the Federal Power Act (FPA), the Fish and Wildlife Conservation Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 of the Revised Code of Washington (RCW) of the State of Washington. On October 16, 2007, FERC officially recognized the HCP as a qualifying Comprehensive Plan pursuant to section 10(a)(2)(A) of the FPA.
- 2.8 On November 1, 2004, Douglas and Colville executed a settlement agreement to resolve all claims regarding any section 10(e) payments to Colville for the term of the original license and any new FERC license arising from the use of lands within the Wells Project Boundary. Pursuant to the settlement agreement, Douglas and Colville also executed a power sales contract and a power sales service agreement. On February 11, 2005 the FERC issued an order approving the settlement agreement and granting approval of the power sales contract under section 22 of the FPA.
- 2.9 The Original Operating License for the Wells Project will expire on May 31, 2012. Douglas is using the Integrated Licensing Process (ILP) as required by FERC regulations issued July 23, 2003 (18 CFR Part 5). Pursuant to the ILP regulations Douglas submitted to FERC, on December 1, 2006, a Notice of Intent to file an application for a New License and a Pre-Application Document.
- 2.10 In March of 2006, following two years of collaborative discussions related to relicensing studies, Douglas approached stakeholders regarding its desire to develop an Aquatic Settlement Agreement for those resources not already protected by the Original Operating License, the HCP, or other related agreements. Stakeholders active in the development of this Agreement included the USFWS, NMFS, WDFW, Ecology, Colville, and Yakama.
- 2.11 Douglas plans to file a Draft License Application (DLA) with FERC on or before December 31, 2009, and plans to file a Final License Application (FLA) for a New License with FERC on or before May 31, 2010. Douglas plans to include this Agreement in the DLA and FLA. It is the Parties' expectation that the Agreement will be signed prior to filing the DLA.

### **3.0 DEFINITIONS**

- 3.1 “Adaptive Management” means an iterative and rigorous process used by the Aquatic Settlement Work Group (Aquatic SWG) to achieve biological goals and objectives. In the context of the relicensing of the Wells Project, this process is intended to improve the management of Aquatic Resources affected by Project operations, in order to achieve the desired goals and objectives of the Aquatic Resource Management Plans as effectively and efficiently as possible, in accordance with the provisions of this Agreement. The process used by the Aquatic SWG has many steps including the following:
- a. Develop initial hypotheses regarding any potential Project impacts and potential protection or mitigation measures;
  - b. Complete studies to determine whether the hypothesized impacts are valid, and if valid, quantify the impact resulting from the Project;
  - c. If the hypothesized impact is validated and quantified, then the Aquatic SWG shall identify appropriate goals and objectives and implementing measures;
  - d. Implement reasonable and appropriate measures to avoid, minimize or mitigate the identified Project impact;
  - e. Develop monitoring and evaluation methodologies for determining whether the goals and objectives have been achieved;
  - f. Should the measures be successful at mitigating or minimizing Project impact(s), then periodic monitoring shall take place to confirm that such goals and objectives continue to be achieved;
  - g. Should the implemented measures fail to achieve the goals and objectives over a reasonable time frame, then the Aquatic SWG shall evaluate additional or revised measures, including those previously considered in the six Aquatic Resource Management Plans, and implement any additional or revised appropriate and reasonable measures, or explain why such goals and objectives cannot be achieved;
  - h. If such goals and objectives have not been achieved over a reasonable time frame, then the Aquatic SWG may reevaluate and revise such goals and objectives.
- 3.2 “Aquatic Settlement Agreement” means this document as well as Attachment A (Proposed License Articles) and Attachments B through G (Aquatic Resource Management Plans).
- 3.3 “Aquatic Resource Management Plans” refers to the six aquatic management plans developed in close collaboration with the Aquatic SWG. These six plans

- are independently known as the White Sturgeon Management Plan (WSMP), Bull Trout Management Plan (BTMP), Pacific Lamprey Management Plan (PLMP), Resident Fish Management Plan (RFMP), Aquatic Nuisance Species Management Plan (ANSMP) and Water Quality Management Plan (WQMP).
- 3.4 “Aquatic Resources” refers to the resources addressed by the six Aquatic Resource Management Plans contained within Attachments B through G.
- 3.5 “Aquatic SWG” refers to the Aquatic Settlement Work Group. The Aquatic SWG is comprised of one voting representative from each of the Parties to this Agreement. The Aquatic SWG is the group charged with the responsibility of implementing this Agreement.
- 3.6 “Chair” refers to a neutral third party, selected unanimously by the Parties and funded by Douglas to coordinate the Aquatic SWG meetings.
- 3.7 “HCP” refers to the Wells Anadromous Fish Agreement and Habitat Conservation Plan.
- 3.8 “Licensee” means the Public Utility District No. 1 of Douglas County or Douglas.
- 3.9 “New Operating License” means the first long-term operating license for Project No. 2149 to be issued by the FERC to Douglas that takes effect after the expiration of the Original Operating License and any subsequent annual licenses that take effect after expiration of the New Operating License.
- 3.10 “Original Operating License” means the original 50-year operating license, as amended, for Project No. 2149 issued by the FERC with an expiration date of May 31, 2012 and any subsequent annual licenses that take effect after expiration of the Original Operating License, but before the effective date of the New Operating License.
- 3.11 A “Party” means an entity who has executed a signature page for this Agreement, and who is identified in Section 1 (Parties) or meets the criteria in Section 1 (Parties).
- 3.12 “Plan Species” refers to the five anadromous fish species covered by the HCP. The five species of fish covered by the HCP are spring Chinook, summer/fall Chinook, steelhead, sockeye and coho.
- 3.13 “Project” means the Wells Hydroelectric Project, licensed to Douglas by the FERC as Project No. 2149.
- 3.14 “Proposed License Articles” means license articles proposed by the Parties to the FERC in this Agreement, and contained in Attachment A hereto.
- 3.15 “Unanimous” and “unanimously” mean that all of the Parties who vote or abstain at an appropriately noticed meeting pursuant to this Agreement agree or abstain

on an action. An abstention does not affect or prevent a vote from being unanimous. See Section 11.5 (Voting).

#### **4.0 THE PURPOSE OF THE AGREEMENT**

The Parties agree that the purpose of this Agreement is to resolve all remaining Aquatic Resource issues related to compliance with all federal and state law applicable to the issuance of a New Operating License for the Project. Subject to the reservations of authority in Section 13 (Reservations of Authority) of this Agreement, this Agreement establishes Douglas's obligations for the protection, mitigation, and enhancement of Aquatic Resources affected by Project operations under the New Operating License and its obligations to comply with all related federal and state laws applicable to the issuance of the New Operating License for the Project. It also specifies procedures to be used by the Parties to ensure that the New Operating License is implemented consistent with this Agreement and other laws. The Parties agree that this Agreement is fair, reasonable, and in the public interest within the meaning of FERC Rule 602, 18 C.F.R. § 385.602(g)(3).

The six Aquatic Resource Management Plans contained in Attachments B through G, together with the HCP will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Project. As of the effective date of the Agreement, pursuant to Section 5 (Term of License and This Agreement), the Parties agree that the measures set forth in the Aquatic Resource Management Plans are adequate to identify and address Project impacts to Aquatic Resources and are expected to achieve the goals and objectives set forth in each of the six Aquatic Resource Management Plans. However, during the course of the New Operating License, there may be instances where the measures found in individual management plans may need to be adapted. In these instances, "Adaptive Management" will be used to achieve the biological goals and objectives.

#### **5.0 TERM OF LICENSE AND THIS AGREEMENT**

Douglas will seek a term of 50 years for the New Operating License. The Parties agree to support a 50-year term for the New Operating License. Subject to Section 7 (Effective Dates and Implementation of Attachments), this Agreement shall become effective when signed by Douglas and at least one other Party and shall remain in effect throughout the term of the New Operating License unless this Agreement is terminated sooner pursuant to Section 8 (Termination of Agreement).

#### **6.0 TRANSFER OF LICENSE AND AGREEMENT**

In the event the New Operating License is transferred in whole from Douglas to another entity and Douglas is not a co-licensee of the Project, the Parties agree that Douglas shall have no further obligations under the New Operating License or this Agreement following such transfer.



## **7.0 EFFECTIVE DATES AND IMPLEMENTATION OF ATTACHMENTS**

The proposed measures contained within Attachment A (Proposed License Articles) and Attachments B through G (Aquatic Resource Management Plans) shall become effective upon issuance of a FERC order granting a New Operating License to Douglas, except to the extent the implementation of any such measures is prohibited, prevented, or rendered impracticable by the FERC order.

## **8.0 TERMINATION OF AGREEMENT**

### **8.1 Automatic Termination Events**

This Agreement shall terminate automatically: (1) at the end of the term of the Agreement as set forth in Section 5 (Term of License and This Agreement); (2) in the event the FERC does not issue a New Operating License to Douglas for the Project; (3) in the event Douglas withdraws from this Agreement based on Section 8.2 (Withdrawal Events); or (4) in the event the New Operating License is revoked.

### **8.2 Withdrawal Events**

#### **8.2.1 Non-Compliance**

A Party may elect at any time to withdraw from the Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal) based on non-compliance of another Party with the provisions of the Agreement, subject to the following procedures: (1) a Party asserts that another Party is not complying with the terms of the Agreement; (2) the Party documents and presents evidence supporting assertion of non-compliance in writing; and (3) the issue of non-compliance is taken to Dispute Resolution, Section 12 (Dispute Resolution).

#### **8.2.2 Governmental Action**

Should a government agency take an action that is materially inconsistent with the terms of this Agreement, including a material inconsistency with or modification of Attachment A (Proposed License Articles) or Attachments B through G (Aquatic Resource Management Plans), then the Parties (not including the government agency, if a Party) shall meet and consider the available actions to address the material inconsistency. Such actions may include a joint or separate request(s) for rehearing with the FERC, a joint or separate appeal(s) to the Washington State Pollution Control Hearing Board (PCHB), judicial review to remove or modify the material inconsistency, or any other action that would address the inconsistency. One or more Parties may proceed to pursue such actions even if all Parties do not wish to participate.

If the material inconsistency is sustained upon the completion of such actions, a Party may: (1) elect to withdraw from this Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal); (2) agree to implement this Agreement subject to such

governmental action; or (3) enter into additional discussions to determine whether an alternative agreement can be reached.

### **8.2.3 Impossibility**

A Party may elect to withdraw from the Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal) in the event the Parties agree in writing that the obligations imposed by this Agreement are impossible to achieve.

### **8.2.4 Conditions Precedent to Withdrawal**

Two conditions must be satisfied before a Party can withdraw from the Agreement pursuant to Section 8.2.1 (Non-Compliance), Section 8.2.2 (Governmental Action), or Section 8.2.3 (Impossibility). First, the Party proposing to withdraw from the Agreement shall provide written notice to all other Parties of the substantive basis for its intent to withdraw. The notice shall include a complete statement of reasons and be served in accordance with the requirements of Section 17.2 (Special Notifications). Second, the substantive basis for the proposed withdrawal must be taken to Dispute Resolution (Section 12).

Following Dispute Resolution, a Party choosing to withdraw shall provide all other Parties with notice of withdrawal. The notice shall be in writing and served in accordance with the requirements of Section 17.2 (Special Notifications). A notice of withdrawal shall become effective sixty (60) days from the date the notice was provided to all other Parties. The right to withdraw shall be waived if not exercised within sixty (60) days of completion of Dispute Resolution.

### **8.2.5 Effect of Withdrawal**

Except as set forth in Section 8.2.6 (Effect of Termination), in the event a Party withdraws from this Agreement, this Agreement places no constraints on the withdrawing Party, shall not thereafter be binding on the withdrawing Party, and the withdrawing Party may exercise all rights and remedies that the Party would otherwise have outside this Agreement.

### **8.2.6 Effect of Termination**

Upon expiration of this Agreement, or in the event this Agreement is terminated, voided or determined for any reason to be unenforceable before the end of its term, then: (1) Douglas shall continue to implement the last agreed-upon measures until the FERC orders otherwise and (2) the Parties are not restrained in any manner from advocating to the FERC appropriate measures to replace this Agreement.

## **9.0 OBLIGATIONS OF THE PARTIES**

### **9.1 Licensee Obligations**

Douglas shall file this Agreement with the FERC as an offer of settlement pursuant to Rule 602 consisting of a fully executed copy of this Agreement and an explanatory statement. The offer of settlement related to this Agreement shall be included within both the Draft and Final License Applications, and Attachments B through G shall be identified therein as Douglas's proposed environmental measures for Aquatic Resources pursuant to 18 C.F.R. § 5.18(a)(5)(C). Douglas shall request that the FERC incorporate, without modification, the Attachments to this Agreement as conditions of the New Operating License. Douglas shall use reasonable efforts to obtain a FERC order issuing the New Operating License in a timely manner. Douglas shall also: (1) submit a statement in support of this Agreement to NMFS and USFWS, as part of any comments in the ESA Section 7 consultation process; (2) ensure that any supplemental information, comments, or responses to comments filed by Douglas with the FERC in the context of the relicensing process are consistent with this Agreement; (3) in the event of an appeal of the Project's 401 certification, submit a statement in support of this Agreement to the PCHB and any court reviewing a decision of the PCHB; and (4) actively support incorporation of the Proposed License Articles into the New Operating License in all other relevant regulatory proceedings.

### **9.2 Obligations of All Parties (Including Licensee)**

Except as provided below and in Section 13 (Reservations of Authority), each Party shall support this Agreement by ensuring that all documents filed with the FERC or any other agency or forum, are consistent with this Agreement. Documents covered by this Section include: (1) any recommendations, conditions and/or prescriptions, or any terms and conditions related to Aquatic Resources; (2) as to Parties other than the USFWS, any ESA Section 7 consultation documents or comments on such documents; (3) as to USFWS, any ESA Section 7 consultation documents, or comments on such documents, or any biological opinions, subject to Section 13 (Reservations of Authority); and (4) any supplemental information, comments or responses to comments.

In the event that a Party receives or develops new information, data, or analyses that it intends to file with the FERC or any other agency or administrative body, such Party shall consult with the Aquatic SWG pursuant to Section 11 (Aquatic Settlement Work Group) of this Agreement, to the extent practicable, and shall notify all Parties as soon as practicable.

Except as provided in Section 13 (Reservation of Authority), if a Party proposes to submit to FERC a condition and/or prescription based upon new information, data, or analyses, the Party must comply with the procedures of Section 12 (Dispute Resolution) if the Aquatic SWG does not unanimously approve such condition or prescription.

## **10.0 MODIFICATION OF AGREEMENT**

This Agreement may be amended or modified only in writing and with written unanimous consent of all Parties.

## **11.0 AQUATIC SETTLEMENT WORK GROUP**

### **11.1 Committee Representation**

There shall be an Aquatic SWG composed of one technical representative and a separate policy representative for each Party. The policy representative shall be an individual of a higher management level within each organization relative to the technical representative. Each Party shall provide all other Parties with written notice of its designated representatives and designated alternate(s) to the Aquatic SWG. Each Party with representation on the SWG shall have one vote.

Upon request by any Party, Douglas shall provide a forum for a meeting or meetings of the policy representatives. The Parties anticipate that the policy representatives will meet at least once annually during the term of the New Operating License to review progress and implementation of this Agreement.

### **11.2 Meetings**

The Aquatic SWG shall meet as specified in the respective Aquatic Resource Management Plans or when requested by any member following notice. However, such notice may be waived by a member if done so expressly in writing to the Chair. NMFS may attend all meetings of the Aquatic SWG for coordination purposes with HCP activities and shall be provided copies of notices and agendas for Aquatic SWG meetings. Individuals representing entities that are not a Party to this Agreement may attend meetings following unanimous approval from all of the Parties. Nothing in this Agreement shall preclude any Party from having multiple non-designated representatives from their organization participate in any properly noticed Aquatic SWG meeting.

### **11.3 Chair of the Aquatic SWG**

The Parties shall unanimously select and Douglas shall fund a neutral, non-voting Chair for the Aquatic SWG. The Chair will prepare an annual list of statements of agreement based upon the results of studies, prepare progress reports, prepare meeting minutes, facilitate and mediate the meetings, and assist the members of the Aquatic SWG in making decisions. The Aquatic SWG shall evaluate the performance of the Chair at least every three (3) years or upon request of two or more members of the Aquatic SWG.

### **11.4 Meeting Notice**

The Chair shall provide all committee members with a minimum of ten (10) business days advanced written notice of all meetings unless a member waives notice in writing or

such waiver is reflected in the approved meeting minutes. The notice shall contain an agenda of all matters to be addressed and voted on during the meeting. Means of notice will be determined by the Parties. Unless urgent action is required, to determine the date for a meeting, the Chair will poll the Parties in an effort to identify a meeting date on which all interested Parties are able to attend. If a date is not available for all Parties to meet within a reasonable time, the Chair will select the date that best accommodates the most Parties.

## **11.5 Voting**

The Aquatic SWG shall act by unanimous vote of those present in person or by telephone. However, the Aquatic SWG may develop its own rules and procedures for voting, which may include expanding the methods of voting (e.g., proxy, writing, or other methods). The Chair shall ensure that all members are sent notices with agenda items that may be brought to a vote during the proposed Aquatic SWG meeting.

If a Party's designated representative(s) cannot be present for an agenda item scheduled for a vote, that Party may request the Chair in advance of his/her expected absence to delay a vote or determination of unanimous approval for up to five (5) business days on the subject agenda item. Alternatively, if the Parties cannot convene for a vote within five (5) business days once a vote has been delayed, the Chair shall consult with the absent Party to solicit and record that Party's vote or abstention. The Chair and Parties shall make a reasonable effort to ensure that a vote on any specified agenda item is delayed only once.

If the Aquatic SWG cannot reach unanimous consent, then upon request by any Party, that agenda item shall be referred to the dispute resolution process set forth in Section 12 (Dispute Resolution). The Parties shall negotiate in good faith and attempt to resolve issues at a technical level prior to elevating issues to Dispute Resolution.

Any entity who is not a Party to this Agreement does not have voting rights on the Aquatic SWG or any other committee established under this Agreement.

## **11.6 Authority and Purpose of Aquatic SWG**

The Aquatic SWG will be used as the primary forum for consultation and coordination among the Parties in connection with conducting studies and implementing the measures set forth in this Agreement and as set forth in Section 12 (Dispute Resolution). Any entity not executing this Agreement shall not be a Party to this Agreement and shall not be entitled to vote on any committee established by this Agreement.

In connection with implementation of the Aquatic Resource Management Plans, the Parties agree to use Adaptive Management as defined herein. Adaptive Management involves many steps that may include forming a hypothesis regarding any potential Project related impacts, initial hypothesis development and testing, identifying potential Project related impacts, protection or mitigation measures, and the collection of data or

information necessary to test the hypothesis and developing studies to determine whether the hypothesis is valid. If the hypothesized impact is validated, certain process and study steps are necessary to quantify the impact(s) resulting from the Project.

When hypothesized impacts are validated and quantified through a systematic process, the Aquatic SWG may refine management goals and objectives set forth in the affected Aquatic Resource Management Plans, or add new goals and objectives as appropriate. The next step will be to implement appropriate and reasonable measures to avoid, minimize, or mitigate the identified Project impacts. Following the implementation of appropriate and reasonable measures to avoid, minimize, or mitigate the identified Project impacts, the Aquatic SWG will develop and Douglas will implement monitoring and evaluation methods for determining whether the goals and objectives of the plan are being achieved. If those refinements are successful, then periodic monitoring shall be implemented to confirm that such goals and objectives continue to be achieved. If the implemented measures fail to achieve the refined or new goals and objectives over a reasonable time frame, then the Aquatic SWG shall: (1) evaluate additional or modified measures, including those previously considered in the six Aquatic Resource Management Plans, and implement any additional or revised appropriate and reasonable measures; or (2) explain why such goals and objectives cannot be achieved.

If after a reasonable period of time such goals and objectives have not been achieved, the Aquatic SWG will, as needed, reevaluate and further refine such goals and objectives. The Aquatic SWG may establish its own procedural guidelines for Adaptive Management decisions and related decision process steps, as necessary, to monitor and evaluate established Aquatic Resource Management Plan goals and objectives and to develop new goals and objectives, studies and mitigation measures.

The Aquatic SWG will consult on, coordinate, and oversee all aspects of implementation of the Aquatic Resource Management Plans. If the Aquatic SWG cannot reach agreement, then these decisions shall be referred to the dispute resolution process in Section 12 (Dispute Resolution).

## **11.7 Studies, Reports, and Meeting Minutes**

The Chair will make available all study plans and reports prepared under this Agreement to all members of the Aquatic SWG as soon as reasonably possible. Draft study plans and reports will be distributed to all of the Aquatic SWG representatives for review and comment. Comments will be provided in writing to the Chair within thirty (30) days of receipt of the plan or report unless the Aquatic SWG decides otherwise. Comments will either be addressed in order within the document or made an appendix to the approved study plan or final report.

The Chair will provide draft meeting minutes, including any proposed or final statement(s) of agreements, within ten (10) days after each meeting. Statements of agreement shall be based on a unanimous vote. Minutes shall reflect all significant group discussions and decisions. All Party representatives who were present and participated in

the meeting will be allowed ten (10) days to provide corrections and comments in writing to the Chair. Final meeting minutes will be provided to the members of the Aquatic SWG as soon as reasonably possible after comments have been received. If disagreements exist, as to the proposed meeting minutes, then the Chair will include all perspectives in the final minutes.

The Chair will work with Douglas to compile all relevant materials into one annual calendar-year report. The annual report shall include all final study plans, reports, meeting minutes and statements of agreements, and a list of future proposed actions as agreed to by the Aquatic SWG. The Chair will provide the annual report to Aquatic SWG members for review and approval prior to being filed with FERC. Comments on the annual report shall be provided in writing to the Chair within thirty (30) days of receipt unless the Aquatic SWG decides otherwise. Douglas PUD shall work with the Aquatic SWG to establish a central electronic database that is accessible to all of the Parties. This electronic database will contain all of the documents related to implementation of this Agreement.

## **12.0 DISPUTE RESOLUTION**

### **12.1 Dispute Resolution Process**

If a dispute arises out of or relates to this Agreement, the disputing Parties agree to first use their best efforts to cooperatively resolve such dispute. The disputing Parties shall use their best efforts to resolve disputes arising in the normal course of business at the technical level between each disputing Party's staff with appropriate authority to resolve such disputes.

When a dispute arises between two or more Parties and cannot be resolved in the normal course of business at the technical level, one or more of the disputing Parties shall provide written notice specifying the disputed issues to the Chair, with copies to all Parties. The notice shall describe the specific nature and background of the dispute. All notices shall be served in accordance with the requirements of Section 17.2 (Special Notifications).

Within three (3) days of receiving the notice, or as the Parties otherwise agree, the Chair shall schedule a meeting of the technical representatives of the Aquatic SWG to consider and attempt to resolve the dispute. The technical representatives of the Aquatic SWG shall meet within thirty (30) days or as the Parties otherwise agree, after receiving the notice of dispute.

If after ten (10) business days, or as otherwise agreed, the Chair determines that the Parties' technical representatives are unable to resolve the dispute then the Chair shall immediately submit the matter in writing to the policy representatives of each of the respective Parties. The policy representatives shall meet within thirty (30) days or as the Parties otherwise agree, after receiving notice from the Chair.

If after ten (10) business days, or as otherwise agreed, the Chair determines that the Parties' policy representatives are unable to resolve the dispute then the Chair shall immediately submit the matter in writing to the executive representatives of each of the respective Parties. The executive representatives shall meet within thirty (30) days or as otherwise agreed, after receiving notice from the Chair. If the executive representatives are unable to resolve the dispute within fifteen (15) business days or as otherwise agreed, then the disputing Parties may agree to submit the dispute to voluntary mediation or binding arbitration but are not obligated to do either. If the disputing Parties are unable to resolve the dispute through the above processes any Party may pursue other appropriate remedies, including withdrawal from this Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal).

## **12.2 Arbitration and Mediation**

In the event the disputing Parties agree pursuant to Section 12.1 (Dispute Resolution Process) to submit a dispute to binding arbitration or voluntary mediation, the following procedures shall apply. The dispute shall then be referred to a mutually acceptable arbitrator or mediator, or if one cannot be agreed upon, to the nearest office of Washington Arbitration & Mediation Service ("WAMS") for resolution within ninety (90) days of the agreement of the Parties to submit the dispute to arbitration or mediation. If the disputing Parties cannot agree on a mutually acceptable arbitrator or mediator within ten (10) business days of such agreement to arbitrate/mediate, the dispute will be referred to WAMS for preparation of a Strike List for arbitrator/mediator selection. Mediation may occur at any time if agreed upon by the Parties. All arbitration proceedings shall be conducted in accordance with the Rules of Arbitration of WAMS or any other mutually agreed upon arbitrator and shall include reasonable discovery provisions as may be stipulated or ordered. The arbitrator's decision shall be final and binding and judgment may be entered thereon, with all remedies otherwise available in court also available in arbitration.

The disputing Parties shall equally share in the cost of arbitration and mediation associated with this Agreement. Parties that do not have an interest in the outcome of the arbitration or mediation proceeding may elect to abstain from further participation in either arbitration or mediation. The Parties agree that the existence of a dispute notwithstanding, they will continue without delay to carry out all their respective responsibilities under this Agreement that are not affected by the dispute.

Any legal action to enforce a decision of the arbitrator shall be brought either in the United States District Court for the Eastern District of Washington or the FERC, if jurisdiction exists, otherwise such action may be brought in any court of competent jurisdiction. The Colville and Yakama hereby provide a waiver of sovereign immunity that is expressly limited to a legal action filed under this section to enforce a decision of the arbitrator.



## **13.0 RESERVATIONS OF AUTHORITY**

The reservation of authority under Section 13.1 (Federal Power Act) of this Agreement is not intended to limit the right of any Party to seek redress with FERC with respect to an issue related to the implementation or enforcement of this Agreement.

### **13.1 Federal Power Act**

Each Party reserves any authority it may have pursuant to the FPA in the event that: (1) this Agreement is not filed with the FERC; (2) the Party withdraws from this Agreement pursuant to the procedures set forth in Section 8.2 (Withdrawal Events); or (3) this Agreement is terminated pursuant to Section 8.1 (Automatic Termination Events).

The USFWS reserves the Secretary of the Interior's authorities pursuant to the FPA. The USFWS may exercise any reserved authority under Section 18 of the FPA regarding those species covered by this Agreement including but not limited to bull trout, white sturgeon, Pacific lamprey, and resident fish. In the event that the USFWS includes a reservation of authority in the preliminary, modified or final conditions that it submits to FERC, the inclusion of such reservation shall not be considered to be materially inconsistent with this Agreement.

The USFWS shall provide notice to the Aquatic SWG before exercising its Federal Power Act authority. Following notice, the Aquatic SWG may make recommendations to the USFWS regarding how the exercise of such authority can be accomplished in a manner that is consistent with this Agreement. In the event that the Aquatic SWG does not reach a unanimous decision regarding such recommendations, then Section 12 (Dispute Resolution) shall apply.

### **13.2 Clean Water Act**

Ecology reserves its authority to issue a 401 certification under the Clean Water Act (CWA) for the Wells Project under such terms and conditions as it determines are necessary to comply with state and federal laws. The Parties intend that this Agreement, together with the HCP, will satisfy Ecology's requirements for the 401 certification with respect to Aquatic Resources and Plan Species affected by the Wells Project; however, this Agreement does not predetermine the outcome of the 401 certification proceeding or prevent Ecology from responding to new information or analysis or from addressing additional resources that may be affected. Section 12 (Dispute Resolution) shall not apply to the issuance of the 401 certification or a re-issuance of the 401 certification prior to the effective date of the New Operating License.

Ecology reserves all authority it may have to amend the 401 certification or to invoke a reopener clause in the 401 certification to amend the 401 certification for the New Operating License, including, but not limited to, modifying schedules and deadlines, under such terms and conditions as it determines are necessary to comply with state and federal law. Section 12 (Dispute Resolution) shall apply to the exercise of Ecology's

reserved authority to amend, modify or reopen the 401 certification during the term of the New Operating License.

Ecology reserves any authority it may have to enforce the 401 certification, state water quality standards, or other appropriate requirements of state law.

### **13.3 Endangered Species Act**

This Agreement does not affect the terms of the HCP. USFWS anticipates that the measures in this Agreement together with the measures contained within the HCP will be adequate to satisfy ESA responsibilities for aquatic species under the jurisdiction of USFWS. In addition, USFWS shall use reasonable efforts to exercise its authority under the ESA in a manner that allows this Agreement to be fulfilled. By signing this Agreement, however, the USFWS does not formally bind itself to make any specific recommendations or take any particular action with respect to ESA compliance. The USFWS expressly reserves the right, consistent with federal law, to take such future actions as it may deem necessary to meet its obligations under the ESA.

If the FERC requests draft biological opinion(s), the USFWS shall provide such documents to the FERC. If, in its consultation with the FERC pursuant to Section 7 of the ESA, the USFWS requests any measures that are materially inconsistent with the terms of this Agreement, any Party may invoke Section 12 (Dispute Resolution). The USFWS shall participate in Dispute Resolution to the extent practicable and consistent with its ESA responsibilities.

### **13.4 Douglas Reservation of Authority**

Douglas reserves any rights it may have to contest the existence and/or exercise of any reserved authority claimed under this Agreement. In the event that a Party exercises its reserved authority and declines to participate in Dispute Resolution, then Douglas shall have the right to withdraw from the Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal).

### **13.5 Exercise of Reserved Authority**

To the extent practicable, a Party shall provide notice to the Aquatic SWG at least sixty (60) days before exercising any authority reserved under this Agreement that may be materially inconsistent with this Agreement. Following notice, the Aquatic SWG will meet to discuss and make recommendations regarding the exercise of such authority. If the Aquatic SWG does not reach a unanimous decision regarding such recommendations, then any Party may initiate Dispute Resolution (Section 12). However, if in its sole discretion a Party determines expeditious action is required to perform its statutory duties or responsibilities, such Party shall not be required to wait in exercising reserved authority until Dispute Resolution is initiated or concluded. This provision does not apply to the issuance of a 401 certification prior to the effective date of the New Operating License.

## **14.0 CHOICE OF LAWS**

This Agreement shall be governed by, and construed, interpreted and enforced in accordance with, the substantive law of the State of Washington (without reference to any principles of conflicts of laws) and applicable federal law.

## **15.0 LIMITATIONS OF REOPENINGS**

Except as provided in Section 13 (Reservations of Authority), the Parties shall not invoke or rely upon any reopener clause set forth in the New Operating License for the Wells Project for the purposes of obtaining additional license articles, conditions or measures or to promote changes in Project structures or operations related to the protection, mitigation and enhancement of Aquatic Resources.

## **16.0 FORCE MAJEURE**

### **16.1 No Liability for Force Majeure**

No Party shall be liable to any other Party for breach of this Agreement as a result of a failure to perform or for delay in performance of any provision of this Agreement if, based on evidence provided by the non-performing Party to the other Parties, such performance is delayed or prevented by Force Majeure. In the event of an enforcement action, the non-performing Party bears the burden of proving by a preponderance of the evidence the existence of Force Majeure, including the absence of negligence. The term “Force Majeure” means any cause reasonably beyond the performing Party’s control, which could not be avoided with the exercise of due care, and which occurs without the fault or negligence of the Party whose performance is affected by the Force Majeure. Force Majeure events may be unforeseen, foreseen, foreseeable, or unforeseeable, including without limitation natural events; labor or civil disruption; terrorism; breakdown or failure of Project works not caused by failure to properly design, construct, operate, or maintain; new regulations or laws that are applicable to the Project; orders of any court or agency having jurisdiction over the Party’s actions; delay in a FERC order becoming final; or delay in issuance of any required permit.

### **16.2 Notice**

The Party whose performance is affected by Force Majeure shall notify the other Parties in writing within seven (7) days, or as soon thereafter as practicable, after becoming aware of any event that such Party contends constitutes Force Majeure. Such notice shall identify the event causing the delay or anticipated delay, estimate the anticipated length of delay, state the measures taken or to be taken to minimize the delay, and estimate the timetable for implementation of the measures. The affected Party shall make all reasonable efforts to promptly resume performance of this Agreement and, when able, resume performance of its obligations and give the other Parties written notice to that effect.

## **17.0 NOTICES**

### **17.1 Routine Notifications**

Unless this Agreement specifically requires otherwise, any routine notice, demand or request provided for in this Agreement, or served, given or made in connection with it, shall be in writing and shall be deemed properly served, given or made if delivered in person or sent by delivery, including email, or sent by mail, postage prepaid to the designated technical and policy representatives of each Party.

### **17.2 Special Notifications**

Unless this Agreement specifically requires otherwise, special notice shall be defined as any notice related to either a withdrawal or dispute resolution notification. All special notices prepared, served, given or made in connection with either withdrawal or dispute resolution, shall be in writing and shall be deemed properly served, given or made if delivered in person or sent by acknowledged delivery, including return receipt email, or sent by registered mail return receipt requested, postage prepaid to the technical, policy and executive representatives officially designated by each Party.

## **18.0 MISCELLANEOUS**

### **18.1 Further Assurances**

The Parties shall use best efforts to assist each other in performing their obligations under this Agreement including providing documents and information as may reasonably be requested.

### **18.2 No Consequential, Incidental or Punitive Damages**

There shall be no liability under this Agreement for any consequential, punitive, exemplary, incidental or indirect losses or damages.

### **18.3 Severability**

If any provision of this Agreement is held to be illegal, invalid, or unenforceable under any present or future law, and if the rights or obligations of any Party under this Agreement will not be materially and adversely affected thereby: (1) such provision will be fully severable; (2) this Agreement shall be construed and enforced as if such illegal, invalid, or unenforceable provision had never comprised a part thereof; (3) the remaining provisions of this Agreement shall remain in full force and effect and will not be affected by the illegal, invalid or unenforceable provision or by its severance here from; and (4) in lieu of such illegal, invalid or unenforceable provision, the Parties shall, in good faith, negotiate a mutually acceptable, legal, valid and enforceable provision as similar in terms to such illegal, invalid or unenforceable provision as may be possible, and shall promptly

take all actions necessary to amend the Agreement to include the mutually acceptable, legal, valid and enforceable provision.

#### **18.4 Waivers**

Except as otherwise provided herein, no provision of this Agreement may be waived except in writing. No failure by any Party to exercise, and no delay in exercising, short of the statutory period, any right, power, or remedy under this Agreement shall operate as a waiver thereof. Any waiver at any time by a Party of its right with respect to a default under this Agreement, or with respect to any other matter arising in connection therewith, shall not be deemed a waiver with respect to any subsequent default or matter.

#### **18.5 No Third-Party Beneficiaries**

None of the promises, rights, or obligations contained in this Agreement shall inure to the benefit of any person or entity not a Party to this Agreement; and no action may be commenced or prosecuted against any Party by any third party claiming to be a third-party beneficiary of this Agreement or the transactions contemplated hereby.

#### **18.6 No Reliance**

Each Party acknowledges that in entering into this Agreement, it has not relied on any statement, representation, or promise of the other Party or any other person or entity, except as expressly stated in this Agreement.

#### **18.7 Assumption of Risk**

In entering into this Agreement, each of the Parties assumes the risk of any mistake of fact or law, and if either or both of the Parties should subsequently discover that any understanding of the facts or the law was incorrect, none of the Parties shall be entitled to, nor shall attempt to, set aside this Agreement or any portion thereof. This provision does not affect the right of any Party to withdraw from this Agreement in accordance with Section 8.2 (Withdrawal Events).

#### **18.8 Waiver of Defenses**

The Parties release each other from any and all claims relating to the formation and negotiation of this Agreement, including reformation, rescission, mistake of fact, or mistake of law. The Parties further agree that they waive and will not raise in any court, administrative body or other tribunal any claim in avoidance of or defense to the enforcement of this Agreement other than the express conditions set forth in this Agreement.

## **18.9 Independent Counsel**

The Parties acknowledge that they have been represented by independent counsel in connection with this Agreement, they fully understand the terms of this Agreement, and they voluntarily agree to those terms for the purposes of making a full compromise and settlement of the subject matter of this Agreement.

## **18.10 Headings**

The headings used for the sections herein are for convenience and reference purposes only and shall in no way affect the meaning or interpretation of the provisions of this Agreement.

## **18.11 Interpretations**

In this Agreement, unless a clear contrary intention appears: (1) the singular number includes the plural number and vice versa; (2) reference to any person includes such person's successors and assigns but, if applicable, only if such successors and assigns are permitted by this Agreement, and reference to a person in a particular capacity excludes such person in any other capacity; (3) reference to any gender includes each other gender; (4) reference to any agreement (including this Agreement), document or instrument means such agreement, document or instrument as amended or modified and in effect from time to time in accordance with the terms thereof and, if applicable, the terms hereof; (5) reference to any Section, Schedule, Attachment, or Exhibit means such Section, Schedule, Attachment, or Exhibit to this Agreement, and references in any Section, Schedule, Attachment, Exhibit, or definition to any clause means such clause of such Section, Schedule, Attachment, Exhibit, or definition; (6) "hereunder", "hereof", "hereto", "herein," and words of similar import are references to this Agreement as a whole and not to any particular section or other provision hereof unless specifically stated; (7) relative to the determination of any period of time, "from" means "from and including", "to" means "to but excluding" and "through" means "through and including"; (8) "including" (and with correlative meaning "include") means including without limiting the generality of any description preceding such term; and (9) reference to any law (including statutes and ordinances) means such law as amended, modified, codified or reenacted, in whole or in part, and in effect from time to time, including rules and regulations promulgated thereunder.

## **18.12 Venue**

To the extent permitted by law, the venue for any action to enforce or interpret this Agreement involving any Federal or Tribal Parties shall be the United States District Court for the Eastern District of Washington or the FERC, and the venue for all other Parties shall be a Washington State court of competent jurisdiction or the FERC.

### **18.13 Legal Authority**

Each Party represents and warrants to the other Parties that it has full authority and power to enter into this Agreement, that the Party's representatives who sign below are duly authorized by it to enter into this Agreement, and that nothing herein violates any law, regulation, judicial or regulatory order, or agreement applicable to such warranting Party.

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Agreement Execution

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed by their proper officers respectively being thereunto duly authorized, and their respective corporate seals to be hereto affixed, the 19 day of January, 2008<sup>9</sup>

PUBLIC UTILITY DISTRICT NO. 1 of DOUGLAS COUNTY, WASHINGTON

By: T. James Davis  
T. James Davis, President

By: Lynn M. Heminger  
Lynn M. Heminger, Vice President

By: Ronald E. Skagen  
Ronald E. Skagen, Secretary

Address of Notice:

Public Utility District No. 1 of Douglas County  
1151 Valley Mall Parkway  
East Wenatchee, Washington 98802-4497

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UNITED STATES FISH AND WILDLIFE SERVICE

Dated: 7/31/2009

By: Ken S. Berg

Title: Project Leader

Address of Notice:


United States Fish and Wildlife Service  
11103 East Montgomery Drive  
Spokane, Washington 99206

United States Fish and Wildlife Service  
215 Melody Lane, Suite 119  
Wenatchee, WA 98801-5933

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STATE OF WASHINGTON, DEPARTMENT OF FISH & WILDLIFE

Dated: 11/20/09

By: 

Title: RD Region 2

Address of Notice:

Washington State Department of Fish and Wildlife  
600 Capital Way North  
Olympia, Washington 98501-1091

Washington State Department of Fish and Wildlife  
1540 Alder Street N.W.  
Ephrata, Washington 98823-7669

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STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY

Dated: 11/19/08

By: 

Title: SECTION MANAGER  
WATER QUALITY PROGRAM

Address of Notice:

Washington State Department of Ecology  
15 West Yakima Avenue, Suite 200  
Yakima, Washington 98902-3452

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CONFEDERATED TRIBES OF THE COLVILLE RESERVATION

Dated: 11-10-08

By: Michael Finley

Title: Vice Chairman

Address of Notice:

Confederated Tribes of the Colville Reservation  
Natural Resource Committee  
P.O. Box 150  
Nespelem, Washington 99155

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CONFEDERATED TRIBES AND BANDS OF THE YAKAMA NATION

Dated: February 24, 2009

By: Ralph Sampson Jr.

Title: Yakama Nation Tribal Council, Chairman

Address of Notice:

Confederated Tribes and Bands of the Yakama Nation  
PO Box 151  
Toppenish, Washington 98948

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UNITED STATES, BUREAU OF LAND MANAGEMENT

Dated: Nov 13, 2009

By: 

Title: Field manager

Address of Notice:

Bureau of Land Management  
915 North Walla Walla  
Wenatchee, Washington 98801-1521

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UNITED STATES, BUREAU OF INDIAN AFFAIRS

Dated: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Address of Notice:

Bureau of Indian Affairs  
911 NE 11<sup>th</sup> Avenue  
Portland, OR 97232

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**ATTACHMENT A: PROPOSED LICENSE ARTICLES**

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## ATTACHMENT A: PROPOSED LICENSE ARTICLES

Article 1. The licensee shall implement the measures set forth in section 4 of the White Sturgeon Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the White Sturgeon Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31<sup>st</sup> of each year to document all studies, measures and other activities completed in the previous year.

Article 2. The licensee shall implement the measures set forth in section 4 of the Bull Trout Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Bull Trout Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31<sup>st</sup> of each year to document all studies, measures and other activities completed in the previous year.

Article 3. The licensee shall implement the measures set forth in section 4 of the Pacific Lamprey Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Pacific Lamprey Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31<sup>st</sup> of each year to document all studies, measures and other activities completed in the previous year.

Article 4. The licensee shall implement the measures set forth in section 4 of the Resident Fish Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Resident Fish Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31<sup>st</sup> of each year to document all studies, measures and other activities completed in the previous year.

Article 5. The licensee shall implement the measures set forth in section 4 of the Aquatic Nuisance Species Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Aquatic Nuisance Species Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31<sup>st</sup> of each year to document all studies, measures and other activities completed in the previous year.

Article 6. The licensee shall implement the measures set forth in section 4 of the Water Quality Management Plan, dated October 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Water Quality Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31<sup>st</sup> of each year to document all studies, measures and other activities completed in the previous year.

**ATTACHMENTS B - G: AQUATIC RESOURCE MANAGEMENT PLANS**

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ATTACHMENT B: WHITE STURGEON MANAGEMENT PLAN

ATTACHMENT C: BULL TROUT MANAGEMENT PLAN

ATTACHMENT D: PACIFIC LAMPREY MANAGEMENT PLAN

ATTACHMENT E: RESIDENT FISH MANAGEMENT PLAN

ATTACHMENT F: AQUATIC NUISANCE SPECIES MANAGEMENT PLAN

ATTACHMENT G: WATER QUALITY MANAGEMENT PLAN

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**ATTACHMENT B: WHITE STURGEON MANAGEMENT PLAN**

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**WHITE STURGEON MANAGEMENT PLAN**  
**WELLS HYDROELECTRIC PROJECT**  
**FERC PROJECT NO. 2149**

August 2008

Prepared by:  
Public Utility District No. 1 of Douglas County  
East Wenatchee, Washington

## EXECUTIVE SUMMARY

The White Sturgeon Management Plan (WSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the WSMP is to increase the white sturgeon (*Acipenser transmontanus*) population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington state water quality standards. Based upon the information available as of December 2006, the Aquatic SWG determined that an assessment of Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Project. Therefore, the Aquatic SWG concluded that resource measures related to white sturgeon should focus on population protection and enhancement by means of supplementation as an initial step in order to increase the number of fish within the Wells Reservoir. In addition to the initial supplementation activities, implementation of a monitoring and evaluation program shall be conducted to accurately assess natural recruitment, juvenile habitat use, emigration rates, carrying capacity, and the potential for natural reproduction so as to inform the scope of a future, longer-term supplementation strategy. All objectives were developed in order to meet the WSMP goal. The PMEs presented within the WSMP are designed to meet the following objectives:

Objective 1: Supplement the white sturgeon population in order to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment;

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program;

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities;

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results;

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage;

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities.

This WSMP is intended to be compatible with other white sturgeon management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies and recovery goals of federal, state and tribal natural resource management agencies. The WSMP is not intended to be a harvest management plan and does not create or supersede jurisdiction over fisheries management decisions made by the responsible fishery agencies and tribes. However, the WSMP activities are expected to ultimately support appropriate and reasonable harvest opportunities consistent with the goals of the responsible fishery agencies and tribes and designated use for harvest under WAC 173-201A identified in the Washington state water quality standards. Should the responsible fishery agencies and tribes determine that there is an ongoing harvestable surplus of sturgeon in the Wells Reservoir, then this indicates significant progress toward achievement of the goals and objectives of this plan.

## **1.0 INTRODUCTION**

The White Sturgeon Management Plan (WSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The WSMP will direct implementation of measures to protect against and mitigate for potential Project impacts on white sturgeon (*Acipenser transmontanus*). To ensure active stakeholder involvement and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of white sturgeon in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies the goal and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for white sturgeon during the term of the new license.

## **2.0 BACKGROUND**

### **2.1 White Sturgeon Biology**

White sturgeon are the largest of all North American freshwater fish. They are found in marine waters and freshwaters of rivers along the Pacific coast from Monterey, California to Cook Inlet in northwestern Alaska (Wydoski and Whitney 2003). Significant populations of the Pacific Coast appear to be restricted to three locations: the Sacramento, Fraser, and Columbia rivers (Lane 1991). White sturgeon are distributed throughout the U.S. portion of the Columbia River and in many of its larger tributaries. Historically, white sturgeon migrated throughout the mainstem Columbia River from the estuary to the headwaters, although passage was probably limited at times by large rapids and falls (Brannon and Setter 1992).

White sturgeon are long-lived fish, with fin ray analysis documenting fish over 100 years in age (Beamesderfer et al. 1995). This anadromous species has been reported to reach a length of 20 feet and a weight of 1,800 pounds (Wydoski and Whitney 2003). In the Columbia River, white sturgeon spawn in the spring between April and July. Only a small percentage of adult white sturgeon in the Columbia River spawn in a given year. Intervals between spawning have been estimated to be between 3 and 11 years. White sturgeon deposit eggs through broadcast spawning at water temperatures between 10 and 18°C. Mature white sturgeon commonly produce between 100,000 and 300,000 eggs, but larger fish may produce up to 3 million eggs (Wydoski and Whitney 2003). Spawning and egg incubation in the Columbia River occur in the swiftest water available (2.6-9.2 feet per second) at depths between 13.1 and 65.6 feet over cobble, boulder, and bedrock substrates (Wydoski and Whitney 2003). In mainstem Columbia River reservoirs, spawning occurred within 5 miles downstream of the mainstem dams. Eggs hatch in approximately 7 days at 15°C.

Columbia River white sturgeon are reported to have declined in numbers because of numerous factors, including obstruction of migration by mainstem hydroelectric dams, altered stream flows, altered hydrologic regimes, altered temperature regimes, reduced spawning habitat, and over harvest (van der Leeuw et al. 2006; Wydoski and Whitney 2003). Variations in population characteristics also have been attributed to differences in exploitation rates and recruitment success, access to marine food resources, and suitability of hydrologic conditions and available habitats (Devore et al. 1995). During the 1800s, prior to construction of mainstem hydroelectric dams on the Columbia River, white sturgeon were in great demand for their caviar and smoked flesh. In 1892, during the peak of commercial harvest activities, approximately 2.5 million kilograms of white sturgeon were harvested (Wydoski and Whitney 2003). Regulations of the white sturgeon fishery began with a 4-foot minimum size limit established in 1899. Several regulations were established from 1899 to 2000 to manage the fishery in the lower Columbia River, although, effective recovery efforts did not begin until spawners were protected in the 1950s (Wydoski and Whitney 2003).

Beginning in the 1930s, with the construction of Rock Island, Grand Coulee, and Bonneville dams, migration was disrupted because white sturgeon generally do not pass upstream through fishways that were built for salmon, although they do pass downstream through dams (Lepla et al. 2001). Construction of hydroelectric projects in the mid-Columbia River Basin, such as Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells has also affected the upstream movement of white sturgeon. Current populations in the Columbia River basin can be divided into three groups: fish below the Bonneville Dam, with access to the ocean; fish isolated functionally, but not genetically, between dams; and fish in several large tributaries. However, the population dynamics and factors regulating production of white sturgeon within isolated populations in the mid-Columbia River reservoirs such as the Rocky Reach and Wells reservoirs are not well understood.

## **2.2 White Sturgeon Management and Recovery Efforts**

Management programs to protect and restore white sturgeon in the Kootenai River and the upper Columbia River are on-going and have provided a relevant framework for the development of a white sturgeon management plan in the Wells Reservoir. The Kootenai and upper Columbia sturgeon recovery efforts have also provided a good technical framework for implementing a sturgeon management plan. The strategies and activities outlined in these aforementioned management programs have provided important information, which has been used to develop an effective WSMP.

### **2.2.1 Kootenai River White Sturgeon Recovery**

In the early 1990s following concerns that white sturgeon populations were decreasing due to near total recruitment failure, a detailed monitoring program was instituted by the Idaho Department of Fish and Game (IDFG) to provide more information on white sturgeon species status in the Kootenai River system. In 1994, the USFWS listed the Kootenai stock of white sturgeon as an endangered species, which introduced a higher level of management and control by various authorities in the drainage and region. A Recovery Team was established to provide technical direction regarding hatchery supplementation efforts. A final Kootenai White Sturgeon Recovery Plan was signed by the USFWS in 1999.

Kootenai white sturgeon recovery efforts consist of a multi-faceted approach aimed at improving survival at various life history stages. Coordinated flow releases during spring are a major habitat restoration focus designed to increase natural recruitment, although currently it is difficult to assess the relationship between flows and recruitment success (USFWS 1999). Directed stocking programs, which address genetic concerns, stocking rates, and fish size at release, have also been implemented to boost juvenile sturgeon in the Kootenai system. The Kootenai Tribe of Idaho in collaboration with the Kootenay Trout Hatchery (KTH) in Canada are primarily responsible for producing high-quality juvenile white sturgeon for the directed stocking program. Information collected from annual monitoring activities, which assess survival, growth rates, and natural spawning success, allow for an adaptive management approach with regards to the stocking program.

### **2.2.2 Upper Columbia River White Sturgeon Recovery**

In 2002, a bi-national Recovery Team, termed the Upper Columbia White Sturgeon Recovery Initiative (UCWSRI) finalized the Upper Columbia White Sturgeon Recovery Plan in response to concerns that the transboundary white sturgeon population residing between Hugh L. Keenleyside Dam and Grand Coulee Dam consists of an aging and declining population with extremely limited recruitment. The Recovery Team, consisting of technical representatives from Federal, Provincial, and State resource management agencies and from Canadian and U.S. tribes, directs the recovery program.

Due to near total recruitment failure over the past two decades, a decision was made early in the recovery planning process to move immediately to development of a hatchery program to produce juvenile sturgeon for stocking (UCWSRI 2002). The breeding plan (Kincaid 1993) developed for the Kootenai sturgeon program was used as a model for the upper Columbia



sturgeon. Rearing of all fish for the stocking program occurs at the KTH. Similar to the Kootenai recovery strategy, a juvenile index monitoring program to assess growth, survival, health, distribution, and relative abundance of released juveniles shall provide information essential to monitoring the upper Columbia sturgeon population and the success of the hatchery stocking program.

### **2.2.3 Rocky Reach White Sturgeon Management Plan**

The relicensing process for the Rocky Reach Hydroelectric Project brought fisheries agencies, tribes, and interested parties together in a Natural Resources Working Group (NRWG) that provided an opportunity for comprehensive review of current and future management priorities for fish resources potentially impacted by ongoing Project operations (Chelan PUD 2005). In 2004 and 2005, NRWG members collaborated on the development of goals and objectives to manage the white sturgeon population within the Rocky Reach Project boundary under the new license. Based upon the information collected from white sturgeon field studies implemented by Chelan PUD in 2001 and 2002, a white sturgeon management plan was developed to promote population growth of sturgeon to a level commensurate with the available habitat. The Rocky Reach management plan measures include the implementation of a white sturgeon supplementation program, a monitoring program to determine population characteristics, and tracking surveys to determine movements and to assess potential spawning locations.

### **2.2.4 Priest Rapids Project White Sturgeon Management Plan**

As part of the Priest Rapids Project relicensing, white sturgeon populations were investigated in the Priest Rapids and Wanapum reservoirs from 1999 to 2003. Results of the study have assisted in identifying a framework for the future development and implementation of a Priest Rapids Project White Sturgeon Management Plan. Biological objectives associated with this management plan consist of increasing white sturgeon populations to a level commensurate with available habitat through a supplementation program and the implementation of a monitoring program to determine population characteristics such as natural recruitment, spawning, rearing, growth, survival, and rates of emigration.

## **2.3 Project White Sturgeon Study**

Since little information existed on the status of white sturgeon populations in the mid-Columbia, Chelan, Grant, and Douglas PUDs each initiated studies of white sturgeon to support their current or upcoming relicensing processes. The information gathered from these studies was intended to provide basic white sturgeon life history information, distribution, and current population sizes in the mid-Columbia River Basin. Additionally, study results provided the foundation for the development of appropriate management goals and objectives.

From 2001-2003, Douglas implemented a study to examine the white sturgeon population within the Project. Prior to the implementation of this study, little information on white sturgeon was available for the Wells Reservoir. WDFW catch record card returns for 1993 and 1994 indicate that legal size white sturgeon were present in the Wells Reservoir (Brad James, WDFW, pers. comm.). Additionally, information from previous studies in reservoirs upstream and downstream supported the existence of a population. The primary objectives of the study were to provide

basic information on the population abundance, age structure, size, and growth of Project white sturgeon; analyze movements of white sturgeon within the Reservoir; and compare the data collected during this study with data collected during assessments at other projects (Jerald 2007).

During the summers of 2001 and 2002, setlines were deployed in the Wells Reservoir. Sturgeon captured on setlines were measured, marked with passive integrated transponder (PIT) tags and with scute markings. Additionally, a select number of captured fish were fitted with radio-transmitters to track movements and had pectoral fin rays removed for age analysis using standard methodologies (Beamesderfer et al. 1989).

Setline sampling took place over a two-year timeframe with a total of 129 setlines deployed and retrieved from throughout the reservoir. In total, 13 white sturgeon were captured during the 2-year study with the majority of the fish being captured in the Columbia River within five miles of the mouth of the Okanogan River. Twelve of the captured fish were PIT tagged. Subsequently, five recapture events were recorded for a total of 18 capture events during the mark-recapture period (one fish was recaptured twice). Population abundance was estimated to be  $31.35 \pm 17.51$ . The 95% confidence interval for sturgeon abundance was calculated to be CI (13 < N < 218). The results of the mark-recapture portion of the study indicated that the sturgeon population in the Wells Reservoir is small with a point estimate of 31 fish over 50 cm in length (Skalski and Townsend 2005).

The length of the 13 fish captured during the study ranged from 60-202 cm. Two of the fish were classified as juveniles (<90 cm fork length) while 11 were classified as sub-adults or adults. It is important to note that the capture methodology was not designed to provide accurate sampling of fish under 50 cm. Captured sturgeon ranged in age from 6 to 30 years old (based on 11 fish) demonstrating that all of these fish recruited to the Wells Reservoir after Wells Dam was completed in 1967 with strong year class recruitment between the years 1972 and 1978 and again between 1988 and 1996. The presence of fish within these age classes suggests that successful recruitment within or to the Wells Reservoir is occurring either through (1) spawning within the Wells Reservoir and/or (2) immigration into the Wells Reservoir from populations upstream. Two white sturgeon were captured in 2001 and subsequently recaptured in 2002 to provide limited growth rate information. One juvenile fish was measured at 65 cm (fork length) on July 11, 2001. The fish was again captured on September 26, 2002 and measured 87 cm. This represented a growth rate of 22 cm in 14 months, or 18.9 cm/year. One adult fish was captured on August 9, 2001 measuring 197 cm (fork length). The fish was subsequently captured on September 6, 2002 and measured 199 cm representing a 2 cm growth rate over approximately 13 months, or 1.85 cm/year (Jerald 2007). In October 2006, this fish was found dead along the shoreline of the Columbia River adjacent to the mouth of the Okanogan River. At that time, biologists measured the fish at 228.5 cm representing a 29.5 cm increase in length over a four year period or an average of 7.4 cm of growth per year.

A total of six white sturgeon were fitted with radio-tags and monitored throughout the study period using mobile and fixed telemetry. Telemetry data along with setline capture data verify that white sturgeon congregate in the Columbia River near the Okanogan River confluence during the summer, fall, and winter months with none of the six fish being detected downstream from Brewster (RM 530) or upstream of Park Island (RM 538). Very little movement of tagged

sturgeon was observed during winter months. In the spring of 2002, one of the five mature fish radio-tagged made an upstream migration into the Okanogan River and two different radio-tagged mature sized sturgeon made movements into the Okanogan River during 2003.

In general, the results of the white sturgeon study in the Wells Reservoir were similar to the results of a study conducted in the neighboring Rocky Reach Reservoir in 2001-2002 (Chelan PUD 2005). Results indicate that the Wells Reservoir adult sturgeon population is estimated from 13-217 fish. These results are similar to the Rocky Reach assessment which estimated numbers of sturgeon from 50-115 fish. Both studies captured similar numbers of sturgeon using similar amounts of effort and similar capture techniques (Rocky Reach=18 sturgeon, Wells=13 sturgeon). Radio-telemetry data from both studies suggest that very little activity occurs during the overwintering period. Wells Reservoir sturgeon ranged in age from 6 to 30 years old while Rocky Reach sturgeon ranged in age from 7 to 50 years old. Both studies suggest that some recruitment into each population is occurring given the presence of juvenile fish in their respective reservoirs (Chelan PUD 2005; Jerald 2007).

### **3.0 GOAL AND OBJECTIVES**

The goal of the WSMP is to increase the white sturgeon population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington state water quality standards. Based upon the available information, the Aquatic SWG agreed that a rigorous and reliable assessment of ongoing Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Wells Reservoir. Therefore, the Aquatic SWG concluded that efforts should focus, initially, on supplementation efforts to increase the population within the Wells Reservoir in order to address Project effects. Once the population numbers have been increased to a level that can be studied, as determined by the Aquatic SWG, Douglas shall implement a monitoring and evaluation program to accurately assess natural recruitment, juvenile habitat use, emigration rates, carrying capacity, and the potential for natural reproduction so as to inform the scope of a future, long-term supplementation strategy. The PME's of the WSMP are designed to meet the following objectives:

Objective 1: Supplement the white sturgeon population in order to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment;

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program;

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities;

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results and in consultation with the Aquatic SWG;

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage;

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities.

This WSMP is intended to be compatible with other white sturgeon management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies and recovery goals of federal, state and tribal natural resource management agencies. The WSMP is not intended to be a harvest management plan and does not create or supersede jurisdiction over fisheries management decisions made by the responsible fishery agencies and tribes. However, the WSMP activities are expected to ultimately support appropriate and reasonable harvest opportunities consistent with the goals of the responsible fishery agencies and tribes and designated use for harvest under WAC 173-201A identified in the Washington state water quality standards. Should the responsible fishery agencies and tribes determine that there is an ongoing harvestable surplus of sturgeon in the Wells Reservoir, then this indicates significant progress toward achievement of the goals and objectives of this plan.

Douglas in consultation with the Aquatic SWG, developed the goal, objectives, and PMEs described in this section. The extent to which implementation of the proposed PMEs successfully achieve the WSMP goal and objectives identified shall be determined through the monitoring and evaluation program. Once the results of the monitoring and evaluation program have been considered, Douglas shall determine, in consultation with the Aquatic SWG, whether changes to the sturgeon stocking program are needed to meet the goals and objectives of the management plan.

The schedule for implementation of specific measures within the WSMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

#### **4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES**

In order to fulfill the goal and objectives described in Section 3.0, Douglas, in consultation with the ASWG, shall develop and implement a white sturgeon management program that includes PMEs. The Program shall be designed for implementation in two phases. Phase I of the PMEs shall be implemented during the first ten years of the new license and consist of supplementation, monitoring and evaluation activities. Results of Phase I PMEs will be used to inform the scope of continued PMEs during Phase II, which shall be implemented for the remainder of the new license.

Douglas, in consultation with the ASWG, shall initiate implementation of the following PME during the 50-year license term:

#### Phase I (Years 1-10)

- Development of a Brood Stock Collection and Breeding Plan (Year 1 and updated as determined by the Aquatic SWG, See Section 4.1.1);
- Brood Stock Collection (Years 1-4 and other years TBD by the Aquatic SWG, see Section 4.1.1);
- Juvenile Stocking (Years 2-5 and other years TBD by the Aquatic SWG, see Section 4.1.2);
- Index Monitoring Program (Years 3-5 and 2 more years prior to Year 10 TBD by the Aquatic SWG, see Section 4.2.1);
- Marked Fish Tracking (Years 3-5 and 2 more years prior to Year 10 TBD by the Aquatic SWG, see Section 4.2.2);
- Natural Reproduction Assessments (5 annual assessments over the license term, see Section 4.2.3)\*;

\* Natural reproduction assessments can be implemented over the term of the license (Phase I and Phase II) as determined by the Aquatic SWG.

#### Phase II (Years 11-50)

- Long-term juvenile stocking (stocking rate and frequency TBD by Aquatic SWG in Years 11-50, see Section 4.4.1);
- Supplementation Program Review (Years 11-50 TBD by the Aquatic SWG, see Section 4.4.2);
- Long-term Index Monitoring Program (Year 12 and once every 3-5 years thereafter TBD by the Aquatic SWG, see Section 4.4.3);
- Adult Passage Evaluation (Year 11 and once every 10 years thereafter, see Section 4.4)

As determined by the Aquatic SWG, appropriate educational opportunities coinciding with implementation of WSMP activities (Section 4.5) will be made available during the entire 50 year license term.

The following sections describe, in detail, the components, timing of implementation, and decision-making process of the PMEs to be conducted during Phase I and II of the white sturgeon management program.

## **4.1 Phase I Supplementation Program (Objective 1)**

### **4.1.1 Brood Stock Collection and Breeding Plan**

Due to the low numbers of sturgeon indicated by the 2001-2003 white sturgeon study and the need to increase genetic variation, there is a low probability that brood stock from only the Wells Reservoir can be utilized as the basis for supplementation activities. Consequently, other sources of fish must be considered in addition to capturing fish from Wells Reservoir to increase the white sturgeon population. Within one year of issuance of the new license Douglas shall prepare and implement a Brood Stock Collection and Breeding Plan, in consultation with the Aquatic SWG, which considers such factors as genetics and questions of imprinting, and are consistent with the goal and objectives of the WSMP and includes the level of detail provided in other existing white sturgeon breeding plans.

Following is a prioritized list of juvenile fish source options that shall be incorporated into a Brood Stock Collection and Breeding Plan:

- Brood stock collected from the Wells Reservoir;
- Brood stock collected from nearby reservoirs (Priest Rapids, Wanapum, Rocky Reach, Rock Island);
- Brood stock collected from McNary Reservoir;
- Juvenile production from the Lake Roosevelt white sturgeon recovery effort;
- Brood stock collected from below Bonneville Dam in the lower Columbia River;
- Juveniles purchased from a commercial facility.

A white sturgeon supplementation program may include, but may not be limited to, the following implementation options (Not listed in a priority order):

- Build new or retrofit existing Douglas funded hatchery facilities to accommodate white sturgeon brood stock, egg incubation, and juvenile rearing;
- Development of a mid-Columbia hatchery facility funded by the three PUDs (Douglas, Chelan, and Grant) to accommodate various phases of white sturgeon supplementation; brood stock, egg incubation, and juvenile rearing;
- Direct release into the Wells Reservoir of juveniles produced via appropriate Breeding Plan criteria and reared at a commercial facility;
- Direct release into the Wells Reservoir juveniles or adults trapped and hauled from the lower Columbia River.

The initial source of brood stock shall be determined within the first year of issuance of the new license. Collection of brood stock shall occur consistent with the brood stock collection plan in years 1-4 of the new license. Any additional years during the Phase I program (first ten years of the new license) in which brood stock collection shall occur in order to facilitate additional juvenile stocking into the Wells Reservoir (Section 4.1.2) will be determined by the Aquatic SWG. The intent of brood stock collection is to use their progeny, if feasible, for future white sturgeon stocking activities in the Wells Reservoir. The brood stock collection plan shall be updated annually, or as otherwise recommended by Douglas in consultation with the ASWG, to incorporate new and appropriate information.

#### **4.1.2 Juvenile White Sturgeon Stocking**

Within two years following issuance of the new license, Douglas shall release up to 5,000 yearling white sturgeon into the Wells Reservoir annually for four consecutive years (20,000 fish total). Additional years and numbers of juvenile sturgeon to be stocked during Phase I will be determined by the Aquatic SWG and will not exceed 15,000 juvenile sturgeon (total of 35,000 juvenile sturgeon during Phase I). In consultation with the Aquatic SWG, yearling fish for release shall be acquired through one or more of the sources listed in priority order in Section 4.1.1 above, or through other measures identified by the Aquatic SWG. If juvenile sturgeon stocking deadlines cannot be achieved, the Aquatic SWG will determine alternative implementation measures that will be undertaken by Douglas (see Table 4.7-1, footnote 2).

Douglas shall ensure that all hatchery-reared juvenile white sturgeon released into the Wells Reservoir are marked with Passive Integrated Transponder (PIT) tags and year-specific scute marks for monitoring purposes described in Section 4.2 of this plan. In order to allow for tracking of juvenile white sturgeon emigration described under Section 4.2.2, Douglas shall ensure that up to one percent (or a maximum of 50) of the juvenile white sturgeon released into the Wells Reservoir are large enough to allow implantation of an active tag prior to release. In addition, following the third year of supplementation (unless the Aquatic SWG determines more analysis is required), the Aquatic SWG may elect to release juveniles at an earlier or later life stage for the fourth year in order to compare success of fish released at varying life stages. For example, the Aquatic SWG may elect to have a proportion of the hatchery-reared juveniles released at differing size intervals (with the minimum size being that which permits PIT tagging), in order to monitor potential differences in survival and growth during future indexing periods.

#### **4.2 Phase I Monitoring and Evaluation Program (Objective 2)**

Douglas shall conduct a monitoring and evaluation program within the Wells Reservoir for the purpose of assessing the effectiveness of the supplementation activities described in Section 4.1 and outlined in Table 4.7-1. Monitoring shall include both an Index Monitoring Program (Section 4.2.1) and a Marked Fish Tracking Program (Section 4.2.2). Both of these studies will be used to collect life history and population dynamics information including rates of fish movements into and out of the Wells Reservoir and habitat use. Douglas shall also obtain updated information, when available, on other white sturgeon recovery programs (e.g., Upper Columbia River, Kootenai River, mid-Columbia PUDs), in order to improve the monitoring and evaluation program and refine its implementation. The results of this information will also inform supplementation, monitoring and evaluation activities during implementation of Phase II of the WSMP.

#### **4.2.1 Index Monitoring Program**

Within three years following issuance of the New License, Douglas shall initiate a three-year index monitoring program (Years 3-5) for juvenile and adult sturgeon in the Wells Reservoir to determine age-class structure, survival rates, abundance, density, condition factor, growth rates, and to identify distribution and habitat selection of juvenile sturgeon. The indexing methods shall include using gillnets, set lines or other appropriate recapture methods for juveniles and adults.

As a component of the Phase I indexing program, Douglas shall capture and implant active tags in a portion of the juvenile and sexually mature adult sturgeon population found in the Wells Reservoir. This tagging effort shall be used to augment broodstock collection (Section 4.1.1), population level information and juvenile habitat use (Section 4.2.2) and natural reproduction potential (Section 4.2.3).

After the initial three-year indexing period (Years 3-5), Douglas shall conduct an additional two years of index monitoring in Phase I as determined by the Aquatic SWG. After year 9, an additional year of index monitoring would take place in year 12 and then every three to five years over the term of the new license (Phase II) to assess age-class structure, survival rates, abundance, condition factor, growth rates; identify distribution and habitat selection of juvenile sturgeon; and to inform the supplementation program strategy (see Table 4.7-1).

Frequency (every 3, 4 or 5 years) of implementation of a long-term index monitoring activities (after year 12) will be determined by the Aquatic SWG. Phase II index monitoring activities will not consist of implantation of active tags in captured individuals.

#### **4.2.2 Marked Fish Tracking Program**

Beginning in year three of the new license and continuing for three years (Years 3-5), Douglas shall conduct tracking surveys of the juvenile white sturgeon that were released with active tags as part of supplementation activities. This will require one percent of each of the annual classes of juvenile sturgeon (up to a maximum of 50 fish each year) released in years 2, 3, 4, and 5 to be reared large enough to implant an active tag for tracking purposes (See Table 4.7-1). The purpose of tracking active-tagged fish is to determine juvenile white sturgeon emigration rates out of the Wells Reservoir and habitat use within the Wells Reservoir.

Douglas shall repeat the tracking survey for two additional years during Phase I (see Table 4.7-1). The additional two years of surveys shall track: 1) active tags implanted in a percentage of juvenile fish from previous years of supplementation activities (dependent upon tag life) and 2) any juvenile and adult fish implanted with active tags during the last indexing period preceding the survey. Subsequent Phase I surveys are likely to coincide with the additional Phase I index monitoring and juvenile stocking activities.



### **4.2.3 Determining Natural Reproduction Potential (Objective 3)**

In years where environmental conditions are appropriate, Douglas shall track sexually mature adult sturgeon that were captured and implanted with active tags under Section 4.2.1 for the purpose of identifying potential spawning locations and determining natural reproduction potential. Appropriate environmental conditions may be determined by examining the following factors: water quality and quantity (i.e., flow, temperature, and turbidity), the presence of reproductively viable adults during index monitoring activities, and the status of maturity for supplemented fish. In years in which sexually mature adult sturgeon are tagged under Section 4.2.1, Douglas may also utilize egg collection mats in combination with tracking in areas of the Wells Reservoir for the purpose of identifying potential spawning locations and activity. Five surveys of natural reproduction using adult tracking and/or egg mat placement shall occur over the term of the new license. Several of these surveys are intended to be implemented during the latter part of the license in order to examine the natural reproductive potential of supplemented fish recruiting to sexual maturity. These activities will support the aquatic life designated use for spawning under WAC 173-201A in the Washington state water quality standards.

### **4.3 Phase II Supplementation and Monitoring Program (Objective 2 and 4)**

The information collected through activities described in Section 4.1-4.3 will provide insight into the population dynamics, habitat availability, and limiting factors that affect the natural population structure of white sturgeon within the Wells Reservoir. This information will inform supplementation, monitoring and evaluation activities during implementation of Phase II supplementation and monitoring activities in the WSMP for the duration of the new license term after year 10.

#### **4.3.1 Long-Term Juvenile White Sturgeon Stocking**

The number and frequency of yearlings released in Phase II of the white sturgeon supplementation program will range from 0 to 5,000 fish. Stocking rates shall be based on the results of the Phase I Monitoring and Evaluation Program (Section 4.2) and determination of carrying capacity (Section 4.3) and shall be consistent with the goal and objectives of the WSMP. The Phase II stocking rates can also be adjusted as determined by the Aquatic SWG (also see Table 4.7-1, footnotes 2 and 3).

#### **4.3.2 Supplementation Program Review**

Douglas shall compile information on other white sturgeon supplementation programs in the Columbia River Basin in order to assess whether the white sturgeon supplementation program being implemented at the Project is: (i) consistent and comparable with the technology and methods being implemented by other supplementation programs in the region; (ii) reasonable in cost and effective to implement at the Project; and (iii) consistent with the supplementation program goals and objectives. The supplementation program review will be conducted annually in coordination with the development of the annual report (Section 4.6).

### **4.3.3 Long-term Index Monitoring Program**

Beginning in Year Twelve of the new license and every 3 to 5 years thereafter for the duration of the new license, Douglas shall continue to conduct a Phase II Index Monitoring Study for juvenile and adult sturgeon in the Wells Reservoir. This program will be used to monitor age-class structure, survival rates, abundance, condition factor, growth rates, identify distribution and habitat selection of juvenile sturgeon, and may continue to support broodstock collection activities. The indexing methods will include using gillnets or other appropriate recapture methods for juveniles and set lines for adults and will not consist of actively tracking fish. Frequency (every 3, 4, or 5 years) of implementation of long-term index monitoring activities (after year 12) will be determined by the Aquatic SWG.

### **4.4 Evaluation and Implementation of Adult Passage Measures (Objective 5)**

In Year Eleven of the new license and every 10 years thereafter for the duration of the new license unless otherwise determined by the Aquatic SWG, the Aquatic SWG shall evaluate the biological merit to providing upstream passage for adult white sturgeon. The assessment of biological merit shall be determined by: (i) evaluating information gathered from monitoring and evaluation activities and determining whether there is significant biological benefit and need for upstream passage; (ii) the availability of reasonable and appropriate means to provide upstream passage; and (iii) consensus from all other operators of the mid-Columbia projects to implement adult upstream passage measures<sup>1</sup>. If all three criteria above are met, Douglas, in consultation with the Aquatic SWG shall develop adult passage measures that are consistent with measures being implemented by other mid-Columbia project operators.

### **4.5 Educational Opportunities Coinciding with WSMP Activities (Objective 6)**

Douglas, in consultation with the Aquatic SWG, shall identify appropriate WSMP activities as opportunities for education to local public entities such as schools, cities, fishing and recreation groups, and other interested local groups. WSMP activities that may be appropriate for public participation are hatchery tours, release of hatchery juveniles, and tagging of juveniles prior to release.

### **4.6 Reporting**

Douglas will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the WSMP. The report will document all white sturgeon activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this WSMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

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<sup>1</sup> The intent is to provide connectivity to the Hanford Reach white sturgeon population.

## 4.7 Implementation Schedule

Table 4.7-1 outlines an estimated long-term schedule of the activities described in Sections 4.1-4.4.

**Table 4.7-1 Project White Sturgeon Implementation Schedule**

New License Year	Brood Stock Plan and Collection <sup>1</sup>	Release Fish into Wells Reservoir <sup>2</sup>	Index Monitoring <sup>3</sup>	Tracking Marked Fish <sup>4</sup>	Natural Production Assessment <sup>5</sup>	Adult Passage Evaluation
PHASE I						
1	X				TBD	
2	X	X				
3	X	X	X	X	TBD	
4	X	X	X	X		
5	TBD	X	X	X		
6	TBD	TBD			TBD	
7	TBD	TBD	TBD	TBD		
8	TBD	TBD				
9	TBD	TBD	TBD	TBD		
10	TBD	TBD			TBD	
PHASE II <sup>6</sup>						
11	Level and frequency TBD	Level and frequency TBD				X <sup>7</sup>
12			X			
13-50			TBD		TBD	Every ten years after Year 11

<sup>1</sup>Douglas brood stock plan shall be completed within one year following this issuance of the new license. Brood stock collection activities will occur at a minimum in years 1-4 during the new license term. Additional years, during Phase I, will be determined by the Aquatic SWG. In Year 11 (Phase II), level and frequency of activity will be determined by the Aquatic SWG and will be based upon the level of long-term supplementation identified from monitoring results.

<sup>2</sup>No more than a total of 35,000 fish will be stocked in Phase I (Years 1-10). The Phase II supplementation program will be determined by the Aquatic SWG and consistent with the goal of the WSMP.

<sup>3</sup> Results of the index monitoring activities will be used to determine the scope of future supplementation activities. Index monitoring activities from year 12 through the remainder of the new license term will occur at a frequency of 3-5 years as determined by the Aquatic SWG.

<sup>4</sup> Active-tagged juvenile and adult sturgeon will be tracked to assess emigration, habitat use, and potential spawning locations. This activity will occur in years 3, 4, and 5. Two additional years will be determined by the Aquatic SWG but will likely be consistent with years in which index monitoring activities are implemented.

<sup>5</sup> Tracking of reproductively viable adult sturgeon in combination with deployment of egg collection mats to identify natural production in the Wells Reservoir during 5 separate years over the term of the new license based on flow conditions or other data as determined by the Aquatic SWG.

<sup>6</sup> Phase II activities will consist only of brood stock plan and collection, stocking activities, index monitoring, and potentially natural reproduction assessments for the remainder of the new license.

<sup>7</sup> Adult Passage Evaluations will occur in Year 11 and every 10 years thereafter for the term of the new license.

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**ATTACHMENT C: BULL TROUT MANAGEMENT PLAN**

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**BULL TROUT MANAGEMENT PLAN**  
**WELLS HYDROELECTRIC PROJECT**  
**FERC PROJECT NO. 2149**

August 2008

Prepared by:  
Public Utility District No. 1 of Douglas County  
East Wenatchee, Washington

## EXECUTIVE SUMMARY

The Bull Trout Management Plan (BTMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the BTMP is to identify, monitor, and address impacts, if any, on bull trout (*Salvelinus confluentus*) resulting from the Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 Incidental Take Statement (ITS). This BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original Wells Bull Trout Monitoring and Management Plan (WBTMMP) (Douglas 2004). The 2004 WBTMMP was developed in coordination with the USFWS, as required by the USFWS Bull Trout Section 7 Biological Opinion (BO) in association with the Federal Energy Regulatory Commission's (FERC) approval of the HCP. The PMEs presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP;

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage;

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate the effectiveness of these measures;

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations;

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP;

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

This BTMP is intended to be compatible with other bull trout management plans and the Upper Columbia Salmon Recovery Plan (UCSRP) in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

## 1.0 INTRODUCTION

The Bull Trout Management Plan (BTMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The BTMP will direct implementation of measures to mitigate project impacts, if any, on bull trout (*Salvelinus confluentus*). To ensure active stakeholder participation and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan to direct the long-term management of bull trout in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and defines the relevant PMEs (Section 4) for bull trout during the term of the new license.

Additionally, this management plan is intended to continue implementation activities aimed at protecting bull trout in a manner consistent with measures specified in the original Wells Bull Trout Monitoring and Management Plan (WBTMMP) (Douglas 2004). The 2004 WBTMMP was developed in consultation with the USFWS, as required by the USFWS Bull Trout Biological Opinion (BO) in association with the implementation of the HCP.

## 2.0 BACKGROUND

### 2.1 Bull Trout Biology

Bull trout are native to northwestern North America, historically occupying a large geographic range extending from California north into the Yukon and Northwest Territories of Canada, and east to western Montana and Alberta (Cavender 1978). They are generally found in interior drainages, but also occur on the Pacific Coast in Puget Sound and in the large drainages of British Columbia.

Bull trout currently occur in lakes, rivers and tributaries in Washington, Montana, Idaho, Oregon (including the Klamath River basin), Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the McKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997). The remaining distribution of bull trout is highly fragmented.

Bull trout are a member of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. Genetic analyses indicate, however, that bull trout are more closely related to an Asian char (*Salvelinus leucomaenis*) than to Dolly Varden (Pleyte et al. 1992). Bull trout are sympatric with Dolly Varden over part of their range, most notably in British Columbia and the Coastal-Puget Sound region of Washington State.

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as clean, cold, connected, and complex instream habitat, a stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity (USFWS et al. 2000). Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats, and should not be expected to occupy all available habitats at the same time (Rieman and McIntyre 1995; Rieman et al. 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. The fluvial, adfluvial, and resident forms exist throughout the range of the bull trout (Rieman and McIntyre 1993). These forms spend their entire life in freshwater. The anadromous life history form is currently known only to occur in the Coastal-Puget Sound region within the coterminous United States (Volk 2000; Kraemer 1994; Mongillo 1993). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

The majority of growth and maturation for anadromous bull trout occurs in estuarine and marine waters, adfluvial bull trout in lakes or reservoirs, and fluvial bull trout in large river systems.

Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives.

For migratory life history types, juveniles tend to rear in tributary streams for 1 to 4 years before migrating downstream into a larger river, lake, or estuary and/or nearshore marine area to mature (Rieman and McIntyre 1993). In some lake systems, age 0+ fish (less than 1 year old) may migrate directly to lakes (Riehle et al. 1997). Juvenile and adult bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover and areas with cold hyporheic zones or groundwater upwellings (Sexauer and James 1993; Baxter and Hauer 2000).

## **2.2 Species Status**

On June 10, 1998, the USFWS listed bull trout within the Columbia River basin as threatened under the Endangered Species Act (ESA) (FR 63(111)). Later (November 1, 1999), the USFWS listed bull trout within the coterminous United States as threatened under the ESA (FR 64(210)). The USFWS identified habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) have isolated population segments resulting in a loss of genetic exchange among these segments (FR 63(111)). The USFWS believes many populations are now isolated and disjunct. In October 2002, the USFWS completed the first draft of a bull trout recovery plan intended to provide information and guidance that will lead to recovery of the species, including its habitat (USFWS 2002). Threatened bull trout population segments are widely distributed over a large area and because population segments were subject to listing at different times, the USFWS adopted a two-tiered approach to develop the draft recovery plan for bull trout (USFWS 2002). In November 2002, the USFWS published in the federal register a proposed rule for the designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout (67 FR 71235). In October 2004 the USFWS published a final rule in the Federal Register designating critical habitat for the Klamath River and Columbia River populations of bull trout (69 FR 59995).

In April 2008, the USFWS completed the 5-year status review for Columbia River bull trout with two recommendations: maintain “threatened” status for the species, and determine if multiple distinct population segments exist within the Columbia River and merit protection under the ESA. The recommendations intend to facilitate analysis of project effects over more specific and biologically appropriate areas, ultimately allowing a greater focus of regulatory protection and recovery resources (USFWS 2008a). The review also identified specific issues that limit the overall ability to accurately and quantitatively evaluate the current status of bull trout. Seven recommendations were made to improve future evaluation and management decisions, all of which are largely based on improvement and standardization of monitoring and evaluation techniques, better delineation and agreement of core areas and Recovery Units, and multi-agency cooperation and management (USFWS 2008b).

The Wells Project is situated within the Upper Columbia River Recovery Unit and the USFWS has identified the Wenatchee, Entiat, and Methow Rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. A core area functions as a metapopulation for bull trout. Not all core areas are equal and each has specific functions that are unique. For example, the Entiat Core Area depends heavily on the mainstem Columbia River to provide overwinter, migration, and forage habitats. The Wenatchee Core Area has populations using lake and riverine (both the Wenatchee and Columbia Rivers) habitat for overwintering, migration, and foraging. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent an interacting reproductive unit. Nineteen local populations have been identified in the Wenatchee (7), Entiat (2) and Methow (10) core areas (USFWS 2002).

## **2.3 Project Bull Trout Studies**

### **2.3.1 2001-2003 Project Bull Trout Study**

Listed Columbia River bull trout have been observed and counted at Wells Dam since 1998. In 2000, due to the potential for operations at mid-Columbia dams to affect the movement and survival of bull trout, the USFWS requested that the three mid-Columbia PUDs (Douglas, Chelan, and Grant PUDs) evaluate the movement and status of bull trout in their respective project areas. At that time, little was known about the life-history characteristics (e.g., movements, distribution, habitat use, etc.) of bull trout in the mid-Columbia River. Therefore, in order to assess the operational effects of hydroelectric projects on bull trout within the mid-Columbia, a three PUD coordinated radio-telemetry study was implemented beginning in 2001. The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River using radio-telemetry (Figure 2.3-1). The number of trout to be collected and tagged at each dam (Rock Island, Rocky Reach, and Wells) was based on the proportion of fish that migrated past those dams in 2000.

From 2001-2003, bull trout were collected from the Wells, Rocky Reach, and Rock Island dams and radio-tagged. Multiple-telemetry techniques were used to assess the movement of tagged bull trout within the study area. At Wells Dam, a combination of aerial and underwater antennas was deployed. The primary purpose for this system was to document the presence of bull trout at the Project, identify passage times and determine their direction of travel (upstream/downstream). In addition to these systems, a number of telemetry systems were deployed to address specific questions posed by the USFWS and Douglas. At Wells Dam, several additional systems were installed to identify tagged bull trout that could enter, ascend, and exit specific gates and fish ladders. All possible access points to the adult fish ladders and the exits were monitored individually in 2001, 2002, and 2003, allowing the route of passage to be determined as well as the ability to establish the exact time of entrance and exit from the ladder system. English et al. (1998; 2001) provides a detailed description of the telemetry systems at each of the dams and within the tributaries.

To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouth of the Methow and Okanogan rivers and periodic aerial surveys were conducted on the reservoir and throughout both watersheds (English et al. 1998, 2001). Key findings of the multi-year study are as follows:

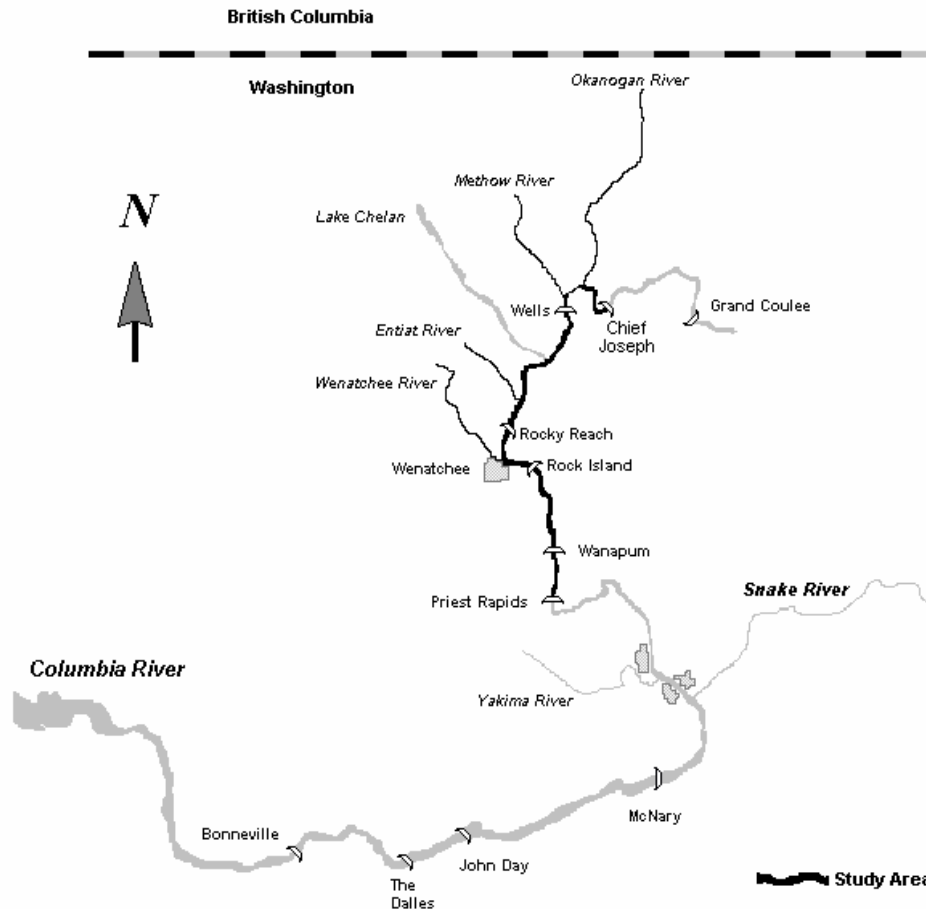
- Total upstream fishway counts (May 1<sup>st</sup> to November 15<sup>th</sup>) at Wells Dam from 2000 to 2003 were 90, 107, 76, and 53 bull trout, respectively.
- Adult bull trout migrate upstream through Wells Dam from May through November. Peak movement occurs in May and June with 94, 95, 92, and 89 percent of adult bull trout being detected during these months at Wells Dam for years 2000-2003, respectively.
- Tagged migratory adult bull trout successfully move both upstream and downstream past the Project (radio-telemetry). From the 79 bull trout radio-tagged in 2001 and 2002 at Rock Island, Rocky Reach, and Wells, five bull trout passed downstream through Wells Dam with no documented mortality. Twelve downstream passage events occurred at Rocky Reach (4) and Rock Island (8) through turbines from 2001 to 2003. None of the 17 (5 Wells, 4 Rocky Reach and 8 Rock Island) observed downstream passage events resulted in observed mortality of bull trout.
- Between 2001 and 2003, a total of 10 (2 tagged at Rock Island, 4 Rocky Reach, 4 Wells), 11 (4 Wells, 5 Rocky Reach, 2 from 2001), and 1 (1 Wells) tagged bull trout were detected moving upstream of the Project, respectively.
- Median tailrace times (tailrace detection to ladder entrance detection) during the telemetry study at Wells in 2001-2003 were 1.53, 7.84, and 1.00 days, respectively. Median travel times (tailrace detection to ladder exit detection) during the telemetry study at Wells in 2001-2003 were 8.87, 7.60, and 1.16 days, respectively. Median ladder passage times (entrance detection to ladder exit detection) during the telemetry study at Wells in 2001-2003 were 5.70, 0.23, and 0.16 days, respectively.
- Adult bull trout migrating upstream of Wells Dam appear to be destined for the Methow River. Between 2001 and 2003, no bull trout selected the Okanogan system (one trout moved into the Okanogan, but left shortly thereafter and moved into the Methow system).
- Median travel time from Wells Dam (detection at ladder exit) to first detection in the Methow River in 2001-2003 was 0.40, 2.78, and 1.09 days, respectively.
- All tributary entrance events (fixed station detections) into the Methow River by bull trout (28 total events, 2001-2003) occurred before June 27. An additional two bull trout, not detected by the tributary fixed station systems, were detected in the Methow River via 2002 aerial surveys. Bull trout in the Methow system selected two primary areas, the mainstem Methow River and the Twisp River.
- To date, 30% (9/30) of bull trout that entered the Methow River have been detected leaving the system. Tributary exit dates were recorded for 78% (7/9) of these emigrating bull trout and 86% (6/7) of bull trout with a recorded exit date left the Methow River system between October and December.
- Bull trout migrating upstream through Wells Dam in 2001 were 5 year old (n=2, mean fork length=55.6cm) and 6 year old (n=6, mean fork length= 54.6cm) fish as determined by scales.



- 92% (11/12) and 53% (8/15) of tagged bull trout detected in the vicinity of Wells Dam entered the Wells Hatchery Outfall in 2001 and 2002, respectively. It is possible that the bull trout frequented the outfall in search of prey. Typical operation at the hatchery is to volitionally release yearling chinook smolts between April 15 and 30, and subyearling chinook smolts in early June. Given that bull trout feed opportunistically (Goetz 1989), it is likely that the tagged bull trout were taking advantage of the large concentration of juvenile salmonids within the hatchery outfall system.

### **2.3.2 2005-2008 Project Bull Trout Study**

On December 10, 2003, the USFWS received a request from the Federal Energy Regulatory Commission (FERC) for formal consultation to determine whether the proposed incorporation of the HCP into the FERC license for operation of the Project was likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request and based upon the results of the 2001-2003 study, which suggested that continued operations are not likely to jeopardize bull trout, the USFWS filed the BO and Incidental Take Statement (ITS) with FERC. On June 21, 2004, FERC issued an order incorporating the HCP and the terms and conditions of the ITS into the FERC license for the Project.



**Figure 2.3-1 Study area for assessing migration patterns of bull trout in the mid-Columbia River (2001-2003). Fixed radio-telemetry sites monitored the movement of bull trout near Priest Rapids, Wanapum, Rock Island, Rocky Reach and Wells dams. Fixed sites placed in the Wenatchee, Entiat, Methow and Okanogan rivers monitored time of entry and exodus of bull trout in large tributaries of the mid-Columbia River.**

In 2004, Douglas in consultation with the USFWS and as required under the HCP BO, developed the WBTMMP. The goal of the WBTMMP is to continue monitoring and evaluating bull trout in the Project to quantify and address, to the extent feasible, potential Project impacts on bull trout. Implementation of WBTMMP measures specifically include: (1) address ongoing Project impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the USFWS bull trout recovery plan; and (3) monitor and minimize the extent of incidental take of bull trout, if any, consistent with Section 7 of the ESA. WBTMMP implementation started in 2005 and will continue through the spring of 2008. Objectives of the plan include identifying Project impacts, if any, on upstream and downstream passage of adult and sub-adult bull trout through Wells Dam, investigating the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir, and identifying the Core Areas and Local Populations, as defined in the USFWS Bull Trout Recovery Plan, of bull trout that utilize the Project.

To address Project impacts, if any, on upstream and downstream passage of adult bull trout, Douglas captured and radio-tagged 6, 10, and 10 adult bull trout at Wells Dam in 2005, 2006, and 2007, respectively (LGL and Douglas PUD, 2008). In 2005, all six fish traveled upstream into the Methow River and no downstream passage events were recorded. Travel time from release (after tagging) until entrance into the Methow River ranged from 7 hours to 12 days. In 2006, in addition to the 10 adult bull trout radio-tagged at Wells Dam, the USFWS radio-tagged 13 bull trout in the Methow River Core Area and Public Utility District No.1 of Chelan County (Chelan PUD) released 29 tagged bull trout from Rocky Reach and Rock Island dams. In total, 13 downstream passage events and 8 upstream passage events were recorded at Wells Dam in 2006. There were no observed instances of bull trout mortality resulting from these passage events. In 2007, 10 bull trout were tagged at Wells Dam, the USFWS tagged 5 bull trout in the Methow River Core Area, and Chelan PUD released 19 tagged bull trout from Rocky Reach and Rock Island dams. In total, 1 downstream passage event and 3 upstream passage events were recorded at Wells Dam in 2007. Similar to 2006, no instances of bull trout mortality were observed resulting from these passage events. From 2005 to 2008 (all radio-tagged fish combined), 25 downstream passage events and 52 upstream passage events by 40 individual bull trout were recorded at Wells Dam with no observances of bull trout injury or mortality (LGL and Douglas PUD, 2008). From 2005-2007, no adult or sub-adult bull trout were observed utilizing Wells Dam fishways during the winter monitoring period (typically November 16 to April 30). Monitoring of radio-tagged adult bull trout ended in June 2008.

To address potential project-related impacts on sub-adult bull trout, fish were opportunistically tagged with passive integrated transponder (PIT) tags when encountered during standard fish sampling operations at Wells Dam or during off-Project tributary smolt trapping activities. In 2005, 2006, 2007, and 2008 a total of 16, 20, 14, and 17 sub-adult bull trout were PIT tagged during tributary smolt sampling activities, respectively. No sub-adult bull trout were observed during Wells Dam fish sampling operations or by the adult PIT-tag detection system in the fishways. Over the 2005-2008 period, no sub-adult bull trout were observed utilizing Wells Dam fishways during the winter period.

In 2005, Douglas collected high resolution bathymetric information of Project waters to address the potential for entrapment or stranding of bull trout in off-channel or backwater areas of the Wells Reservoir. This data combined with Wells inflow patterns, reservoir elevations, and backwater curves would allow Douglas to begin identifying entrapment or stranding areas. In 2006, a field survey of potential bull trout stranding sites using bathymetric and operations information was conducted during a period of low reservoir elevation associated with the Methow River flood control program. Following a complete survey of the project, no stranded bull trout (sub-adult or adult) were found during the 2006 low water event. In 2007, reservoir conditions were not sufficiently low to warranted further field investigations.

In support of identifying the local populations and core areas of bull trout utilizing the Project area, Douglas funded the collection of genetic samples from 22, 20, and 24 bull trout in 2005, 2006 and 2007, respectively. In 2005, 6 samples were collected at Wells Dam and 16 were collected at off-Project operations (Methow and Twisp river screw traps). In 2006, 10 samples were collected at Wells Dam and 10 samples were collected at off-Project operations. In 2007,

10 samples were collected at Wells Dam and 14 samples were collected at off-Project operations. All genetic samples were provided to the USFWS.

### **3.0 GOALS AND OBJECTIVES**

The goal of the BTMP is to identify, monitor and address impacts, if any, on bull trout resulting from the Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 ITS (See Section 4.7). This BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original WBTMMP (Douglas 2004). The 2004 WBTMMP was developed in coordination with the USFWS, as required by the USFWS Bull Trout BO in association with the HCP. The PME's presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP;

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage;

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures;

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations (similar to WBTMMP);

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan, including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP;

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

This BTMP is intended to be compatible with other bull trout management plans and the UCSRP in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

The schedule for implementation of specific measures within the BTMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

## **4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES**

In order to fulfill the goals and objectives described in Section 3.0, Douglas, in consultation with the Aquatic SWG, will implement PME's for Project bull trout consistent with the objectives identified in Section 3.0. The measures proposed in this section are intended to serve both as PME's for bull trout throughout the new license term and to adequately monitor and minimize any incidental take of bull trout consistent with Section 7 of the ESA.

### **4.1 Operate the Upstream Fishways and Downstream Bypass Systems in a Manner Consistent with the HCP (Objective 1)**

#### **4.1.1 Provide Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout**

Douglas will continue to provide upstream passage for adult bull trout through the existing upstream fishways and downstream passage of adult and sub-adult bull trout through the existing downstream bypass system. Both upstream fishway facilities (located on the west and east shores) are operational year around with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Maintenance activities on Wells fishways occur during the winter when bull trout have not been observed passing Wells Dam. Operation of the downstream passage facilities for bull trout will be consistent with bypass operations for Plan Species identified in the HCP. Currently the bypass system is operated from April 12 through August 26 of each year. This operating period is consistent with the period of high bull trout and anadromous fish presence at the Project.

#### **4.1.2 Upstream Fishway Counts**

Douglas shall continue to conduct video monitoring in the Wells Dam fishways from May 1<sup>st</sup> through November 15<sup>th</sup> to count and provide information on the population size of upstream moving bull trout.

#### **4.1.3 Upstream Fishway Operations Criteria**

Douglas shall continue to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the HCP.

#### **4.1.4 Bypass Operations Criteria**

Douglas shall continue to operate the bypass system at Wells Dam in accordance with criteria outlined in the HCP.

## **4.2 Identify Any Adverse Project-related Impacts on Adult and Sub-adult Bull Trout Passage (Objective 2)**

### **4.2.1 Adult Bull Trout Upstream and Downstream Passage Evaluation**

Douglas shall continue to monitor upstream and downstream passage and incidental take of adult bull trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every ten years thereafter during the new license term, Douglas will conduct a one-year monitoring program to determine whether Douglas remains in compliance with the ITS. The same study protocols used during past radio-telemetry assessments at Wells Dam (LGL and Douglas PUD 2007) will be employed for these monitoring studies.

If the adult bull trout counts at Wells Dam increases more than two times the existing 5-year average or if there is a significant change in the operation of the fish ladders or hydrocombine, then the Aquatic SWG will determine whether additional years of take monitoring are needed beyond those identified in this section of the BTMP. If the authorized incidental take level is exceeded during any one-year period, Douglas will conduct another monitoring study in the succeeding year. If the authorized incidental take level is exceeded in this second year, Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to exceedance of the allowable level of incidental take.

### **4.2.2 Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities**

Douglas shall assess upstream and downstream passage and incidental take of adult, migratory bull trout at off-Project (outside of the Project boundary) adult salmon and steelhead brood stock collection facilities associated with the Wells HCP. Specifically, beginning in year one of the new license, Douglas will conduct a one-year radio-telemetry study to assess passage and incidental take at off-Project adult collection facilities (i.e., Twisp weir). Douglas will capture and tag up to 10 adult, migratory bull trout (>400mm) at adult collection facilities and use fixed receiver stations upstream and downstream of collection facilities to examine upstream and downstream passage characteristics and incidental take. Study protocols that have been used during past radio-telemetry assessments at Wells Dam (LGL 2008) will be employed for this assessment.

If negative impacts to passage associated with Off-Project collection facilities are observed or the authorized incidental take level is exceeded during any one-year period, Douglas will conduct another monitoring study in the succeeding year. If negative impacts to passage continue to be observed or the authorized incidental take level is exceeded in this second year, Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to passage impacts or the exceedance of the allowable level of incidental take.

After year one of the new license, the implementation of this sub-objective will be integrated into the one-year telemetry monitoring program that is to be conducted every ten years (beginning in year 10 of the new license) at Wells Dam as identified in Section 4.2.1. In year 10 of the new license and every 10 years thereafter, bull trout will be captured and tagged only at Wells Dam

(Section 4.2.1) since data show that bull trout passing Wells Dam are migrating back into the Methow River watershed (LGL 2008). Through the continued deployment of fixed station monitoring at off-Project adult salmon and steelhead brood stock collection facilities, these tagged bull trout will continue to provide passage and take information in support of this sub-objective throughout the term of the new license.

#### **4.2.3 Sub-Adult Bull Trout Monitoring**

While an objective of the BTMP is to identify potential Project impacts on upstream and downstream passage of sub-adult bull trout, Aquatic SWG members (including the USFWS) agree that it is not feasible to assess sub-adult passage because sub-adult bull trout have not been observed at Wells Dam. During the previous six years of bull trout data collection at Wells Dam (BioAnalyst Inc. 2004; LGL 2008), sub-adult bull trout have not been documented passing Wells Dam (based upon fishway video counts and bull trout trapping for radio-telemetry). However, it is expected that through the increased monitoring associated with the implementation of the BTMP that there may be additional encounters with sub-adult bull trout. If at any time during the new license term, sub-adult bull trout are observed passing Wells Dam in significant numbers (>10 per calendar year), the Aquatic SWG will recommend reasonable and appropriate methods for monitoring sub-adult bull trout. Specifically, Douglas may modify counting activities, continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult bull trout when these fish are collected incidentally during certain fish sampling operations. This activity will occur the following year of first observation of sub-adult bull trout (>10 per calendar year) and subsequently as recommended by the Aquatic SWG.

#### **4.3 Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified (Objective 3)**

Douglas shall continue to operate the upstream fishway and downstream bypass at Wells Dam in accordance with the HCP. However, if upstream or downstream passage problems for bull trout are identified (as agreed to by the USFWS and Douglas), Douglas will identify and implement, in consultation with the Aquatic SWG and HCP Coordinating Committee, reasonable and appropriate options to modify the upstream fishway, downstream bypass, or operations to reduce the identified impacts to bull trout passage.

#### **4.4 Investigate Entrapment or Stranding of Bull Trout during Periods of Low Reservoir Elevation (Objective 4)**

During the implementation of the WBTMMP from 2004-2008, Douglas, through the use of high resolution bathymetric information, hydraulic and elevation data, and backwater curves, identified potential bull trout entrapment and stranding areas in the Wells Reservoir. Although no stranded bull trout were observed in these areas during the implementation of the WBTMMP, Douglas will continue to investigate potential entrapment or stranding areas for bull trout through periodic monitoring when periods of low reservoir elevation expose identified sites. During the first five years of the new license, Douglas will implement up to five bull trout entrapment/stranding assessments during periods of low reservoir elevation (below 773' MSL).

If no incidences of bull trout stranding are observed during the first five years of study, additional assessment will take place every fifth year during the remainder of the license term, unless waived by the Aquatic SWG. If bull trout entrapment and stranding result in take in exceedance of the authorized incidental take level, then reasonable and appropriate measures will be implemented by Douglas, in consultation with the Aquatic SWG, to address the impact.

#### **4.5 Participate in the Development and Implementation of the USFWS Bull Trout Recovery Plan (Objective 5)**

##### **4.5.1 Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout**

Douglas will monitor activities associated with the implementation of other Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and Predator Control Program that may result in the incidental capture and take of bull trout. If the incidental take of bull trout is exceeded due to the implementation of other Aquatic Resource Management Plan activities, then Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take. If the incidental take of bull trout is exceeded due to the implementation of the Predator Control Program, then Douglas will develop a plan, in consultation with the HCP Coordinating Committee and the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

##### **4.5.2 Funding Collection of Tissue Samples and Genetic Analysis**

Beginning in year 10 of the new license, and continuing every 10 years thereafter for the term of the new license, Douglas will, if recommended by the Aquatic SWG, collect up to 10 adult bull trout tissue samples in the Wells Dam fishway facilities over a period of one year and fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the bull trout radio-telemetry monitoring study. Samples will be submitted to the USFWS Central Washington Field Office in Wenatchee, Washington. Any sub-adult bull trout collected during these activities will also be incorporated into the bull trout genetic analysis.

Beginning in year one of the new license, Douglas will collect up to 10 adult bull trout tissue samples from the Twisp River brood stock collection facility over a period of one year and will fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the Off-Project bull trout radio-telemetry monitoring study.

##### **4.5.3 Information Exchange and Regional Monitoring Efforts**

Douglas will continue to participate in information exchanges with other entities conducting bull trout research and regional efforts to explore availability of new monitoring methods and coordination of radio-tag frequencies for bull trout monitoring studies in the Project.

Douglas will make available an informational and educational display at the Wells Dam Visitor Center to promote the conservation and recovery of bull trout in the Upper Columbia River and associated tributary streams.



## **4.6 Identify Any Adverse Impacts of Project-related Hatchery Operations on Adult and Sub-adult Bull Trout (Objective 6)**

### **4.6.1 Bull Trout Monitoring During Hatchery Activities**

During the term of the new license, Douglas shall monitor hatchery actions (e.g., salmon trapping, sturgeon brood stocking and capture activities) that may encounter adult and sub-adult bull trout for incidental capture and take. Actions to be monitored shall be associated with the Wells Hatchery, the Methow Hatchery, and any future facilities directly funded by Douglas.

If the incidental take of bull trout is exceeded due to Douglas's hatchery actions then Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

## **4.7 USFWS Section 7 Consultation**

The PME's contained within the BTMP were specifically developed, in consultation with the USFWS, to address potential Reasonable and Prudent Measures (RPMs) for the Project relicensing and associated section 7 consultation. All of the FWS's potential RPMs for the Wells Project can be found in Appendix A. Each of these RPMs has been cross referenced with the specific supporting objective and PME (Sections 4.1 - 4.6) found within the BTMP. The purpose of Appendix A is to provide consistency with Douglas PUD's Aquatic Settlement Agreement and the FWS' subsequent section 7 consultation on the relicensing of the Wells Project.

## **4.8 Reporting**

Douglas will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the BTMP. The report will document all bull trout activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this BTMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

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## **APPENDIX A**

**CROSS REFERENCED UNITED STATES FISH AND WILDLIFE  
SERVICE (USFWS) REASONABLE AND PRUDENT MEASURES (RPMS)  
WITH WELLS BULL TROUT MANAGEMENT PLAN (BTMP)  
OBJECTIVES AND SUPPORTING PROTECTION, MITIGATION AND  
ENHANCEMENT MEASURES (PMES)**

**FWS RPM 1:** FERC shall require Douglas PUD, in coordination with the Service, to provide adequate year-round passage conditions for all life history stages of bull trout at all Project facilities.

**Associated BTMP Objectives and PMEs:**

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP (Section 4.1).

PME: Provide Upstream and downstream Passages for Adult and Sub-Adult Bull Trout (Section 4.1.1).

PME: Upstream Fishway Counts (Section 4.1.2).

PME: Upstream Fishway Operations Criteria (Section 4.1.3).

PME: Bypass Operations Criteria (Section 4.1.4).

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage (Section 4.2).

PME: Adult Bull Trout Upstream and Downstream Passage Evaluation (Section 4.2.1).

PME: Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities (Section 4.2.2).

PME: Sub-Adult Bull Trout Monitoring (Section 4.2.3).

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures.

**FWS RPM 2.** FERC shall require Douglas PUD, in coordination with the Service, to minimize the effect of spillway operations and hydrographic variation to all life history stages of bull trout at all Project facilities.

**Associated BTMP Objectives and PMEs:**

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP (Section 4.1).

PME: Provide Upstream and downstream Passages for Adult and Sub-Adult Bull Trout (Section 4.1.1).

PME: Upstream Fishway Operations Criteria (Section 4.1.3).

PME: Bypass Operations Criteria (Section 4.1.4).

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures (Section 4.3).

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations (Section 4.4).

**FWS RPM 3.** FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Hatchery Supplementation Program to all life stages of bull trout.

**Associated BTMP Objectives and PMEs:**

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage (Section 4.2).

PME: Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities (Section 4.2.2).

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

PME: Bull Trout Monitoring During Hatchery Activities (Section 4.6.1).

**FWS RPM 4.** FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the other Aquatic Resource Management Plans and Predator Control Program to all life stages of bull trout.

**Associated BTMP Objectives and PMEs:**

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan, including information exchange and genetic analysis (Section 4.5).

PME: Monitor other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout (Section 4.5.1).

**FWS RPM 5.** FERC shall require Douglas PUD, in coordination with the Service, to design and implement a bull trout monitoring program that will adequately detect and quantify Project impacts. This information will reduce uncertainty regarding Project impacts over the life of the project and shall be used to modify Project operations to the extent practicable to further minimize the manner or extent of take.

**Associated BTMP Objectives and PMEs:**

Refer to Wells Bull Trout Management Plan in its entirety.

**Additional PMEs Proposed in the BTMP (not listed above):**

PME: Funding Collection of Tissue Samples and Genetic Analysis (Section 4.5.2).

PME: Information Exchange and Regional Monitoring Efforts (section 4.5.3).



**ATTACHMENT D: PACIFIC LAMPREY MANAGEMENT PLAN**

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**PACIFIC LAMPREY MANAGEMENT PLAN**  
**WELLS HYDROELECTRIC PROJECT**  
**FERC PROJECT NO. 2149**

September 2009

Prepared by:  
Public Utility District No. 1 of Douglas County  
East Wenatchee, Washington

## EXECUTIVE SUMMARY

The Pacific Lamprey Management Plan (PLMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey (*Lampetra tridentata*) resulting from the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several Pacific lamprey PMEs in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey;

Objective 2: Identify and address any Project-related impacts on downstream passage and survival and rearing of juvenile Pacific lamprey;

Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.

## **1.0 INTRODUCTION**

The Pacific Lamprey Management Plan (PLMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The PLMP will direct implementation of measures to protect against and mitigate for potential Project impacts on Pacific lamprey (*Lampetra tridentata*). To ensure active stakeholder involvement and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of Pacific lamprey in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies the goal and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for Pacific lamprey during the term of the new license.

## **2.0 BACKGROUND**

### **2.1 Pacific Lamprey Biology**

Pacific lamprey are present in most tributaries of the Columbia River and in the mainstem Columbia River during their migration stages. They have cultural, utilitarian and ecological significance in the basin, because Native Americans have historically harvested them for subsistence, ceremonial and medicinal purposes (Close et al. 2002). As an anadromous species, they also play an important role in the food web by contributing marine-derived nutrients to the basin and may act as a predatory buffer for juvenile salmon and steelhead. Little specific information is available on the life history or status of lamprey in the mid-Columbia River watersheds. They are known to occur in the Methow, Wenatchee and Entiat rivers (NMFS 2002) and recently have been captured during juvenile salmon and steelhead trapping operations in the Okanogan River.

In general, adults are parasitic on fish in the Pacific Ocean while ammocoetes (larvae) are filter feeders that inhabit the fine silt deposits in backwaters and quiet eddies of streams (Wydoski and Whitney 2003). Adults generally spawn in low-gradient stream reaches in the tail areas of pools and in riffles, over gravel substrates (Jackson et al. 1997). Adults die after spawning. After hatching, the ammocoetes burrow into soft substrate for an extended larval period filtering particulate matter from the water column (Meeuwig et al. 2002). The ammocoetes undergo a metamorphosis into macrophthalmia (outmigrating juvenile lamprey) between 3 and 7 years after hatching, and then migrate from their parent streams to the ocean (Close et al. 2002). Adults typically spend 1-4 years in the ocean before returning to freshwater tributaries to spawn.

Pacific lamprey populations of the Columbia River have generally declined in abundance over the last 40 years according to counts at dams on the lower Columbia and Snake rivers (Close et al. 2002). Starke and Dalen (1995) reported that adult lamprey counts at Bonneville Dam regularly exceeded 100,000 fish in the 1960s and more recently have ranged between 20,000 and 120,000 for the period 2000-2004 (DART - [www.cqs.washington.edu/dart/adult.html](http://www.cqs.washington.edu/dart/adult.html)).

In the mid-Columbia River Basin, adult lamprey count data at hydroelectric projects varies by site but is generally available for all projects since 1998 (with the exception of Wanapum Dam where data is only available for 2007). As is expected, the general trend for mid-Columbia River counts is relatively consistent with observations at Bonneville Dam from year to year (i.e., relatively high count years at Bonneville result in relatively high count years in the mid-Columbia River). It is important to note that the daily and seasonal time periods as well as the counting protocols may differ at each project. These differences may affect data reliability and need to be considered when examining and comparing these data. Table 2.1-1 provides a summary of adult lamprey passage data for mid-Columbia River hydroelectric facilities.

**Table 2.1-1. Minimum, maximum, and average counts for adult Pacific lamprey at mid-Columbia River hydroelectric projects from 1998 to 2007.**

	<b>Priest Rapids</b>	<b>Wanapum*</b>	<b>Rock Island</b>	<b>Rocky Reach</b>	<b>Wells</b>
Min	1,130	4,771	559	303	21
Max	6,593	4,771	5,074	2,583	1,417
Average	3,016	4,771	2,157	952	326

\* Wanapum Dam counts are only available for 2007.

Close et al. (1995, 2002) identified several factors that may account for the decline in lamprey counts in the Columbia River Basin. This includes reduction in suitable spawning and rearing habitat from flow regulation and channelization and pollution, reductions of prey in the ocean, and juvenile and adult passage problems at dams. Mesa et al. (2003) found that adult Pacific lamprey had a mean critical swimming speed of approximately 85 cm/s which suggests that they may have difficulty negotiating fishways with high current velocities that were designed for salmon and steelhead passage.

The study of adult Pacific lamprey migration patterns past dams and through reservoirs in the lower Columbia River has provided the first data sets on lamprey passage timing, travel times, and passage success at hydroelectric projects (Vella et al. 2001; Ocker et al. 2001; Moser et al. 2002a; Moser et al. 2002b). These studies have shown that approximately 90% of the radio-

tagged lamprey released downstream of Bonneville Dam migrated back to the tailrace below Bonneville Dam; however, less than 50% of the lamprey which encountered a fishway entrance actually passed through the ladder exit at the dam (Nass et al. 2005).

Similar collection and passage efficiency results were observed at Rocky Reach, Wanapum, and Priest Rapids dams during tagging studies conducted at those projects (Nass et al. 2003; Stevenson et al. 2005).

Of the 125 radio-tagged lampreys released approximately 7 kilometers downstream of Rocky Reach Dam, 93.6% were detected at the project, and of those fish, 94.0% entered the fishway. Of the fish that entered the Rocky Reach fishway, 55.5% exited the ladder (Stevenson et al. 2005).

During studies at Wanapum and Priest Rapids dams, a total of 51 and 74 lamprey were radio-tagged and released downstream of Priest Rapid Dam in 2001 and 2002, respectively. Over the two years of study, the proportion of fish that approached the fishway that exited the ladders was 30% and 70% at Priest Rapids and 100% and 51% at Wanapum Dam in 2001 and 2002, respectively (Nass et al. 2003).

Two recent reviews of Pacific lamprey (Hillman and Miller 2000; Golder Associates Ltd. 2003) in the mid-Columbia River have indicated that little specific information is available regarding their population status (Stevenson et al. 2005).

## **2.2 Status of Pacific Lamprey**

In January 2003, the USFWS received a petition from 11 environmental groups seeking the listing of four lamprey species (Pacific lamprey, river lamprey, western brook lamprey, and Kern brook lamprey). The petition cited population declines and said lampreys are threatened by artificial barriers to upstream and downstream migration, de-watering and habitat degradation among other threats. In response to the petition, the USFWS conducted an initial review to determine whether an emergency listing was warranted and decided in March 2003 that such a situation did not exist.

In an agreement stemming from a lawsuit filed by the petitioners in response to the initial finding, the USFWS committed to the issuance of a 90-day finding on the petition by December 20, 2004. Again, the USFWS announced that the petition seeking a listing of the four lamprey species did not contain enough information to warrant further review and the agency was not going to place the lamprey species on the Endangered Species list. For Pacific lamprey, the petitioners provided information showing a drop in range and numbers, but did not provide information describing how the regional portion of the species' petitioned range, or any smaller portion, is appropriate for listing under the Endangered Species Act (ESA). The agency did however decide it will continue to work with others on efforts to gather information related to the conservation of lamprey and their habitats.

## 2.3 Monitoring and Studies of Outmigrating Juvenile Lamprey (Macrophthalmia)

Little information in the mid-Columbia River basin exists with regard to the outmigration timing and abundance of juvenile Pacific lamprey. Upstream of the Project, recent juvenile salmonid trapping operations by WDFW and the Colville Tribe have provided preliminary information on the presence of juvenile lamprey outmigrants in both the Methow and Okanogan rivers. This information represents incidental captures of juvenile lamprey, and may not be reflective of actual abundance or population trends. In the Okanogan River, information is available for 2006 and 2007 where 220 and 24 juvenile lamprey were observed, respectively, during spring trapping operations. In the Methow River watershed, information is available for two sites; the Twisp and Methow rivers. At the Twisp River site, no juvenile lamprey have been observed since data has been collected (2005). At the Methow River site, for the years 2004-2007, 89, 84, 831, and 37 juvenile lamprey were observed, respectively, in trapping operations that typically last from April to November with peaks generally occurring in the spring. Data collection from these activities is likely to continue and provide information on juvenile Pacific lamprey as they begin their outmigration through the Columbia River hydrosystem towards the Pacific Ocean.

Although there is a growing body of information on adult Pacific lamprey and their interactions at hydroelectric projects, relatively little information exists describing the effects of hydroelectric plant operations on outmigrating juvenile lamprey (macrophthalmia). Recent juvenile lamprey studies at hydroelectric projects have addressed testing for lamprey macrophthalmia survival through juvenile bypass facilities (Bleich and Moursund 2006), impingement at intake diversion screens (Moursund et al. 2000 and 2003), validation of existing screening criteria (Ostrand 2005), and responses of juvenile Pacific lamprey to simulated turbine passage environments (Moursund et al. 2001; INL 2006). Results of other studies targeting predaceous birds and fish suggest that juvenile lamprey may compose a significant proportion of the diets of these predators (Poe et al. 1991; Merrell 1959).

A review of the recent body of work addressing juvenile lamprey at hydroelectric facilities concludes that there is a current lack of methods and tools to effectively quantify the level of survival for juvenile lamprey migrating through hydroelectric facilities. Furthermore, no studies exist that assign a level of survival attributed to a project's operations. This is due to the lack of miniaturized active tag technologies to overcome two study limitations. Macrophthalmia (juvenile outmigrating lamprey) are relatively small in size and unique in body shape and they tend to migrate low in the water column resulting in the rapid attenuation of active tag signal strength. In an effort to develop a tagging protocol, the Bonneville Power Administration (BPA) funded Oregon State University (OSU) to identify and develop tag technologies for lamprey macrophthalmia. Recent reports on this developmental effort have concluded that the smallest currently available radio-tag was still too large for implantation in the body cavity of a juvenile lamprey (Schreck et al. 2000). Additionally, external application was not effective as animals removed tags within the first week and fish performance was affected. This report also concluded that internal implantation of Passive Integrated Transponder (PIT) tags was the most viable option for tagging juvenile lamprey although this method included severe limitations such as the limited range of detection systems and the ability to tag only the largest outmigrating juvenile lamprey (Schreck et al. 2000).



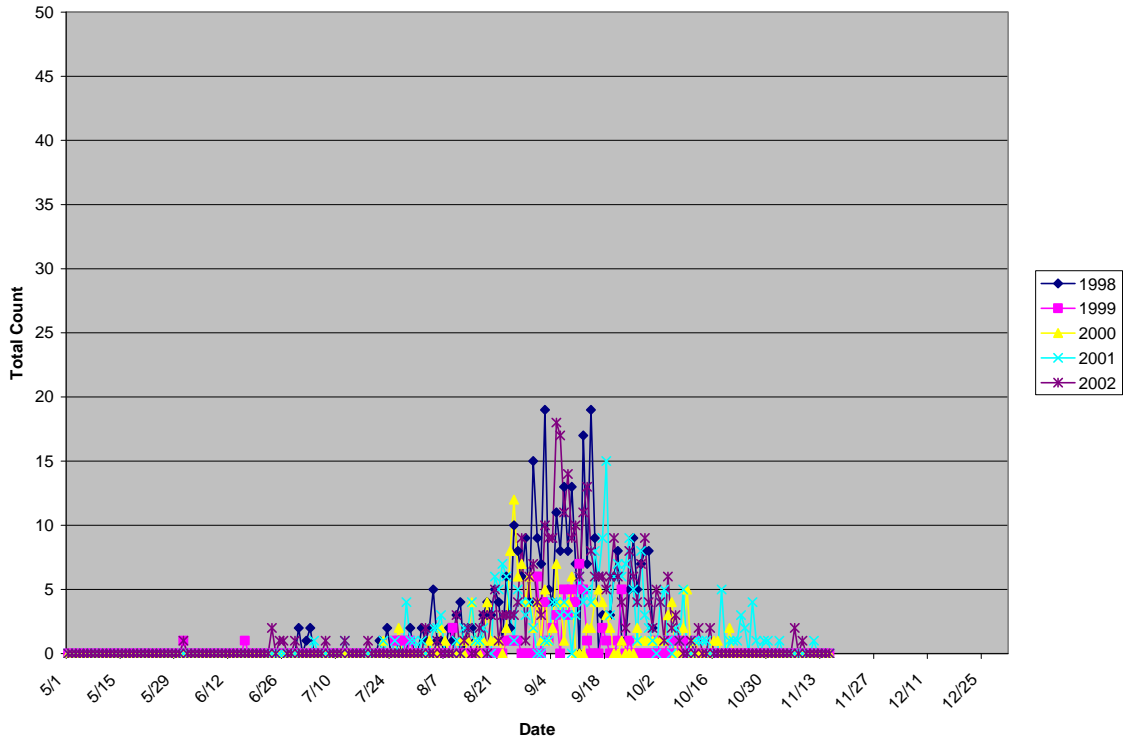
## 2.4 Project Adult Pacific Lamprey Counts and Passage Timing

Returning adult Pacific lamprey have been counted at Wells Dam since 1998. Between the years of 1998 and 2007, the number of lamprey passing Wells Dam annually has averaged 326 fish and ranged from 21 fish in 2006 to 1,417 fish in 2003 (Table 2.3-1). In addition to the overriding condition that Pacific lamprey numbers are declining in the Columbia River system, the relatively small number of adult lamprey observed at Wells Dam may be attributed to fact that the Project is the last of nine passable dams on the mainstem Columbia River and the fact that the Project is over 500 miles upstream from the Pacific Ocean and the bioenergetic expenditure for a relatively poor swimming species such as Pacific lamprey is likely great.

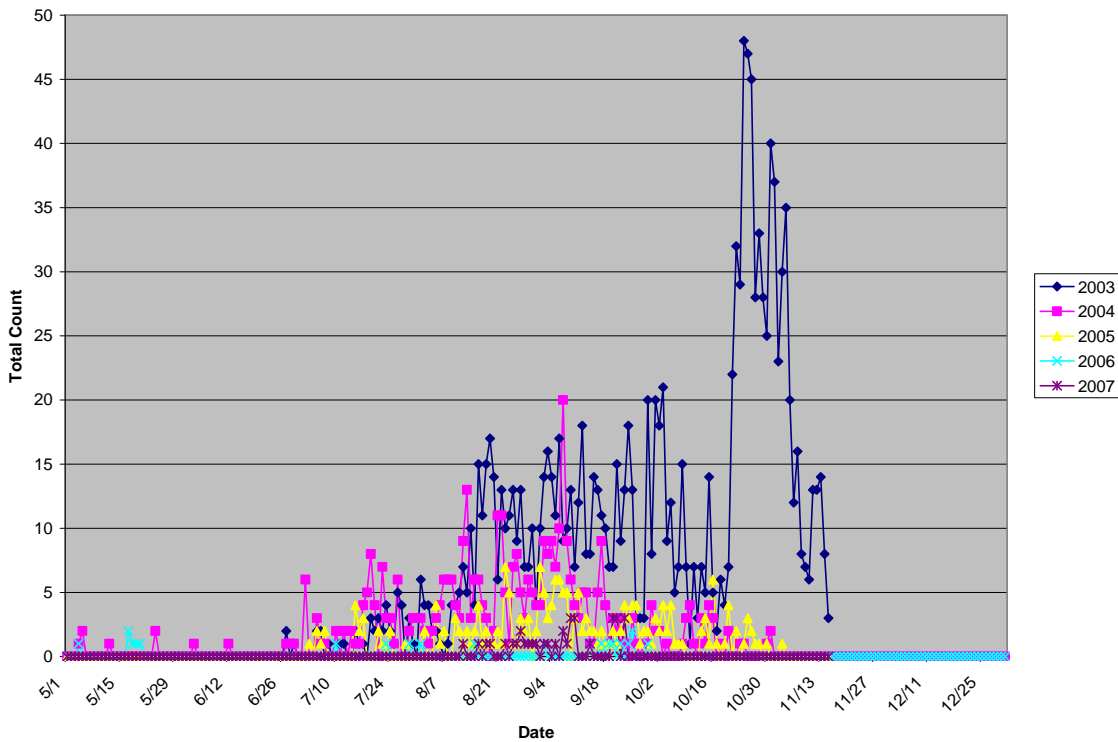
Adult lamprey pass Wells Dam from early July until late November with peak passage times between mid-August and late October (Figures 2.4-1 and 2.4-2). In all years since counting was initiated, Pacific lamprey counts at the east fish ladder were greater than at the west fish ladder except for 2007. It is important to note that historically, counting protocols were designed to assess adult salmonids and did not necessarily conform to lamprey migration behavior (Moser and Close 2003). Traditional counting times for salmon did not coincide with lamprey passage activity which occurs primarily at night; the erratic swimming behavior of adult lamprey also makes them inherently difficult to count (Moser and Close 2003). Beamish (1980) also noted that lamprey overwinter in freshwater for one year prior to spawning. Consequently, lamprey counted in one year may actually have entered the system in the previous year (Moser and Close 2003) which confounds annual returns back into the Columbia River Basin. In addition to salmonid-specific counting protocols, adult fishway facilities have been constructed specifically for passage of salmonids. Recent research has identified areas such as picketed lead structures downstream of fish count windows that adult lamprey may access to bypass count stations and avoid being enumerated (LGL 2008). It is unknown to what degree lamprey behavior and methodological and structural concerns are reflected in Columbia River lamprey passage data. However, it is important to consider such caveats when examining historic lamprey count data at Columbia River dams including Wells Dam.

**Table 2.4-1 Adult Pacific lamprey counts at Wells Dam for east and west fish ladders, 1998-2007.**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
East	174	47	96	153	226	724	263	151	13	17
West	169	26	59	106	117	694	140	64	8	18
Total	343	73	155	259	343	1418	403	215	21	35



**Figure 2.4-1** Daily counts of adult Pacific lamprey at Wells Dam during the fish counting season, 1998-2002.



**Figure 2.4-2** Daily counts of adult Pacific lamprey at Wells Dam during the fish counting season, 2003-2007.

## **2.5 Project Pacific Lamprey Studies**

Until recently, relatively little information was available on Pacific lamprey in the mid-Columbia River Basin. However, with increased interest in the species coupled with a petition for listing under the ESA (Section 2.2), Douglas has initiated studies to address Pacific lamprey passage and migratory behavior in the Project consistent with currently available technology.

### **2.5.1 2001-2003 Project Pacific Lamprey Study**

In 2004, Douglas contracted with LGL Limited to conduct a lamprey radio-telemetry study at Wells Dam in coordination with Chelan PUD, which was conducting a similar study at Rocky Reach Dam. A total of 150 lamprey were radio-tagged and released at or below Rocky Reach Dam. The radio-tags used in this study had an expected operational life of 45 days (Nass et al. 2005). It is important to note that as a result of the lamprey release site being located over 50 miles downstream of Wells Dam, the value of the study results for the Project was limited by the relatively small numbers of tagged fish detected upstream at Wells (n=18) and the fact that many of the radio-tags detected at Wells Dam were within days of exceeding their expected battery life.

The 2004 study at Wells Dam was implemented through a combination of fixed-station monitoring at the dam and fixed-stations at tributary mouths. Collectively, these monitoring sites were used to determine migration and passage characteristics of lamprey entering the Project Area. Of the 150 adult lamprey released at or below Rocky Reach in 2004, 18 (12% of 150) were detected in the Wells Dam tailrace, and ten (56% of 18) of these were observed at an entrance to the fishways at Wells Dam. A total of 3 radio-tagged lamprey passed Wells Dam prior to expiration of the tags, resulting in a Fishway Efficiency estimate of 30% (3 of 10) for the study period. A single lamprey was detected upstream of Wells Dam at the mouth of the Methow River (Nass et al. 2005).

For lamprey that passed the dam, the majority (92%) of Project Passage time was spent in the tailrace. Median time required to pass through the fishway was 0.3 d and accounted for 8% of the Project Passage time (Nass et al. 2005).

Although the 2004 study at Wells Dam provided preliminary passage and behavioral information for migrating adult lamprey, the limited observations due to the small sample size (n=18) were insufficient in addressing the objectives of the 2004 study.

### **2.5.2 2007-2008 Project Pacific Lamprey Study**

In 2007, Douglas contracted with LGL Limited to conduct a second lamprey radio-telemetry study at Wells Dam. The study was scheduled to occur from early August through November and utilized tags that had 87 days of battery life. A total of 21 adult lamprey were tagged and released for the purpose of this study. However, due to very low adult lamprey returns to Wells Dam in 2007 (n=35) and low trapping efficiency, only 6 adult Pacific lamprey were captured at Wells Dam during trapping activities (August 14 to October 3). Therefore, 15 additional adult lamprey were collected at Rocky Reach Dam, transported to Wells Dam, tagged and released. The project was continued in 2008 to obtain additional information.

A comprehensive report was produced in February of 2009 containing the results from the two-year radio-telemetry behavior studies (Robichaud et al. 2009). Results indicated that the “greatest impediment to successful passage of adult lamprey at Wells Dam appears to be the conditions at the fishway entrance, probably related to water velocities that limit swimming and attachment capabilities.” An equally significant impediment to successful passage of adult lamprey at Wells Dam in 2008 was the installation of perforated plates on the floor of the weir orifices in an effort to increase trapping efficiency. Robichaud et al. further recommended the following:

- Implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s). These proposed flow reductions should be restricted to hours of peak lamprey activity (i.e., nighttime) and within their primary migratory period at Wells Dam (August-September).
- Remove perforated plates from orifice floors at the current trapping locations and discontinue trapping efforts at Wells Dam.
- Consider using monitoring tools that are less intrusive, do not require the collection of fish from the ladders at Wells Dam, and minimize the surgical implantation of tags in fish that are nearing their physiological limits.

### **2.5.3 2009 Pacific Lamprey Ladder Modification Study**

In response to Robichaud et al. (2009), Douglas PUD, in consultation with the Aquatic SWG, prepared a plan to implement and evaluate measures to enhance passage of adult Pacific lamprey at Wells Dam (Murauskas and Johnson, 2009). These measures, originally scheduled for year two after license issuance (2013), were designed to determine whether temporary velocity reductions at the fishway entrances would enhance the attraction and relative entrance success of adult lamprey at Wells Dam. Three alternative entrance flow velocities (i.e., existing high, moderate, and low) will be assessed using Dual-frequency Identification Sonar (DIDSON) in a randomized block design during the fall of 2009. The goal is to identify optimal hydraulic conditions conducive to entry of adult lampreys into the fishways at Wells Dam.

## **3.0 GOALS AND OBJECTIVES**

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several Pacific lamprey PME in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey;

Objective 2: Identify and address any Project-related impacts on downstream passage and survival, and rearing of juvenile Pacific lamprey;

Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.

The schedule for implementation of specific measures within the PLMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

## **4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES**

Douglas, in consultation with the Aquatic SWG, will implement PME's for Pacific lamprey in the Project consistent with the goals and objectives identified in Section 3.0. The measures proposed in this section are intended to serve as PME's for Pacific lamprey throughout the new license term.

### **4.1 Adult Pacific Lamprey Passage (Objective 1)**

#### **4.1.1 Upstream Fishway Operations Criteria**

Douglas shall operate the upstream fishways at Wells Dam in accordance with criteria outlined in the HCP. Based upon information collected from activities conducted in Sections 4.1.3 - 4.1.7, Douglas, in consultation with the Aquatic SWG and the HCP Coordinating Committee, may evaluate various operational and structural modifications to the upstream fishways (e.g., reduction in fishway flows at night) for the benefit of Pacific lamprey passing upstream through Wells Dam during the new license term. If requested, the Aquatic SWG shall develop an Operations Study Plan (OS Plan) that specifically identifies all operational modifications to be evaluated, the proposed monitoring strategy, implementation timeline and criteria for success. The plan shall include a component to evaluate the effects of lamprey modifications on salmon. Upon completion of the evaluation, the Aquatic SWG, in consultation with the HCP Coordinating Committee, will determine whether the proposed modifications should be made permanent, removed, or modified.

#### **4.1.2 Salvage Activities During Ladder Maintenance Dewatering**

Douglas shall continue to implement the Adult Fish Passage Plan and associated Adult Ladder Dewatering Plan as required by the HCP. These plans include practices and procedures utilized during fishway dewatering operations to minimize fish presence in the fish ladders and then once dewatered directs Douglas staff to remove stranded fish and safely place them back into the

Columbia River. All fish species, including Pacific lamprey that are encountered during dewatering operations are salvaged consistent with the protocol identified in the HCP. Any adult lamprey that are captured during salvage activities will be released upstream of Wells Dam, unless otherwise determined by the Aquatic SWG. Douglas will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas will provide a summary of salvage activities in the annual report.

#### **4.1.3 Upstream Fishway Counts and Alternative Passage Routes**

Douglas shall continue to conduct annual adult fish passage monitoring in the Wells Dam fishways using the most current technology available, to count and provide information on upstream migrating adult Pacific lamprey 24-hours per day during the adult fishway monitoring season (May 1- November 15). Based upon information collected from activities conducted in Sections 4.1.6 - 4.1.7, Douglas, in consultation with the Aquatic SWG, may choose to address the use of alternative upstream passage routes around Wells Dam fishway counting stations by adult Pacific lamprey. Potential measures to improve counting accuracy, following consultation and approval of the Aquatic SWG, may include, but may not be limited to, the development of a correction factor based upon data collected during passage evaluations (Sections 4.1.6 and 4.1.7) or utilization of an alternative passage route as a counting facility for adult Pacific lamprey.

#### **4.1.4 Upstream Passage Improvement Literature Review**

If additional passage improvement measures are deemed necessary by the Aquatic SWG, then within six months after this determination, Douglas, in consultation with the Aquatic SWG, shall complete a literature review on the effectiveness of upstream passage measures (i.e., lamprey passage systems, plating over diffuser grating, modifications to orifices, rounding sharp edges, fishway operational changes, etc.) implemented at other Columbia and Snake river hydroelectric facilities. The literature review will be conducted in support of activities identified in Section 4.1.5 to help in the selection of reasonable measures that may be implemented to improve adult lamprey passage at Wells Dam.

#### **4.1.5 Fishway Modifications to Improve Upstream Passage**

If additional passage improvement measures are deemed necessary by the Aquatic SWG, based upon the results of studies conducted at Wells Dam, then within one year or as soon as practicable following consultation with the Aquatic SWG, Douglas shall identify, design and implement any reasonable upstream passage modifications (structural and/or operational). Passage measures will be designed to improve passage performance by providing safe, effective, and volitional passage for Pacific lamprey through the Wells Dam fishways without negatively impacting the passage performance of adult anadromous salmonids. The following components shall be included in these passage measures:

- Fishway Inspection: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall conduct a fishway inspection with the Aquatic SWG and regional lamprey passage experts to identify and prioritize measures to improve adult lamprey passage and enumeration at Wells

Dam. Additional ladder inspections will be conducted at the request of the Aquatic SWG, consistent with winter ladder dewatering operations.

- Entrance Efficiency: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall develop a Lamprey Entrance Efficiency Plan (LEE Plan) for evaluating operational and physical ladder entrance modifications intended to create an environment at the fishway entrances that are conducive to adult lamprey passage without significantly impacting the passage of adult salmonids. These improvements shall be evaluated until compliance, as described below, is attained.
- Diffuser Gratings: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall identify and address, if needed, diffuser gratings within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.
- Transition Zones: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall identify and address, if needed, transition zones within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.
- Ladder Traps and Exit Pools: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall identify and address, if needed, lamprey ladder traps and exit pools within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.

Douglas shall exhibit steady progress, as agreed to by the Aquatic SWG, towards improving adult lamprey passage until performance at Wells Dam is determined to be similar to other mid-Columbia River hydroelectric dams, or until scientifically rigorous standards and evaluation techniques are established by the Lamprey Technical Workgroup, or its successor, and adopted regionally. The Aquatic SWG will then evaluate, and if applicable and appropriate, adopt these standards for use at Wells Dam. If compliance is achieved, Douglas shall only be required to implement activities pursuant to Section 4.1.7 (Periodic Monitoring) for adult Pacific lamprey passage.

#### **4.1.6 Adult Pacific Lamprey Upstream Passage Evaluation**

Should upstream passage measures be implemented under Section 4.1.5, then within one year following the implementation of such measures, Douglas, in consultation with the Aquatic SWG, shall conduct a one-year study to monitor the effectiveness of such measures on upstream passage performance of adult Pacific lamprey through Wells Dam. If monitoring results indicate that passage rates at Wells Dam are not similar to passage rates at other mid-Columbia River dams or within standards as described in Section 4.1.5, Douglas, in consultation with the Aquatic SWG, shall develop and implement additional measures to improve upstream Pacific lamprey passage. Measures described in Sections 4.1.5 and 4.1.6 may be repeated, as necessary, until adult passage through Wells Dam is similar to passage rates at other mid-Columbia River hydroelectric dams or within standards as described in Section 4.1.5.

#### **4.1.7 Periodic Monitoring**

Once adult Pacific lamprey upstream passage rates at Wells Dam are similar to rates at other mid-Columbia River dams or within standards as described in Section 4.1.5, Douglas, in consultation with the Aquatic SWG, shall periodically monitor adult Pacific lamprey passage performance through Wells Dam fishways to verify the effectiveness of passage improvement measures. Specifically, every ten years after compliance has been achieved, or as determined by the Aquatic SWG, Douglas shall implement a one-year study to verify the effectiveness of the adult fish ladders with respect to adult lamprey passage. If results of the monitoring program confirm the effectiveness of adult lamprey passage measures and the results indicate that passage rates are still in compliance, then no additional measures are needed. If the results indicate that adult upstream passage rates are out of compliance, then the upstream passage study will be replicated to confirm the results. If the results after two years of study both indicate that passage rates have not been maintained, Douglas, in consultation with the Aquatic SWG, shall develop and implement measures to improve upstream Pacific lamprey passage, if any (see Section 4.1.5).

### **4.2 Juvenile Pacific Lamprey Downstream Passage and Survival and Rearing (Objective 2)**

#### **4.2.1 Downstream Bypass Operations Criteria**

Douglas is required to operate the downstream bypass system at Wells Dam in accordance with criteria outlined in the HCP.

#### **4.2.2 Salvage Activities During Ladder Maintenance Dewatering**

Douglas shall continue to conduct salvage activities as required by the HCP's Adult Fish Passage Plan during fishway dewatering operations. All fish species, including Pacific lamprey that are encountered during dewatering operations shall be salvaged consistent with the protocol identified in the HCP. Any juvenile Pacific lamprey that are captured during salvage activities will be released downstream of Wells Dam. Douglas will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas will provide a summary of salvage activities in the annual report.

#### **4.2.3 Juvenile Pacific Lamprey Passage and Survival Literature Review**

Beginning in year five and every five years thereafter during the new license, Douglas, in consultation with the Aquatic SWG, shall conduct a literature review to summarize available technical information related to juvenile lamprey passage and survival through Columbia and Snake river hydroelectric facilities. This information will be used to assess the feasibility of conducting activities identified in Section 4.2.4.

#### **4.2.4 Juvenile Pacific Lamprey Downstream Passage and Survival Evaluation**

Based upon the current state of the science regarding tag technology and methodologies for Pacific lamprey macrophthalmia (Section 2.3), coupled with the challenges of obtaining



macrophthalmia in sufficient numbers within the Project to meet sample size requirements for a statistically rigorous study, a juvenile downstream passage and survival evaluation is not feasible at this time.

During the term of the new license, if tag technology and methodologies are developed and field tested and a sufficient source of macrophthalmia in or upstream of the Project are identified to ensure that a field study will yield statistically rigorous and unbiased results, Douglas, in consultation with the Aquatic SWG, shall implement a one-year juvenile Pacific lamprey downstream passage and survival study.

If statistically valid study results indicate that Project operations have a significant negative impact on the Pacific lamprey population above the Wells Dam, Douglas, in consultation with the Aquatic SWG, shall identify and implement scientifically rigorous and regionally accepted measures (e.g., translocation, artificial production or habitat enhancement), if any, or additional studies to address such impacts. If operational changes are needed to improve passage survival of juvenile lamprey migrants, then those changes need to be coordinate with the HCP Coordinating Committee.

#### **4.2.5 Juvenile Pacific Lamprey Habitat Evaluation**

Within three years of the effective date of the new license, Douglas shall implement a one-year study to examine presence and relative abundance of juvenile Pacific lamprey in habitat areas within the Project that may be affected by Project operations. As part of this measure, Douglas shall identify areas of potential juvenile Pacific lamprey habitat for future evaluation. Sampling of these areas will assess presence/absence and relative abundance. Any sampling methodologies used in support of this activity will require coordination with the HCP Coordinating Committee and regulatory approval of the federal and state agencies.

### **4.3 Participate in Regional Pacific Lamprey Conservation Activities (Objective 3)**

#### **4.3.1 Regional Lamprey Working Groups**

Douglas shall participate in Pacific lamprey work groups in order to support regional conservation efforts (e.g., the Pacific Lamprey Technical Work Group and the USFWS Lamprey Conservation Initiative). Activities may include but are not limited to information exchanges with other entities, meeting attendance, and coordination of Douglas' Pacific lamprey activities with other entities conducting lamprey research in the mid-Columbia River. Activities may also include conducting PLMP research within the Project, and sharing that information with other entities.

#### **4.4 Reporting**

Douglas will provide an annual report to the Aquatic SWG summarizing the previous year's activities and proposed activities for the following year undertaken in accordance with the PLMP. The report will document all Pacific lamprey activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this PLMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

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**ATTACHMENT E: RESIDENT FISH MANAGEMENT PLAN**

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**RESIDENT FISH MANAGEMENT PLAN**  
**WELLS HYDROELECTRIC PROJECT**  
**FERC PROJECT NO. 2149**

August 2008

Prepared by:  
Public Utility District No. 1 of Douglas County  
East Wenatchee, Washington

## EXECUTIVE SUMMARY

The Resident Fish Management Plan (RFMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PMEs in support of the RFMP. The PMEs presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs and Douglas PUD's Land Use Policy.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management (ANS, bull trout, Pacific lamprey, and white sturgeon) plans and HCP predator control activities.

Objective 3: If any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas.

Objective 4: In response to proposed major changes in Wells Dam operations requiring FERC approval, Douglas will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan and White Sturgeon Management Plan by continuing to monitor changes, if necessary, in the resident fish assemblage within the Project. The RFMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

## **1.0 INTRODUCTION**

The Resident Fish Management Plan (RFMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The RFMP will direct implementation of measures to protect and enhance native resident fish populations in the Wells Reservoir. To ensure active stakeholder involvement and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of native resident fish populations in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for native resident fish during the term of the new license.

## **2.0 BACKGROUND**

### **2.1 Resident Fish Species**

The resident fish assemblage present in the Wells Reservoir is composed of a diverse community of native and introduced, warm and coldwater, and recreational and non-recreational fish species. Since the construction of Wells Dam several studies have either directly (McGee 1979; Beak 1999) or indirectly (Dell et al. 1975; Burley and Poe 1994) addressed the resident fish assemblage in the Wells Reservoir.

### 2.1.1 Project Resident Fish Assessments

In assessing the occurrence of gas bubble disease in fish in the mid-Columbia River reservoirs, Dell et al. (1975) observed that the most abundant resident fish species in the Wells Reservoir were northern pikeminnow (*Ptychocheilus oregonensis*), stickleback (*Gasterosteus spp.*), and suckers (*Catostomus spp.*). They also determined that mountain whitefish (*Prosopium williamsoni*) and pumpkinseed (*Lepomis gibbosus*) were the most abundant resident game fish, although these two species accounted for less than two percent of the total 32,289 fish sampled. Overall, 27 species of resident and migratory fish were identified in the study area (Table 2.1-1).

In 1993, a one-year study was conducted to determine the relative predation by northern pikeminnow on outmigrating juvenile salmonids and to develop relative predation indices for each of the five mid-Columbia River reservoirs. During the study, incidental catch (species captured other than northern pikeminnow) was high with over 25 fish species recorded and catch dominated by Catostomidae (suckers) (Burley and Poe 1994).

**Table 2.1-1 Native and non-native resident fish species that have been documented in the Wells Reservoir from past resident fish assessments, monitoring efforts, and miscellaneous studies (Dell et al. 1975; McGee 1979; Burley and Poe 1994; Beak 1999; NMFS 2002; BioAnalyst, Inc. 2004).**

Native Species	Non-Native Species
White sturgeon <i>Acipenser transmontanus</i> *	Carp <i>Cyprinus carpio</i>
Chiselmouth <i>Acrocheilus alutaceus</i>	Black bullhead <i>Ictalurus melas</i>
Longnose sucker <i>Catostomus catostomus</i>	Brown bullhead <i>Ictalurus nebulosus</i>
Bridgelip sucker <i>Catostomus columbianus</i>	Pumpkinseed <i>Lepomis gibbosus</i>
Largescale sucker <i>Catostomus macrocheilus</i>	Bluegill <i>Lepomis macrochirus</i>
Lake whitefish <i>Coregonus clupeaformis</i>	Smallmouth bass <i>Micropterus dolomieu</i>
Prickly sculpin <i>Cottus asper</i>	Largemouth bass <i>Micropterus salmoides</i>
Threespine stickleback <i>Gasterosteus aculeatus</i>	Yellow Perch <i>Perca flavescens</i>
Burbot <i>Lota lota</i>	Black crappie <i>Pomoxis nigromaculatus</i>
Peamouth <i>Mylocheilus caurinus</i>	Walleye <i>Stizostedion vitreum</i>
Rainbow trout <i>Oncorhynchus mykiss</i>	Tench <i>Tinca tinca</i>
Mountain whitefish <i>Prosopium williamsoni</i>	
Northern pikeminnow <i>Ptychocheilus oregonensis</i>	
Redside shiner <i>Richardsonius balteatus</i>	
Dace <i>Rhinichthys spp.</i>	
Bull Trout <i>Salvelinus confluentus</i> *	

\* Individual management plans for both white sturgeon and bull trout have been developed and as such, they are not addressed in this Resident Fish Management Plan.

McGee (1979) noted that chiselmouth (*Acrocheilus alutaceus*), redbreast shiners (*Richardsonius balteatus*), and largescale suckers (*Catostomus macrocheilus*) were the most abundant non-game fish captured during Wells Reservoir surveys while pumpkinseed were the most abundant game fish caught. Similar sampling design and methodology to the 1974 study (Dell et al. 1975) were employed in order to ensure that results of the study were comparable with past observations. In total, 2,480 fish were collected during the study using live traps, beach seines and angling.

Twenty of the 27 known species previously trapped in other mid-Columbia reservoirs (Dell et al. 1975) were captured in the Wells Reservoir during the study.

In 1998, Douglas conducted an updated Wells Reservoir resident fish assessment (Beak 1999). Again, an effort was made to implement a sampling design similar to the two previous studies (1974 and 1979) so as to be consistent and allow comparisons with past results. In total, 22 species of fish were identified with 5,657 fish captured using beach seines and 716 fish observed via diving transects. Beak (1999) reported suckers (*Catostomus* spp.) as the most abundant resident fish captured in beach seining sampling in the Wells study area. These species represented 41 percent of the beach seining catch and 46 percent of the underwater dive survey count. Other abundant species in the beach seine catch were bluegill (*Lepomis macrochirus*) (32 percent), northern pikeminnow (10 percent), peamouth (*Mylocheilus caurinus*) (6 percent), and carp (*Cyprinus carpio*) (5 percent). Fifteen other species represented the remaining 7 percent of the total catch of 3,783 fish. Table 2.1-2 ranks the relative abundance of dominant fish species captured in the 1974, 1979, and 1998 Project studies and how species abundance has shifted over time.

**Table 2.1-2 Ranking of relative abundance of dominant fish species in the 1974, 1979, and 1998 Wells Reservoir resident fish assessments (Beak 1999).**

Species	1974	1979	1998
Largescale sucker <i>Catostomus macrocheilus</i>	1	4	1
Redside Shiner <i>Richardsonius balteatus</i>	3	3	3
Northern Pikeminnow <i>Ptychocheilus oregonensis</i>	2	5	4
Bluegill <i>Lepomis macrochirus</i>	16	0	2
Pumpkinseed <i>Lepomis gibbosus</i>	11	2	18
Chiselmouth <i>Acrocheilus alutaceus</i>	4	1	10

### 2.1.2 Recreational Fish Species

#### Kokanee

Landlocked sockeye (*Oncorhynchus nerka*), known as kokanee are a native fish which occur in several lakes in the mid and upper Columbia basins including Lake Wenatchee, Lake Chelan, Lake Osoyoos, and Lake Roosevelt. Although previous resident fish assessments have not detected the presence of this fish species in the Project, anecdotal information exists indicating that low numbers of kokanee may be present in the Project. These fish likely originate from Lake Roosevelt, above Grand Coulee Dam, and during periods of high spring flow are displaced downstream through Grand Coulee and Chief Joseph dams and into the Wells Reservoir.

#### Largemouth Bass

Largemouth bass (*Micropterus salmoides*) were widely introduced in Washington in the late 1800s (Wydoski and Whitney 2003). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002). They prefer clear water habitat with mud and sand substrates, which is best suited for aquatic vegetation production (Wydoski and Whitney 2003). Little is known about the

populations in the Wells Reservoir as they are infrequently captured (Beak 1999; Duke 2001; Burley and Poe 1994).

### Mountain Whitefish

Mountain whitefish are assumed to occur in all small-order tributaries to the Methow, Okanogan, Wenatchee and Entiat rivers, and in connecting larger lake systems. They are also believed to occur in the mainstem reservoirs, although their behavior patterns are not known. They mostly inhabit riffles in summer and large pools in winter (Wydoski and Whitney 2003). Spawning typically occurs from October through December, generally in riffles, but also on gravel shoals of lake shores. Mountain whitefish feed primarily on instar forms of benthic aquatic insects, although they also occasionally eat crayfish, freshwater shrimp, leeches, fish eggs and small fish. In lakes, they feed extensively on zooplankton, particularly cladocerans. There is evidence that mountain whitefish still spawn in the lower reaches of some tributaries (NMFS 2002). Mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Dam tailrace (Zook 1983).

### Northern Pikeminnow

Northern pikeminnow are a slow-growing, long-lived predator native to the Columbia River basin. In summer, adult northern pikeminnow prefer shallow, low velocity areas in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman 1973). Spawning occurs during the summer, in shallow water areas with gravel substrate. They tend to concentrate in tailrace areas downstream of mainstem dams during the juvenile salmonid migration period, holding in relatively slow-moving water areas (less than about 3 feet per second) near passage routes (NMFS 2002). Due to their large numbers and distribution throughout the Columbia River basin, northern pikeminnow are considered to pose the greatest predation threat to migrating juvenile anadromous salmonids (NMFS 2002).

### Resident Rainbow Trout

Rainbow trout (*Oncorhynchus mykiss*) are an inland (remains in freshwater) form of steelhead. However, some rainbow trout remain in freshwater for most of their life but undergo a physiological change to a smolt and migrate to the ocean late in life. In addition to the potential for rainbow trout to become anadromous, the progeny of steelhead are believed to have the potential to become resident rainbow (Peven 1990). Inland rainbow and juvenile steelhead are not distinguishable from each other until the steelhead undergo smoltification. The mid-Columbia River tributaries contain a mixture of resident rainbow and ocean-migrating steelhead. Resident rainbow trout are likely present in low numbers in the Wells Reservoir. During the 1998 resident fish assessment, rainbow trout consisted of 0.05 percent of the relative catch (Beak 1999).

### Smallmouth Bass

Smallmouth bass (*Micropterus dolomieu*) are a non-native game fish that have inhabited the mid-Columbia River reach since at least the 1940s. They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their

recreational importance (WDFW 2002). Preferred habitat for this species includes rocky shoals, banks, or gravel bars. Adult smallmouth bass in the mid-Columbia River are most abundant around the deltas of warmer tributary rivers. In the Wells Reservoir, smallmouth bass are typically found in the lower Okanogan River and the confluence of the Okanogan and Columbia rivers (Beak 1999). They are also abundant in areas upstream of the mid-Columbia River.

Smallmouth bass were the second most abundant predator species captured in the mid-Columbia River during predator assessment sampling conducted in 1994. They were most frequently captured from forebay sampling sites (Burley and Poe 1994). Similar relative abundance estimates of smallmouth bass were observed in recent sampling programs in other mid-Columbia River reservoirs (Beak 1999; Duke 2001). They are a significant fish predator species in the Columbia River, and prey on juvenile salmonids. In the 1994 predator assessment, fish composed 87 percent of the smallmouth bass diet, with salmonids consisting of 11 percent of the prey fish.

### Walleye

Walleye (*Stizostedion vitreum*) are a cool-water, piscivorous game fish believed to have moved downstream into the mid-Columbia River reach from a population established for recreational fishing in Lake Roosevelt in the late 1950s (Zook 1983). They were the least abundant predator species captured in the mid-Columbia River in 1994 (Burley and Poe 1994). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002).

Walleye occur throughout the mainstem reservoirs but are not typically found in the tributaries. Although suitable spawning habitat appears to be plentiful in the mid-Columbia River, peak summer temperatures in this section of river are suboptimal and appear to restrict the recruitment of subyearling walleye to the yearling age class (Zook 1983). Recruitment of walleye into the mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee Dam during spring run-off (Zook 1983).

### **2.1.3 Other Resident Species**

Resident, non-recreational species make up the bulk of the standing crop of fish in the Wells Reservoir. Many of these species are native to the Wells Reservoir, including burbot (*Lota lota*), chiselmouth, peamouth chub, redbreast shiner, largescale sucker, bridgelip sucker (*C. columbianus*), longnose sucker (*C. catostomus*), lake whitefish (*Coregonus clupeaformis*), Prickly sculpin (*Cottus asper*), threespine stickleback (*Gasterosteus aculeatus*), and dace species (*Rhinichthys spp.*) (See Table 2.1-1). Currently, no management actions or active fisheries for these species occur.



## **2.2 Resident Fish Habitat**

### **2.2.1 Spawning habitat**

Objectives of past resident fish studies (McGee 1979; Zook 1983; Beak 1999) did not specifically address spawning habitat but rather focused on species diversity, relative abundance and spatial distribution. Therefore, little information exists about the location and availability of spawning habitat for resident fish species in Project waters. It is likely that some resident fish species (cyprinids, catostomids, cottids) that spend their entire lives in Project waters utilize areas of the Wells Reservoir, tailrace, and lower tributaries (Methow and Okanogan rivers) to reproduce while other resident species, although present in the Wells Reservoir, utilize areas outside of the Project Boundary. Zook (1983) in his review of resident fish in the Wells Reservoir, hypothesized that some resident species such as mountain whitefish, rainbow trout, and walleye, although present, may not be successfully reproducing. Zook's review (1983) suggests that resident rainbow trout are primarily a product of residualism of hatchery-produced steelhead and that mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Tailrace. The report also suggests that walleye populations in the Wells Reservoir are recruited from the Lake Roosevelt population that was introduced in the late 1950s. The report also states that although spawning habitat appears to be available, evidence of successful reproduction has not been observed (Zook 1983).

Northern pikeminnow control efforts have been implemented at the Wells Reservoir starting in 1995. Part of these efforts included the identification of known spawning locations through the use of radio-telemetry. Based upon results of this study, northern pikeminnow spawning habitat is located in the Wells Reservoir near Park Island, near river mile (RM) 1.5 on the Methow River and in the Wells tailrace immediately downstream of the east bank fish ladder (Bickford and Skillingstad 2000).

### **2.2.2 Rearing habitat**

Past resident fish surveys (McGee 1979; Beak 1999) observed significant spatial trends in species distribution within the Wells Reservoir. Both McGee (1979) and Beak (1999) noted that in general, spiny ray species (centrarchids) were most abundant between RM 530 and RM 540 and in the lower Okanogan River portion of the Project. This unique area of the Wells Reservoir is shallow and broad with slower water velocities, finer substrate, warmer water temperatures, and higher turbidity (Beak 1999) and is conducive to rearing spiny ray fish species while excluding more streamlined fish that prefer fast flowing water. Both surveys also found that the more streamlined resident fish species, such as chiselmouth and redbreasted sunfish (cyprinids), were most abundant downstream of RM 530 where water velocities increased, turbidity decreased, and the amount of shallow littoral habitat decreased. Other resident fish such as various sucker species and white sturgeon are most likely distributed throughout the Wells Reservoir but reside and feed at depths near the river bottom. Migratory, cold water species such as bull trout and whitefish spawn outside of the Wells Reservoir and it is likely that the majority of juvenile fish of these species rear in tributary habitats. Sub-adult bull trout, however, have been observed passing over other mid-Columbia River dams and recent studies suggest that bull trout forage for resident species present in the Wells Reservoir (BioAnalysts Inc. 2004).

## **2.3 Management Activities Affecting Resident Fish**

### **2.3.1 Habitat Conservation Plan's Predator Control Program**

Section 4.3.3 of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) includes the requirement that Douglas implement a northern pikeminnow and piscivorous bird harassment and control program to reduce the level of predation upon anadromous salmonids in the mid-Columbia Basin. The northern pikeminnow removal program includes a northern pikeminnow control program, participation in fishing derbies and tournaments and the use of long-line fishing equipment. These efforts are designed to provide an immediate and substantial reduction in the predator populations present within the waters of the Project.

Since efforts were first initiated in 1995, Douglas's northern pikeminnow removal program has captured over 134,000 northern pikeminnow (1995-2006). The continual harvest of northern pikeminnow from these waters will provide additional decreases in predator abundance. Yearly removal efforts will also keep the northern pikeminnow population in a manageable state.

The other component of the predator control program is the implementation of control measures for piscivorous birds. The focus of Douglas's piscivorous bird control program is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing. When hazing and access deterrents fail, options for removal are also implemented by the US Department of Agriculture (DOA) Animal Control staff hired to conduct the hazing programs.

Although the intent of the predator control program is for the protection of anadromous salmonids, reductions in aquatic and terrestrial predator abundance within the Reservoir may benefit many native resident fish species.

### **2.3.2 Project Shoreline Management and Land Use Policy**

Douglas owns approximately 89 miles of shoreline in fee title and addresses shoreline management issues through the implementation of a strict Land Use Policy that requires formal approval of all land use activities that take place within the Project Boundary. Applications to permit activities such as construction of boat docks, piers, and landscaping are reviewed and considered for approval by Douglas after all required regulatory permits are acquired by the applicant. Additionally, when making land use or related permit decisions on Douglas owned lands that affect habitat within the Project Boundary, Douglas is required by Section 5 of the HCP to notify and consider comments from the HCP signatory parties (Douglas 2002). Shoreline management activities directly related to Project land use benefit resident fish, juvenile anadromous fish, and aquatic invertebrates and plants by minimizing impact in littoral areas within the Project Boundary.

### 3.0 GOALS AND OBJECTIVES

The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PME's in support of the RFMP. The PME's presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs and Douglas PUD's Land Use Policy.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management (ANS, bull trout, Pacific lamprey, and white sturgeon) plans and HCP predator control activities.

Objective 3: If any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas.

Objective 4: In response to proposed major changes at Wells Dam requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, and White Sturgeon Management Plan by continuing to monitor changes, if necessary, in the resident fish assemblage within the Project. This management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

The schedule for implementation of specific measures within the RFMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

#### **4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES**

In order to fulfill the goal and objectives described in Section 3.0, Douglas, in consultation with the Aquatic SWG, shall develop and implement a resident fish management program that includes the following PME's.

#### **4.1 Implementation Of Programs that Benefit Resident Fish (Objective 1)**

##### **4.1.1 HCP Predator Control Programs**

Douglas shall continue to conduct annual predator control activities for northern pikeminnow and avian predators as outlined in the HCP (Douglas 2002). Although implementation of this program is targeted at reducing predation on anadromous species covered by the HCP, it is also anticipated to have direct benefits for resident fish species.

##### **4.1.2 Project Shoreline Management and Land Use Policy**

Douglas shall continue to implement the Douglas Land Use Policy which requires approval of all land use activities that take place within the Project Boundary. All permit activities such as construction of boat docks, piers, and landscaping within Project Boundary will be subject to review and approval by Douglas only after the applicant has received all other required regulatory permits, in addition to consideration by the HCP signatory parties and permit review by state and federal action agencies. The intent of the review and approval process captured in the Land Use Policy is to protect aquatic habitats and aquatic species that may be affected by proposed land use activities within the Project.

#### **4.2 Monitoring the Resident Fish Assemblage within the Wells Reservoir (Objective 2)**

Douglas shall conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Wells Reservoir. This assessment shall occur in year 2 and every 10 years thereafter during the term of the new license. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir.

In order to maintain comparative assemblage information over time to inform Project resident fish status and trends, methodology for monitoring activities shall remain consistent with the methods described in Beak (1999). Information collected from these monitoring activities may be used to inform the implementation activities of the other Wells aquatic resource management plans and the HCP predator control activities.

#### **4.3            Actions to Address Major Shifts in Native Resident Fish Assemblage (Objective 3)**

Based upon information collected during the resident fish status and trends monitoring (Section 4.2), if any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through the implementation of other Aquatic Resource Management Plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas.

#### **4.4            Monitoring in Response to Proposed Changes in Project Operations (Objective 4)**

If at any time during the new license term, future changes in Wells Dam operations are proposed that require FERC approval and the Aquatic SWG concludes that either reservoir or tailrace habitat within Project Boundary may be affected with regards to spawning, rearing, and migration (aquatic life designated uses) of native resident fish, an assessment will be implemented to identify potential effects, if any, in order to make informed license decisions. If the results of the assessment identify adverse effects to native resident fish species of social, economic and cultural importance, attributable to such changes in Project operations, then Douglas will consult with the Aquatic SWG to select and implement reasonable and appropriate measures to address such effects.

#### **4.5            Reporting**

Douglas will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the RFMP. The report will document all native resident fish activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this RFMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

## 5.0 REFERENCES

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**ATTACHMENT F: AQUATIC NUISANCE SPECIES  
MANAGEMENT PLAN**

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**AQUATIC NUISANCE SPECIES MANAGEMENT PLAN**  
**WELLS HYDROELECTRIC PROJECT**  
**FERC PROJECT NO. 2149**

August 2008

Prepared by:  
Public Utility District No. 1 of Douglas County  
East Wenatchee, Washington

## EXECUTIVE SUMMARY

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Project waters. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several PMEs in support of the ANSMP. The PMEs presented within the ANSMP are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil (*Myriophyllum spicatum*) proliferation during in-water (i.e., construction, maintenance, and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities, and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

This ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be

supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Water Quality Management Plan by continuing to prevent the introduction and/or spread of aquatic nuisance species in Project waters. The ANSMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

## **1.0 INTRODUCTION**

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The ANSMP will direct implementation of measures to prevent the introduction and/or spread of aquatic nuisance species in Project waters. To ensure active stakeholder participation and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management and prevention of aquatic nuisance species in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for aquatic nuisance species during the term of the new license.

## **2.0 BACKGROUND**

Nonnative aquatic species may be released or “introduced” into an aquatic environment intentionally or unintentionally. Most often, such species are unable to adapt to their new environments and do not form self-sustaining populations (ANSC 2001). However, if such a species is able to adapt, become established, and thrive, it has the potential to threaten the diversity or abundance of native species and aquatic habitats and may even affect economic resources and human health. Such species are considered aquatic nuisance species or ANS (ANSC 2001).

RCW 77.60.130 defines the term aquatic nuisance species as a “nonnative aquatic plant or animal species that threatens the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, or recreational activities dependent on such

waters” (RCW 2007). Since few natural controls exist in their new habitat, ANS may spread rapidly, damaging recreational opportunities, lowering property values, clogging waterways, impacting irrigation and power generation, destroying native plant and animal habitat, and sometimes destroying or endangering native species (ANSC 2001).

## **2.1 Aquatic Nuisance Species of Concern**

### **2.1.1 Eurasian Watermilfoil (*Myriophyllum spicatum*)**

Eurasian watermilfoil (EWM) is an aquatic plant native to Europe, Asia, northern Africa, and Greenland. It was once commonly sold as an aquarium plant (Ecology 2007). EWM may have been introduced to the North American continent at Chesapeake Bay in the 1880's, although evidence shows that the first collection was made from a pond in the District of Columbia during the fall of 1942. By 1985, EWM had been found in 33 states, the District of Columbia, and the Canadian provinces of British Columbia, Ontario, and Quebec (Ecology 2007). The first documented occurrence of EWM in the State of Washington was in 1965. The source of introduction was most likely from sources in Canada and despite an effort to stop its spread, EWM infestations in Lake Osoyoos, British Columbia spread down through the Okanogan Lakes and into the Okanogan River and the Columbia River in 1974 (Duke 2001).

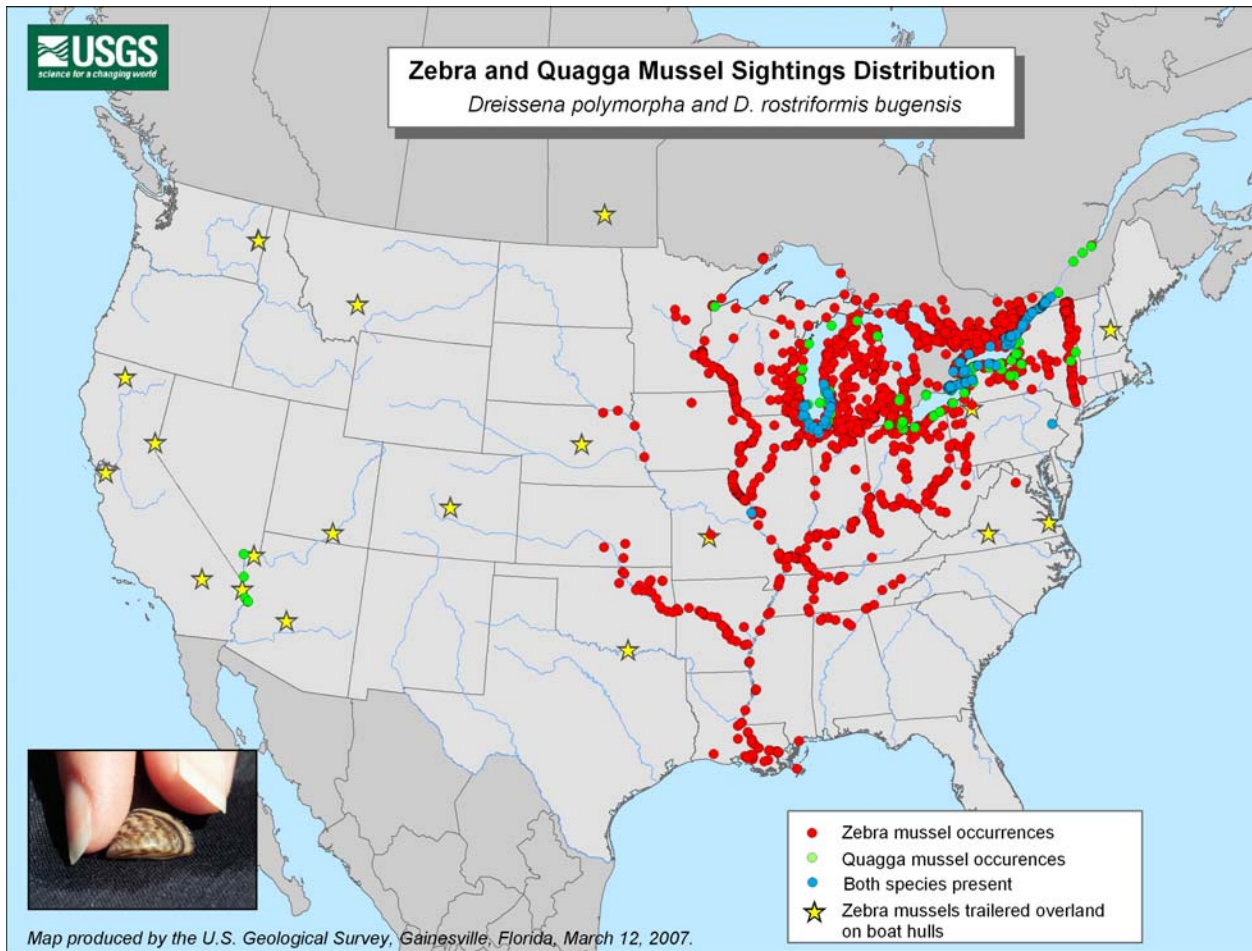
EWM is extremely adaptable with the ability to thrive in a variety of environmental conditions. It grows in still to flowing waters, can tolerate salinities of up to 15 parts per thousand, grows rooted in water depths from 1 to 10 meters, and can survive under ice (Ecology 2007). Relative to other submersed plants, EWM requires high light, has a high photosynthetic rate, and can grow over a broad temperature range (Ecology 2007). EWM exhibits an annual pattern of growth. In the spring, shoots begin to grow rapidly as water temperatures approach 15 degrees centigrade. When they near the surface, shoots branch profusely, forming a dense canopy (Ecology 2007). Typically, plants flower upon reaching the surface and die back to the root crowns, which sprout again in the spring.

Although EWM can potentially spread by both sexual and vegetative means, vegetative spread is considered the major method of reproduction. During the growing season, the plant undergoes autofragmentation. The plant fragments often develop roots at the nodes before separation from the parent plants. Fragments are also produced by wind and wave action, control harvest activity and boating activities, with each plant fragment having the potential to develop into a new plant (Ecology 2007).

EWM is classified as a class B noxious weed by the Washington State Noxious Weed Control Board (WNWCB 2007). Class B noxious weeds are nonnative plants whose distribution is limited to portions of Washington State. Additionally, EWM has been identified as a nuisance species in the Washington State Aquatic Nuisance Species Management Plan (ANSC 2001). EWM can adversely impact aquatic ecosystems by forming dense canopies that often shade out native vegetation. Monospecific stands of EWM affect aquatic habitat, water quality, can impact power generation and irrigation, and interfere with recreational activities. In Washington, private and government sources spend about \$1,000,000 per year on EWM control (Ecology 2007).

**2.1.2 Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussel (*Dreissena rostriformis bugensis*)**

Zebra and quagga mussels are freshwater, bivalve mollusks that typically have a dark and white (zebra-like) pattern on their shells. They are native to Eurasia and were both introduced into the Great Lakes as a result of ballast water discharge from transoceanic ships that were carrying veligers, juveniles, or adult mussels (USGS 2007). Zebra mussels first invaded North America in the mid-1980s and quagga mussels invaded a few years later in 1989 (USFWS 2007). These two species are closely related with subtle morphological differences. More research is needed on North American quagga mussels to assess ecological differences between the two species, but the practical implications of both species are essentially identical (USFWS 2007). The North American distribution of these species has been concentrated in the Great Lakes region of the U.S. with the zebra mussel distribution also spanning farther into the southern U.S. (Figure 2.1-1). Despite recent measures to prevent their westward expansion, quagga mussels were discovered in the Lake Mead Recreation Area. Populations have subsequently been found throughout the Boulder Basin of Lake Mead (Figure 2.1-1) and in more than a dozen reservoirs serving Southern California (Pam Meacham, pers. comm.).



**Figure 2.1-1 Zebra and Quagga Mussel Sightings Distribution Map (USGS 2007).**



Zebra and quagga mussel size varies from microscopic to two inches long. Typical lifespan is up to 5 years. Both species may spawn year around if conditions are favorable. Peak spawning typically occurs in spring and fall. *Dreissena* are dioecious (either male or female) with external fertilization. Both species are prolific reproducers. Fecundity is high with a few individuals having the capability of producing millions of eggs and sperm (USFWS 2007). After fertilization, pelagic microscopic larvae, or veligers, develop within a few days and these veligers soon acquire minute bivalve shells. Free-swimming veligers drift with currents for three to four weeks until suitable substrate for settling is located. Adults attach to hard surfaces via byssal threads, but can detach and move to new habitat. Both species can tolerate a wide range of water temperatures (1-30°C), low velocities (<2 m/sec), and prefer hard surfaces for attachment although quagga mussels can live in soft sediments (USFWS 2007). Zebra mussels are typically found just below the surface to about 12 meters and quagga mussels are typically found at any depth where oxygen is available (USFWS 2007).

Zebra mussels have caused major ecological and economic problems since their arrival in North America, and quagga mussels pose many of the same threats. Both species are prolific filter feeders, removing substantial amounts of phytoplankton and suspended particulate from the water thus impacting aquatic ecosystems by potentially altering food webs (USGS 2007). *Dreissena's* ability to rapidly colonize hard surfaces causes serious economic problems. These major bio-fouling organisms can clog water intake structures such as pipes and screens, therefore reducing capabilities for power and water treatment plants. Recreation-based industries and activities have also been heavily impacted; docks, breakwalls, buoys, boats, and beaches have all been heavily colonized (USGS 2007). Zebra mussel densities have been reported to be over 700,000 individuals per square meter in some facilities in the Great Lakes area. Each year, the economic impact to the U.S. and Canada is approximately \$140 million in damage and control costs (Sea Grant 2007).

## **2.2 Project Information**

Past aquatic studies contributing information to aquatic nuisance species of concern, discussed above, consisted of an aquatic macrophyte species composition and mapping survey (Lê and Kreiter 2005) and a macroinvertebrate assessment and rare, threatened, and endangered (RTE) species survey (Bioanalysts 2006). Results of these studies and other Project aquatic studies indicate that the aquatic ecosystem within the Project is composed of a diverse community of flora and fauna consisting of varied aquatic taxa such as plankton, macroinvertebrates (insects, snails and bivalves), fish, and plants. Although nonnative species are present within Project waters, the aquatic community is characterized by a native species dominated assemblage. It is important to note the varying degree to which a nonnative species can be characterized as a “nuisance” species. The many factors that determine a nonnative species’ magnitude of infestation and impact are complex and not always well understood.

### **2.2.1 Aquatic Macrophytes**

Some information exists on aquatic macrophyte communities in the mid-Columbia River system. Vegetation mapping in and around the Rocky Reach Reservoir (River Miles (RM) 473.6 to 515.5) identified 979 acres of aquatic macrophytes (Duke 2001) out of a total surface area of 8,167 acres (Duke 2001). Nonnative EWM represented 34 percent of the biomass samples

collected from within the Rocky Reach Reservoir (Duke 2001). In the Priest Rapids and Wanapum reservoirs, the composition of EWM in the aquatic macrophyte community was higher at 42 percent of littoral plant biomass (Normandeau et al. 2000).

In August and September 2005, Douglas conducted an aquatic macrophyte study in the Wells Reservoir. Sixty-one transects totaling 369 sample points were completed during the 2005 study (Lê and Kreiter 2005). Depths of up to 30 feet were sampled and sampling points along transects were completed at intervals of 5 feet or less. A total of nine aquatic plant species were documented (Table 2.2-1). Table 2.2-1 presents the percentage of samples in which each of the identified aquatic species was categorized as the dominant species (consisting of >60 percent of the sample composition). The two most dominant species in samples collected were common waterweed (*Elodea canadensis*) and leafy pondweed (*Potamogeton foliosus*) at 24.7 percent and 16.7 percent, respectively. Both of these species are native. EWM was dominant in only 6.3 percent of samples (Table 2.2-1). Samples with no plants (absent) consisted of 41.7 percent of all samples taken. This observation supports the concept that macrophyte communities maintain a patchy distribution.

**Table 2.2-1 Aquatic macrophyte species identified and the frequency at which each of the species was considered the dominant species (consisting of >60 percent of the total sample) in a given sample during the Macrophyte Identification and Distribution Study, 2005 (Lê and Kreiter 2005).**

Scientific Name	Common Name	Percentage of samples in which dominant
<i>Chara spp.</i>	Muskgrass	.003% (1/396)
<i>Elodea canadensis</i>	Common waterweed	24.7% (98/396)
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	6.3% (25/396)
<i>Potamogeton crispus</i>	Curly leaf pondweed	4.3% (17/396)
<i>Potamogeton foliosus</i>	Leafy pondweed	16.7% (66/396)
<i>Potamogeton nodosus</i>	American pondweed	1.3% (5/396)
<i>Potamogeton pectinatus</i>	Sago pondweed	0.8% (3/396)
<i>Potamogeton zosteriformis</i>	Flat-stemmed or eelgrass pondweed	2.3% (9/396)
Absent		41.7% (165/396)

Although EWM is present in the Project, the 2005 study indicated that it is not a dominant component of the Project aquatic plant community. During the Project study, EWM was often sub-dominant to several native species in samples collected. These contrasting observations between the Wells Reservoir and downstream reservoirs (Rocky Reach, Priest Rapids, and

Wanapum) where EWM was found to be the most abundant species are not clearly understood. One possible explanation may be that EWM, which is a species that can proliferate from plant fragments (Ecology 2001), has increased its ability to colonize due to potentially higher levels of disturbance in the downstream reservoirs as compared to the Wells Reservoir. The Rocky Reach Reservoir serves a larger population base, maintains an EWM removal program at recreational sites, and has higher levels of recreational use and development as compared to the Wells Reservoir. It is possible that these activities directly and indirectly re-mobilize EWM plant fragments and increase the potential for colonization in the Rocky Reach Reservoir as well as in downstream reservoirs (Lê and Kreiter 2005).

### **2.2.2 Aquatic Macroinvertebrates**

In September and October 2005, Douglas conducted an aquatic invertebrate inventory and an assessment of the presence of rare, threatened, and endangered (RTE) aquatic invertebrates within the Wells Reservoir. The overall objective of the study was to document the distribution, habitat associations and qualitative abundance of the current aquatic invertebrate (e.g., clams, snails and insects) assemblage in the Wells Reservoir.

Samples were collected within representative habitats throughout the Wells Reservoir using an air lift suction device, Ponar grabs and colonization baskets. A total of 17 sites were sampled. In addition to the varied aquatic insects and worms found during the survey, approximately 20 species of freshwater mollusks were identified during the inventory from dredge samples (Table 2.3-1). Within the Methow, Okanogan and Columbia portions of the Wells Reservoir, 13, 11, and nine species of mollusks were present, respectively. Of the 20 species, 10 gastropods (snails) and 10 bivalves (clams, mussels) were identified. The gastropods included nine native species and one nonnative species (Big-ear radix, *Radix auricularia*). Similarly, the bivalves also included nine native species and one nonnative species (Asian clam, *Corbicula fluminea*) (BioAnalysts, Inc. 2006). The 2005 macroinvertebrate assessment did not discover the presence of any zebra mussels or quagga mussels within the Project.

### **2.2.3 Project Aquatic Nuisance Species Monitoring**

In 2006, Douglas, in coordination with the Aquatic Nuisance Species Division of WDFW, began monitoring for zebra mussels and quagga mussels in Project waters. Activities consisted of monthly plankton tows to target mussel veligers at sites downstream of boat launches within the Wells Reservoir. Sampling activities were conducted during the summer and early fall when recreational boating activity is at a peak. Sampling protocols were provided by WDFW. All samples were sent back to WDFW for analysis. To date, none of the samples collected within the Project have contained any signs of zebra or quagga mussel presence.

In 2007, Douglas, in coordination with the Center for Lakes and Reservoirs at Portland State University, installed a permanent substrate sampler in the Wells Dam forebay to monitor for zebra and quagga mussel colonization within the Project. Douglas staff checks the substrate sampler monthly throughout the year as specified by the monitoring protocol. To date, no signs of zebra or quagga mussel presence have been detected. Both of these monitoring activities are ongoing.

**Table 2.3-1 Mollusks collected from sampling stations on the Methow, Okanogan, and Columbia rivers during the 2005 Project Aquatic Macroinvertebrate Inventory.**

<b>Location</b>	<b>Common Name</b>	<b>Taxon</b>
Methow River	Western pearlshell	<i>Margaritopsis falcata</i>
	Striate fingernail clam	<i>Sphaerium striatinum</i>
	Ridgebeak peaclam	<i>Pisidium compressum</i>
	Western lake fingernail clam	<i>Musculium raymondi</i>
	Shortface lanx	<i>Fisherola nuttalli</i>
	Ashy pebblesnail	<i>Fluminicola fuscus</i>
	Western floater	<i>Anodonta kennerlyi</i>
	Ubiquitous peaclam	<i>Pisidium casertanum</i>
	Big-ear radix*	<i>Radix auricularia</i>
	Golden fossaria	<i>Fossaria obrussa</i>
	Prairie fossaria	<i>Fossaria (Bakerilymnaea) bulimoides</i>
Ash gyro	<i>Gyraulus parvus</i> <i>Corbicula sp.</i>	
Okanogan River	Western ridgemussel	<i>Gonidea angulata</i>
	Striate fingernail clam	<i>Sphaerium striatinum</i>
	Ridgebeak peaclam	<i>Pisidium compressum</i>
	Ubiquitous peaclam	<i>Pisidium casertanum</i>
	Asian clam*	<i>Corbicula fluminea</i>
	Ashy pebblesnail	<i>Fluminicola fuscus</i>
	Fragile ancyliid	<i>Ferrissia californica</i>
	Ash gyro	<i>Gyraulus parvus</i>
Western lake fingernail clam	<i>Musculium raymondi</i> <i>Physella sp.</i> <i>Anodonta sp.</i>	
Columbia River	Western floater	<i>Anodonta kennerlyi</i>
	Asian clam*	<i>Corbicula fluminea</i>
	Ridgebeak peaclam	<i>Pisidium compressum</i>
	Three ridge valvata	<i>Valvata tricarinata</i>
	Rocky Mountain physa	<i>Physella propinqua propinqua</i>
	Ash gyro	<i>Gyraulus parvus</i>
	Golden fossaria	<i>Fossaria (F.) obrussa</i>
Prairie fossaria	<i>Fossaria (Bakerilymnaea) bulimoides</i>	
Big-ear radix*	<i>Radix auricularia</i>	

\*Nonnative taxon.

### **3.0 GOAL AND OBJECTIVES**

The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Project waters. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several PME's in support of the ANSMP. The PME's presented within the ANSMP are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil proliferation during in-water (i.e., construction, maintenance and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

The ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Water Quality Management Plan by continuing to prevent the introduction and/or spread of aquatic nuisance species in Project waters. The ANSMP is intended to be not inconsistent with other management strategies of federal, state, and tribal natural resource management agencies.

The schedule for implementation of specific measures within the ANSMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

## **4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES**

In order to fulfill the goals and objectives described in Section 3.0, Douglas, in consultation with the Aquatic SWG, has agreed to implement the following PME's.

### **4.1 Implement Best Management Practices During Recreational Improvement Activities (Objective 1)**

If at any time during the new license term, Douglas is required to construct, improve or maintain recreation access at boat launches and swim areas and the removal or disturbance of aquatic macrophyte beds that contain Eurasian watermilfoil may potentially occur, Douglas will implement containment efforts utilizing best management practices agreed to by the Aquatic SWG during such activities.

## **4.2 Participation in Regional and State ANS Efforts (Objective 2)**

### **4.2.1 Coordination with Regional and State Entities**

Douglas shall continue to coordinate with regional and state entities to implement activities in Project waters to monitor for the presence of ANS, specifically zebra and quagga mussels. Activities covered by this objective will consist of monitoring for the presence of zebra and quagga mussels as is identified in Section 2.2.3. If ANS are detected during monitoring activities, Douglas will immediately notify the appropriate regional and state agencies and assist in the implementation of reasonable and appropriate measures to address the ANS presence as is consistent with ANS Management protocols.

Douglas shall participate in information exchanges and regional efforts to coordinate monitoring activities.

### **4.2.2 Monitor Bycatch from other Project Aquatic Resource Management Activities**

Douglas shall monitor bycatch data collected from ongoing Project aquatic resource management activities for aquatic nuisance species presence to support regional and state efforts and the ANSMP. Such ongoing activities may consist of broodstock collection activities at Wells Dam and in associated Project tributaries, the northern pikeminnow removal program, water quality monitoring and any other aquatic resource activities related to implementation of Aquatic Resource Management Plans for bull trout, Pacific lamprey, white sturgeon, and resident fish.

### **4.2.3 ANS Information and Education**

Douglas shall make information regarding the effects of ANS introductions and the importance of prevention available to the public. Such outreach activities may consist of posting signage at Project recreation areas and boat launches.

Douglas shall also provide literature produced by appropriate state entities (Ecology and WDFW) for distribution at the visitor centers of local communities of the Project (Pateros, Brewster, Bridgeport) including Wells Dam.

## **4.3 Monitor and Address ANS Effects to Aquatic Communities During Changes in Project Operations (Objective 3)**

If at any time during the new license term, future changes in Project operations requiring FERC approval are proposed and the Aquatic SWG concludes that such proposed operations may encourage the introduction or proliferation of aquatic nuisance species within the Project, the Aquatic SWG will assess the potential effects, if any, in order to make informed management decisions.

If the assessment identifies adverse effects to Aquatic Resources due to aquatic nuisance species attributable to changes in Project operations, Douglas shall consult with the Aquatic SWG to select and implement reasonable and appropriate PME(s) to address the identified adverse effect(s).

#### **4.4 Reporting**

Douglas will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the ANSMP. The report will document all ANS activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this ANSMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

## 5.0 REFERENCES

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**ATTACHMENT G: WATER QUALITY MANAGEMENT PLAN**

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**WATER QUALITY MANAGEMENT PLAN**  
**WELLS HYDROELECTRIC PROJECT**  
**FERC PROJECT NO. 2149**

August 2009

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East Wenatchee, Washington

## EXECUTIVE SUMMARY

The Water Quality Management Plan (WQMP) is one of six Aquatic Resource Management Plans (Plans) contained within the Aquatic Settlement Agreement (Agreement). To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). The goal of the WQMP is to protect the quality of the surface waters affected by the Wells Hydroelectric Project (Project) with regard to the numeric criteria. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Douglas, in collaboration with the Aquatic SWG, has agreed to implement measures in support of the WQMP. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State Water Quality Standards (WQS), Chapter 173-201A WAC. The measures presented within the WQMP (Section 4.0) are designed to meet the following objectives:

Objective 1: Maintain compliance with state WQS for TDG. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

The WQMP is intended to be compatible with other water quality management plans in the Columbia River mainstem, including Total Maximum Daily Loads (TMDL). Furthermore, the WQMP is intended to be supportive of the Habitat Conservation Plan (HCP), Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Aquatic Nuisance Species Management Plan through the protection of designated uses (WAC 173-201A-600) in Project waters. The WQMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

## **1.0 INTRODUCTION**

The Water Quality Management Plan (WQMP) is one of six Aquatic Resource Management Plans (Plans) contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license. The Plans, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) for aquatic life in support of the Clean Water Act (CWA) Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

During the development of this plan, the Aquatic Settlement Work Group (Aquatic SWG) focused on management priorities for resources potentially impacted by Project operations. Entities that participated in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), and Douglas.

The Washington State Water Quality Standards (WQS) found at WAC 173-201A include designated uses (recreation, agriculture, domestic and industrial use, and habitat for aquatic life) and supporting numeric criteria. The WQMP is intended to address only the numeric criteria of the WQS. Aquatic life uses of the Project identified by the WQS shall be addressed by the five other Aquatic Resource Management Plans within the Agreement and by the measures implemented in the HCP.

This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant measures (Section 4) to maintain compliance with the numeric criteria of state WQS during the term of the new license.

## **2.0 BACKGROUND**

Section 401 of the Clean Water Act (33 USC Chapter 26 § 1341 *et seq.*) requires that applicants for a hydroelectric project license from the Federal Energy Regulatory Commission (FERC) provide FERC with a 401 Certification that provides reasonable assurance that the Project will comply with applicable WQS and any other appropriate requirements of state law. In Washington State, Ecology is responsible for issuing 401 Certifications.

### **2.1 Water Quality Standards**

Congress passed the CWA in 1972, and designated the U.S. Environmental Protection Agency (EPA) as the administering federal agency. This federal law requires that a state's water quality standards protect the surface waters of the U.S. for beneficial or designated uses, such as recreation, agriculture, domestic and industrial use, and habitat for aquatic life. Any state WQS,

or amendments to these standards, do not become effective under the CWA until they have been approved by EPA.

Ecology is responsible for the protection and restoration of Washington State's waters. Ecology establishes WQS that set limits on pollution in lakes, rivers, and marine waters in order to protect water quality and specified designated uses of such water bodies. These standards are found in WAC 173-201A.

### **2.1.1 Water Quality Standards for the Project**

The Project includes the mainstem Columbia River above Wells Dam, one mile of the mainstem Columbia River below Wells Dam, the Methow River (up to river mile [RM] 1.5) and the Okanogan River (up to RM 15.5).

Under the 2006 WQS, the Project includes designated uses for spawning/rearing (aquatic life), primary contact recreation, and all types of water supply and miscellaneous uses. Numeric criteria to support the protection of these designated uses consist of various physical, chemical, and biological parameters including total dissolved gas (TDG), temperature, dissolved oxygen (DO), pH, turbidity, and toxins.

Unless stated otherwise in the subsections below, WQS criteria discussed in subsections 2.1.1.1 to 2.1.1.6 apply to all waters within the Project.

#### **2.1.1.1 Total Dissolved Gas**

TDG is measured as a percent saturation. Based upon criteria developed by Ecology, TDG measurements shall not exceed 110% at any point of measurement in any state water body. The WQS state that an operator of a dam is not held to the TDG standards when the river flow exceeds the seven-day, 10-year-frequency (7Q10) flood. The 7Q10 flow is the highest value of a running seven consecutive day average using the daily average flows that may be seen in a 10-year period. The 7Q10 total river flow for the Project was computed by Ecology (Pickett et al 2004) using the hydrologic record from 1974 through 1998 and a statistical analysis to develop the number from 1930 through 1998. The U.S. Geological Survey Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" was followed. The resulting 7Q10 flow at Wells Dam is 246,000 cubic feet per second (cfs).

In addition to allowances for TDG standard exceedances during natural flood flows in excess of 7Q10, the TDG criteria may be adjusted to accommodate spill to facilitate fish passage over hydroelectric dams when consistent with an Ecology-approved Gas Abatement Plan (GAP). Ecology has approved on a per application basis, an interim exemption to the TDG standard (110%) to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)). Dams in the Columbia and Snake rivers may be granted such an exemption. The GAP must be accompanied by fisheries management, physical, and biological monitoring plans (173-201A-200(1)(f)(ii)).



## Columbia and Snake River TDG Exemption

On the Columbia and Snake rivers, three conditions apply to the TDG exemption. First, in the tailrace of a dam, TDG shall not exceed 125% as measured in any one-hour period during spillage for fish passage. Second, TDG shall not exceed 120% in the tailrace of a dam, as an average of the 12 highest consecutive hourly readings in any one day (24-hour period), relative to atmospheric pressure. Third, TDG shall not exceed 115% in the forebay of the next dam downstream, also based on an average of the 12 highest consecutive hourly readings in any one day (24-hour period), relative to atmospheric pressure.

The increased levels of spill resulting in elevated TDG levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine passage. The TDG exemption provided by Ecology is based on a risk analysis study conducted by the NMFS (NMFS 2000).

### 2.1.1.2 Temperature

Temperature is measured by the 7-day average of the daily maximum temperatures (7-DADMax). The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date (WAC 173-201A-020).

Under the WQS, the 7-DADMax temperature within the Columbia, Methow, and Okanogan river portions of the Project shall not exceed 17.5°C (63.5°F) (WAC 173-201A-602 and 173-201A-200(1)(c)). Additionally, the WQS contains additional supplemental temperature requirements for the Project portion of the Methow River (see Methow River Supplemental Requirements section below). When a water body's temperature is warmer than 17.5°C (or within 0.3°C (0.54°F) of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C (0.54°F).

When the background condition of the water is cooler than 17.5°C, the allowable rate of warming up to, but not exceeding, the numeric criteria from human actions is restricted as follows:

(A) Incremental temperature increases resulting from individual point source activities must not, at any time, exceed  $28/(T+7)$  as measured at the edge of a mixing zone boundary (where "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge).

(B) Incremental temperature increases resulting from the combined effect of all non-point source activities in the water body must not, at any time, exceed 2.8°C (5.04°F).

Temperatures are not to exceed the criteria at a probability frequency of more than once every ten years on average. Temperature measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) Be taken from well mixed portions of rivers and streams.

(B) Not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

The following guidelines on preventing acute lethality and barriers to migration of salmonids are also used in determinations of compliance with the narrative requirements for use protection established in WAC 173-201A (e.g., WAC 173-201A-310(1), 173-201A-400(4), and 173-201A-410 (1)(c)). The following site-level considerations do not, however, override the temperature criteria established for waters in WAC 173-201A-200(1)(c) or WAC 173-201A-602:

(A) Moderately acclimated (16-20°C, or 60.8-68.0°F) adult and juvenile salmonids will generally be protected from acute lethality by discrete human actions maintaining the 7-DADMax temperature at or below 22°C (71.6°F) and the 1-day maximum (1-DMax) temperature at or below 23°C (73.4°F).

(B) Lethality to developing fish embryos can be expected to occur at a 1-DMax temperature greater than 17.5°C (63.5°F).

(C) To protect aquatic organisms, discharge plume temperatures must be maintained such that fish could not be entrained (based on plume time of travel) for more than two seconds at temperatures above 33°C (91.4°F) to avoid creating areas that will cause near instantaneous lethality.

(D) Barriers to adult salmonid migration are assumed to exist any time the 1-DMax temperature is greater than 22°C (71.6°F) and the adjacent downstream water temperatures are 3°C (5.4°F) or cooler.

### Methow River Supplemental Requirements

Ecology has identified water bodies, or portions thereof, which require special protection for spawning and incubation in accordance with Ecology publication 06-10-038. This publication indicates where and when the following criteria are to be applied to protect the reproduction of native char, salmon, and trout. Water temperatures are not to exceed 13°C from October 1 to June 15 in the lower Methow River including the portion within the Project boundary (up to RM 1.5).

#### 2.1.1.3 Dissolved Oxygen

DO criteria are measured in milligrams per liter (mg/L). Under the WQS, DO measurements shall not be under the 1-day minimum of 8.0 mg/L. 1-day minimum is defined as the lowest DO reached on any given day. When a waterbody's DO is lower than the 8.0 mg/L criteria (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease more than 0.2 mg/L. Concentrations of DO are not to fall below 8.0 mg/L at a probability frequency of more than once every ten years on average.

DO measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) Be taken from well mixed portions of rivers and streams.

(B) Not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

#### 2.1.1.4 pH

pH is defined as the negative logarithm of the hydrogen ion concentration. Under the WQS, pH measurements shall be in the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.5 units.

#### 2.1.1.5 Turbidity

Turbidity is measured in nephelometric turbidity units (NTUs). Turbidity shall not exceed 5 NTU over background when the background is 50 NTU or less; or a 10% increase in turbidity when the background turbidity is more than 50 NTU.

#### 2.1.1.6 Toxins

Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by Ecology.

Ecology shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with WAC 173-201-240 and to ensure that aquatic communities and the existing and characteristic beneficial uses of waters are being fully protected.

Within the Project Area, specifically within the Project portion of the Okanogan River, two toxic substances are of concern: Dichloro-Diphenyl-Trichloroethane (DDT) and Polychlorinated Biphenyls (PCBs). DDT is a synthetic organochlorine insecticide that was frequently used in agriculture prior to being banned in 1972. PCBs are an organic compound that were used as coolants and insulating fluids for transformers, and capacitors. PCBs are classified as persistent organic pollutants and production was banned in the 1970s due to its high level of toxicity.

Toxic substances criteria identified in the WQS for these two substances are as follow:

(A) In freshwater, DDT (and metabolites) shall not exceed 1.1 µg/L as an instantaneous concentration at any time. Exceedance of the criteria is defined as an acute condition. DDT (and metabolites) shall not exceed 0.001 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.

(B) In freshwater, PCBs shall not exceed 2.0 µg/L as a 24-hour average. Exceedance of the criteria is defined as an acute condition. PCBs shall not exceed 0.01 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.

### **2.1.2 305(b) Report, 303(d) List and Total Maximum Daily Loads**

Every two years, the EPA, as specified in section 305(b) of the CWA, requires Ecology to compile an assessment of the state's water bodies. Data collected from the water quality assessment are used to develop a 305(b) report. The report evaluates and assigns each water body into five categories based upon the Ecology's evaluation of the water quality parameters collected from within each water body.

Category 1 states that a water body is in compliance with the State WQS for the parameter of interest.

Category 2 states a water body of concern.

Category 3 signifies that insufficient data are available to make an assessment.

Categories 4a-4c indicates an impaired water body that does not require a Total Maximum Daily Load (TMDL) for one of three reasons:

- Category 4a indicates a water body with a finalized TMDL.
- Category 4b indicates a water body with a Pollution Control Program.
- Category 4c indicates a water body impaired by a non-pollutant (e.g., low water flow, stream channelization, and dams).

Category 5 represents all water bodies within the state that are considered impaired and require a Water Quality Implementation Plan (WQIP) (formerly TMDL). The 303(d) list consists of only water bodies with Category 5 listings.

Information presented below in subsections 2.1.2.1 to 2.1.2.6 are based upon the Draft 2008 Water Quality Assessment and candidate 303(d) list that has been finalized by Ecology and submitted to the EPA for approval.

#### **2.1.2.1 Total Dissolved Gas**

The reach of the Columbia River within the Project is on the state's 1998 303(d) list for TDG impairment (Category 5 listing). In 2004, Ecology developed a TDG TMDL (which was approved by EPA) for the mid-Columbia River and as such, this reach of the Columbia River, which includes the Project, is no longer on the 303(d) list for TDG (Category 4a).

Neither the reach of the Methow River within the Project (RM 1.5) nor the reach of the Okanogan River within the Project (RM 15.5) are listed on the 2008 303(d) list for TDG.

#### **2.1.2.2 Temperature**

The reach of the Columbia River within the Project is on the state's 2004 303(d) list for temperature impairment. The EPA has developed a draft temperature TMDL for the mainstem Columbia River, including that portion of the Columbia River contained within the Project. It is anticipated that the EPA will issue the final temperature TMDL for the Columbia River at some future date. The TMDL will address the water temperature effects of dams and other human

actions, including model analyses and load allocations for mainstem hydroelectric projects including Wells Dam.

The reach of the Methow River within the Project (RM 1.5) is not on the 2008 303(d) list for temperature.

The reach of the Okanogan River within the Project (RM 15.5) is not on the 2008 303(d) list for temperature. However, reaches of the Okanogan River upstream of the Wells Project boundary are listed on the 2008 303(d) list for temperature.

#### 2.1.2.3 DO

No part of the Project area is on the 2008 303(d) list for DO.

#### 2.1.2.4 pH

No part of the Project area is on the 2008 303(d) list for pH.

#### 2.1.2.5 Turbidity

No part of the Project area is on the 2008 303(d) list for turbidity.

#### 2.1.2.6 Toxins

Neither the reach of the Columbia River within the Project nor the reach of the Methow River within the Project (RM 1.5) is on the 2008 303(d) list for toxins.

The reach of the Okanogan River within the Project (RM 15.5) is not listed on the 2008 303(d) list for toxins. In 1998, Ecology put the portion of the Okanogan River within Project boundary on the 303(d) list for 4, 4'-DDE, 4,4'-DDD, PCB-1254, and PCB 1260 concentrations above standards in edible carp tissue (Ecology 1998). In 2004, Ecology completed the Lower Okanogan River DDT and PCB TMDL (which was approved by EPA).

## **2.2 Project Water Quality Monitoring Results**

### **2.2.1 Total Dissolved Gas**

TDG supersaturation is a condition that occurs in water when atmospheric gasses are forced into solution at pressures that exceed the pressure of the overlying atmosphere. Water containing more than 100% TDG is in a supersaturated condition. Water may become supersaturated through natural or dam-related processes that increase the amount of air dissolved in water. Supersaturated water in the Columbia River may result from the spilling of water at Columbia River dams. The occurrence of TDG supersaturation in the Columbia River system is well documented and has been linked to mortalities and migration delays of salmon and steelhead (Beiningen and Ebel 1970; Ebel et al. 1975).

At Wells Dam, Douglas has monitored TDG for compliance with state and federal water quality regulations since 1998 and more recently in support of its GAP and TDG exemption issued by Ecology for juvenile fish passage (Le 2008). Douglas is required to monitor TDG in the Wells Dam forebay and tailrace area (on the Columbia River, near RM 515.6). Douglas uses Rocky Reach forebay TDG data collected by Chelan County PUD for downstream forebay monitoring compliance data.

A TDG study conducted in 2006 indicated that the current location of the TDG compliance monitoring stations are appropriate in providing representative TDG production information both longitudinally and laterally downstream of Wells Dam (EES Consulting et al. 2007). Detailed information regarding the study is provided in Section 2.3.1.2.

Since 2003, Douglas has operated the Project during the juvenile fish passage season (April – August) in accordance with an Ecology-approved GAP and associated TDG exemption. TDG monitoring at Wells Dam is facilitated through the deployment of Hydrolab Minisonde probes in the center of the Wells forebay and approximately 3 miles downstream of Wells Dam. TDG data are logged every fifteen minutes, averaged (4 in an hour) and transmitted on the hour. Probes are serviced and checked monthly for accuracy and calibrated if necessary. Average, minimum, and maximum TDG measurements in the Wells Dam forebay and tailrace since monitoring began are provided in Table 2.2-1. Also included in Table 2.2-1 are Rocky Reach forebay TDG data acquired from Chelan County PUD’s TDG monitoring program.

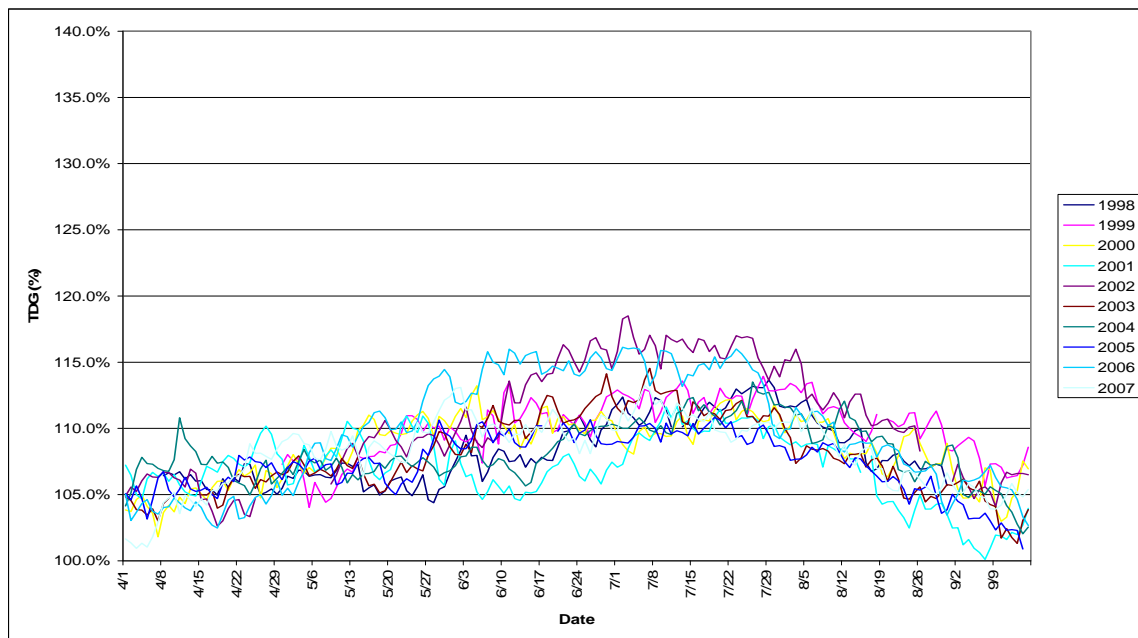
Levels of TDG at Wells Dam and the Rocky Reach Dam forebay that result in exceedances of the numeric criteria are most likely to occur during April through August as a result of high flows caused by either rapid snow melt or federal flow augmentation intended to aid downstream juvenile salmonid passage. Douglas monitors for TDG at Wells Dam between April 1 and September 15 annually to coincide with this observation (Figure 2.2.1 and 2.2.2). Chelan County PUD monitors for TDG at Rocky Reach Dam between April 1 and August 31 (Figure 2.2.3). High TDG values at both Wells Dam and Rocky Reach Dam resulting in exceedances are often associated with various factors including high spring flows, unit outages, and upstream Federal Columbia River Power System operations, including federal flow augmentation, resulting in water entering the Project with relatively high TDG levels. During these time periods, river conditions in the mid-Columbia River system are conducive to exceedances of the TDG criteria.

In past years, Wells forebay monitoring data show that on average TDG values at this location range from 107-110% with maximum values sometimes exceeding the 115% standard specified by the TDG exemption. Rocky Reach forebay monitoring data indicate that on average TDG values at this location range from 108-110% with maximum values sometimes exceeding the 115% standard. In general, Wells Dam adds relatively small amounts of TDG through the use of spill intended to aid in the passage of juvenile salmonids (0-2%). However, similar to other hydroelectric facilities on the Columbia River system, probabilities for exceedances are more likely during late spring periods of high river flow and low electrical demand. Table 2.2-1 contains historic average, minimum and maximum TDG measurements associated with the Wells Project. Note that the high TDG values recorded during 2006 were a direct result of the 2006 TDG Study that required Douglas to intentionally spill water in various spillway

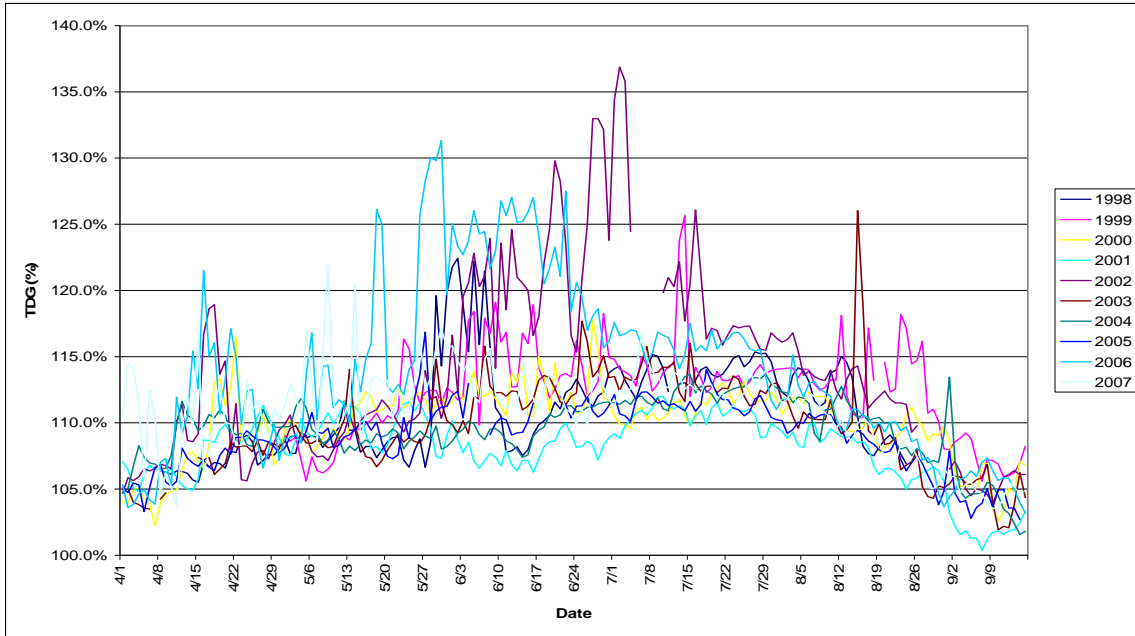
configurations. This study was intended to define the gas generation dynamics of the Wells Project under various operating parameters.

**Table 2.2-1 Average, minimum, and maximum TDG measurements at Wells Dam from Hydrolab MiniSonde stations placed in the Wells Forebay, Wells Tailrace and Rocky Reach Forebay. Values are in percent dissolved gas and are 12-hour high (non-consecutive) averages.**

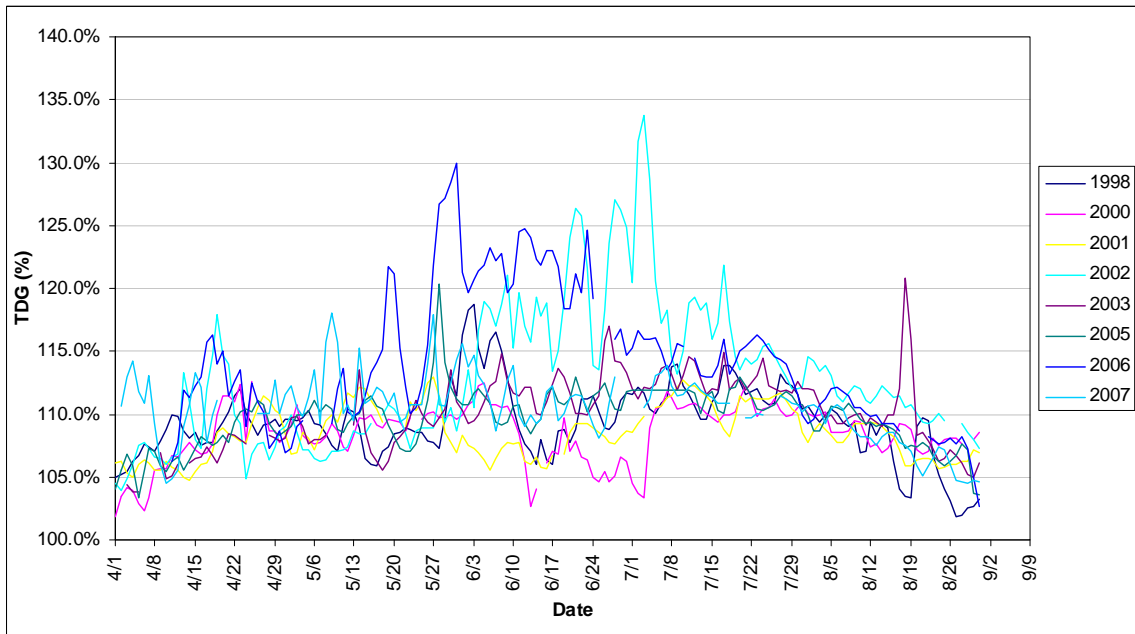
Location	TDG	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Wells Forebay	Avg.	108.3	110.1	108.5	107.1	110.8	108.1	108.2	107.4	109.9	108.3
	Min	104.4	104.0	101.8	100.1	102.6	101.3	102.0	110.8	102.5	100.9
	Max	113.7	113.9	113.2	111.7	118.5	114.5	113.5	100.9	116.1	113.2
Wells Tailrace	Avg.	111.1	112.4	110.1	108.1	113.9	109.8	109.6	109.1	114.0	110.9
	Min	105.5	105.6	102.2	100.4	103.9	101.9	101.6	102.8	103.2	103.5
	Max	122.4	125.7	125.4	112.0	136.9	126.0	113.7	116.8	131.3	122.0
Rocky Reach Forebay	Ave	109.4	N/A	108.5	108.5	112.9	110.1	109.1	109.6	114.4	110.4
	Min	101.8	N/A	101.9	104.7	103.9	103.8	104.7	103.3	102.7	104.5
	Max	118.7	N/A	112.6	113.0	133.8	120.8	114.3	120.4	130.0	118.0



**Figure 2.2-1 Wells Dam forebay average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24-hour period. Monitoring season is typically April 1 to September 15. Data for years 1998-2007.**



**Figure 2.2-2 Wells Dam tailrace average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24 hour period. Monitoring season is typically April 1 to September 15. Data for years 1998-2007 (Breaks in data are the result of equipment malfunction).**



**Figure 2.2-3 Rocky Reach forebay average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24 hour period. Monitoring season is typically April 1 to August 31. Data for years 1998-2007 (Breaks in data are the result of equipment malfunction).**

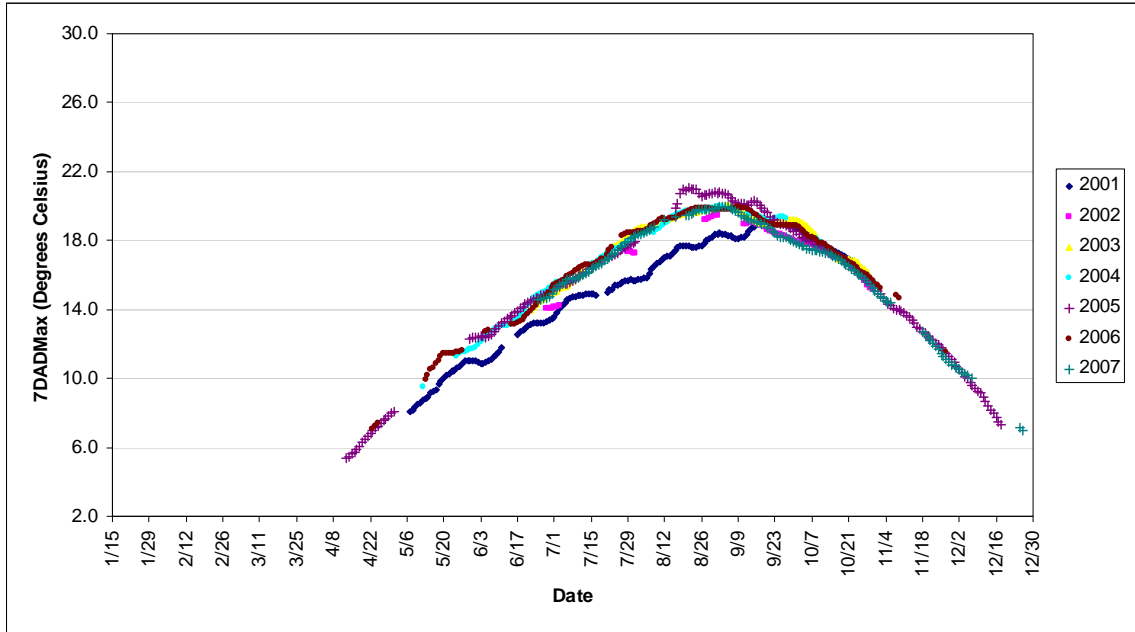


### 2.2.2 Temperature

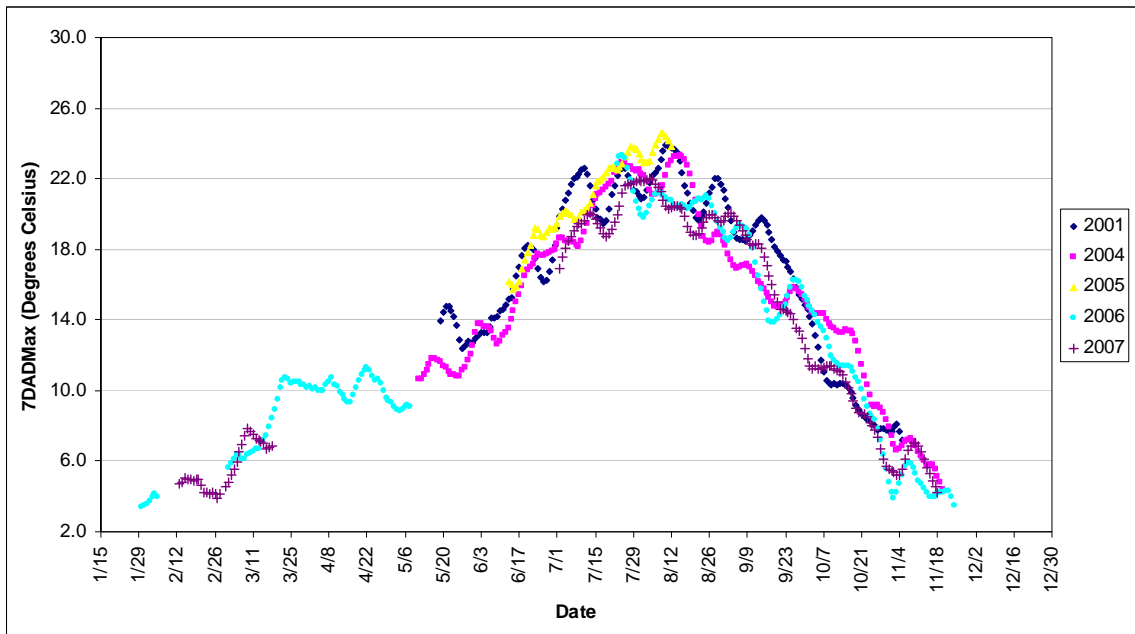
Beginning in 2001, an extensive water temperature monitoring effort was initiated by Douglas in order to better understand the temperature dynamics throughout the Wells Reservoir.

Temperature data was collected by Douglas at four locations in the Columbia River (RM 544.5, RM 535.3, RM 530.0, and RM 515.6) and at one site each on the Okanogan (RM 10.5) and Methow (RM 1.4) rivers. Data collected by Douglas were collected hourly using Onset tidbit temperature loggers. Monitoring start and end dates varied from year to year but generally began in the early spring and ended in late fall. Quality assurance and control measures were implemented prior to deploying and upon retrieving temperature loggers to ensure that data collected were accurate. Due to sensor loss or sensor malfunction in some years, the availability of data at some of these monitoring locations is sporadic.

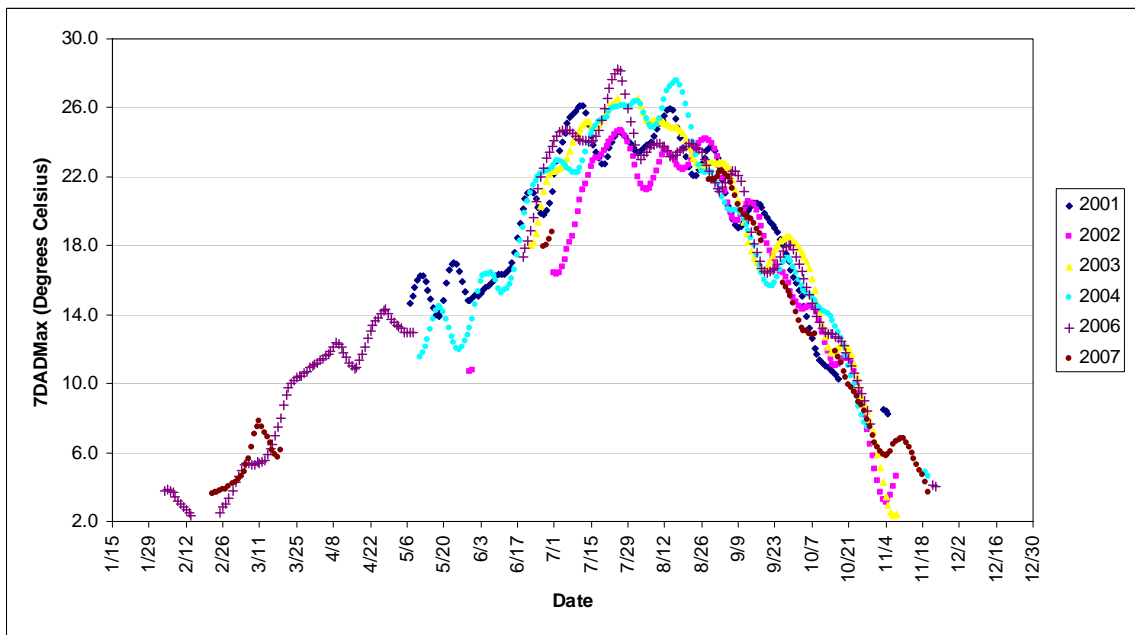
In general, 7-DAD Max temperature data indicate that the portion of the Columbia River upstream of and within the Project generally warms to above 17.5°C (WQS numeric criteria) in mid-July and drops below the numeric criteria by early October (Figure 2.2-4). Water temperatures in the Methow River upstream of the Project warm to above 17.5°C in mid-July and drop below the numeric criteria by September (Figure 2.2-5), while trends in the Okanogan River (upstream of the Project) indicate warming above 17.5°C from early June with cooling by late September (Figure 2.2-6). Maximum water temperatures typically occur in late summer (August) with temperatures below Chief Joseph Dam, the Methow River (RM 1.4), and the Okanogan River (RM 10.5) reaching 20.0°C, 22.5°C, and 27.0°C, respectively. It is important to note that these data are representative of water temperatures as they flow into the Project. In 2006, Douglas expanded the Project temperature monitoring season to cover the entire year and implemented a more frequent downloading schedule. Douglas also added additional monitoring stations at the mouths of the Okanogan (RM 0.5) and Methow (RM 0.1) rivers. These have been used to model temperature and allocate the effects of Project operations on water temperatures at Wells Dam and within the Wells Reservoir as they relate to compliance with the WQS numeric criteria for temperature.



**Figure 2.2-4 7-DAD Max water temperature collected in the tailrace of Chief Joseph Dam (RM 544) using Onset temperature loggers for years 2001-2007.**



**Figure 2.2-5** 7-DADMax water temperature collected in the Methow River upstream from the influence of Wells Dam (RM 1.4) using Onset temperature loggers for years 2001-2007. Data were unavailable in 2002 and 2003.

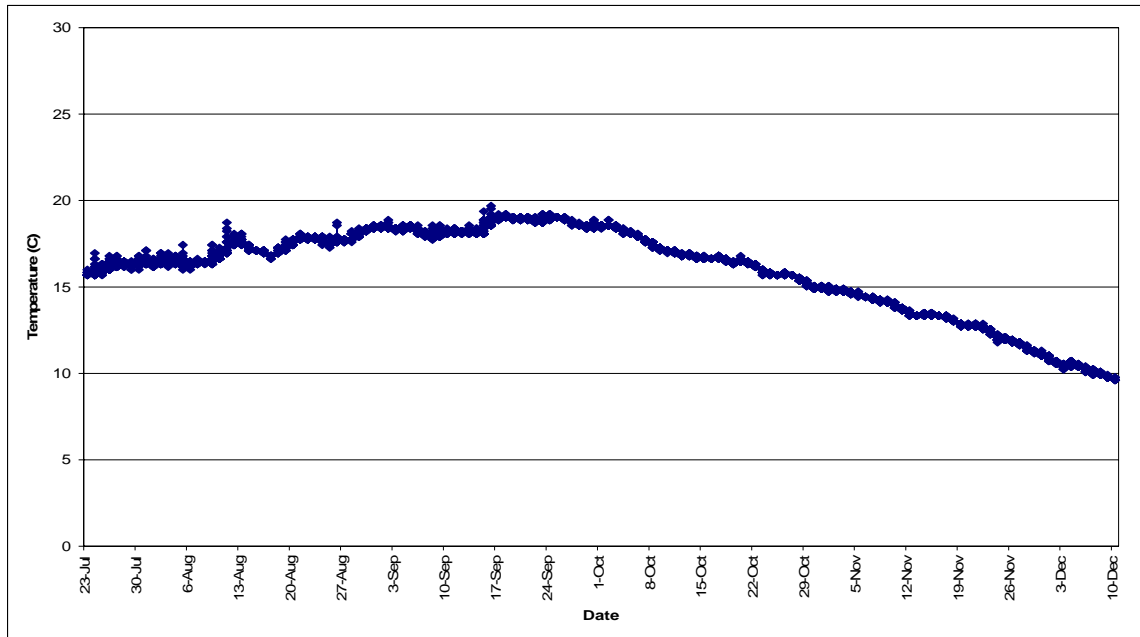


**Figure 2.2-6** 7-DADMax water temperature collected in the Okanogan River (RM 10.5) using Onset temperature loggers for years 2001-2007.

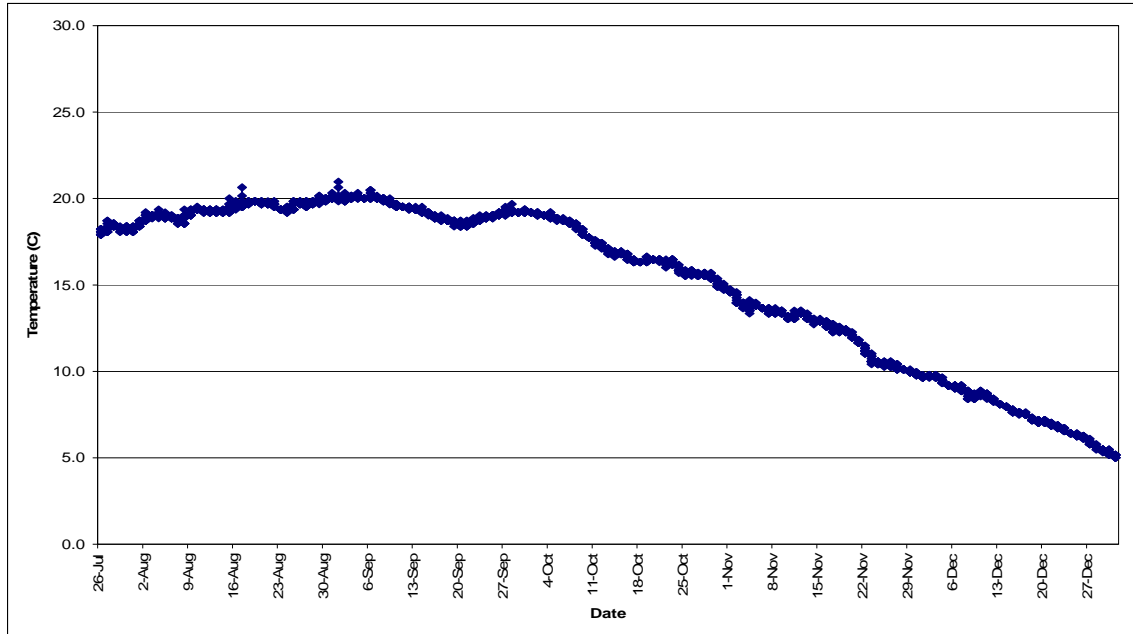
### 2.2.2.1 Wells Dam Fish Ladder Temperature Monitoring

Wells Dam has two fish ladders, one at each end of the dam. The two fish ladders are conventional staircase type fish ladders with 73 pools. The water source for the upper pools is the Wells Dam forebay. The flow through the upper 17 pools varies from 44 cfs at full reservoir to approximately 31 cfs at maximum reservoir drawdown. The lower 56 pools discharge a constant 48 cfs of water. To maintain the flow at 48 cfs in the lower ladder pools, supplementary water (auxiliary water supply) is introduced into Pool No. 56 through a pipeline from the reservoir. Pools are numbered in order from the bottom (near the collection gallery and entrance) to the top (exit to the Wells Dam forebay). The ladders are enclosed.

According to the HCP Biological Opinion (BO) issued by NMFS, all entities that use the fish trapping facilities at Wells Dam are required to discontinue trapping operations when fish ladder water temperatures exceed 68.0° F (20.6°C). In 2001 and 2003, Douglas added supplemental temperature recording equipment at Pool 39 near the broodstock collection facilities in the east fishway at Wells Dam to ensure compliance with requirements in the NMFS BO. In 2001, hourly data indicated that water temperatures at this location in the east fish ladder did not exceed 68.0°F (20.6°C) at any time during the monitoring period (Figure 2.2-7), which ran from late July to early December. In 2003, data were recorded every two hours and exceedances of greater than 68.0°F (20.6°C) were observed on three hourly occasions (Figure 2.2-8).



**Figure 2.2-7** Hourly water temperatures collected at the Wells Dam east fish ladder trap during 2001.

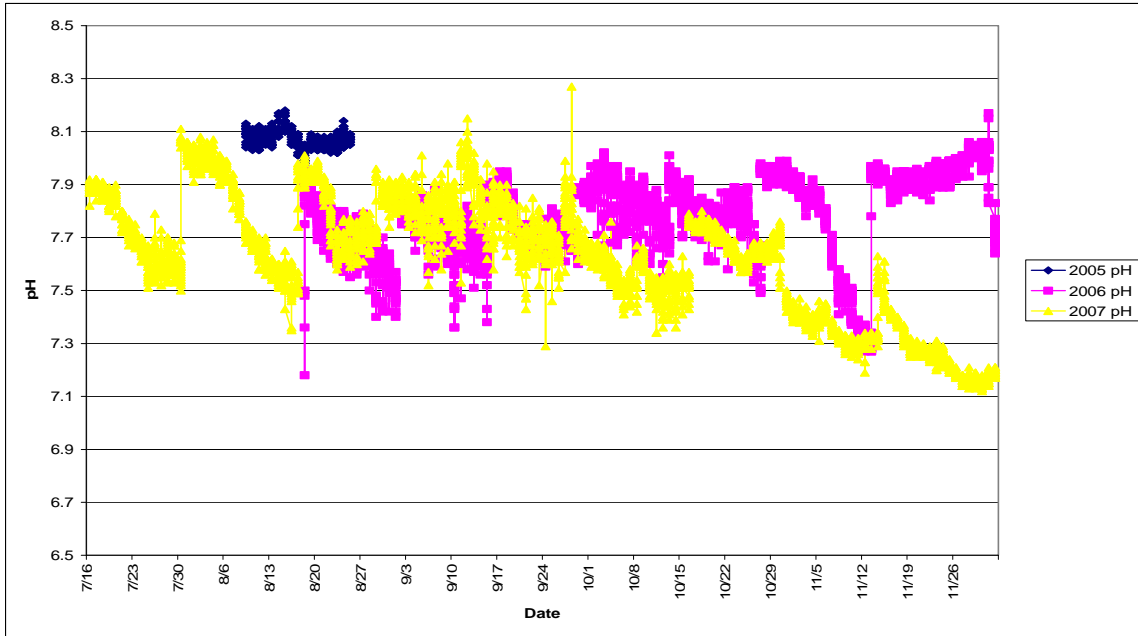


**Figure 2.2-8 Water temperatures collected every two hours at the Wells Dam east fish ladder trap during 2003.**

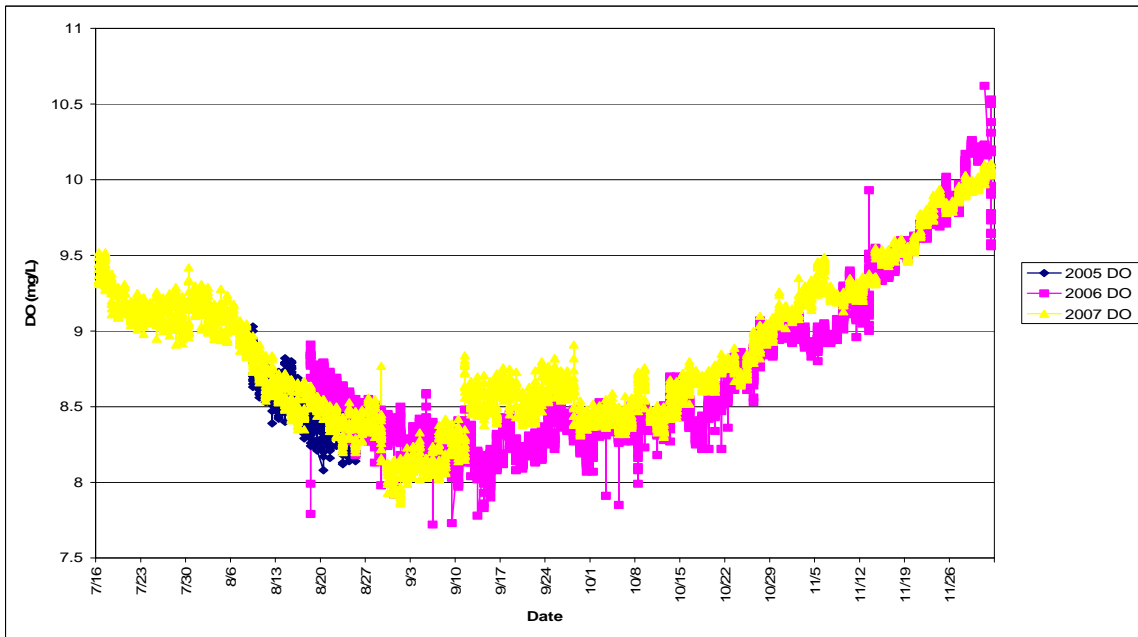
### 2.2.3 DO, pH, and Turbidity

#### 2.2.3.1 DO and pH

In 2005, Douglas added sensors to its existing forebay TDG monitoring equipment (Hydrolab Minisonde) in order to collect preliminary information on pH and DO within the Project to monitor these parameters during the late summer when probabilities of exceedance are highest. In 2006, Douglas expanded the monitoring period to include the entire late summer period. In 2007, Douglas further expanded the monitoring period to begin in July and end in early December (Figure 2.2-9 and 2.2-10). The monitoring data indicate that values for these parameters are generally in compliance with the WQS numeric criteria at this site. pH values are consistently within the range of 6.5 to 8.5 as specified by the numeric criteria. During August and September periods of this study, there were periodic excursions of DO below the numeric criteria of 8.0 mg/L. Probable causes are likely due to the physiological processes of aquatic plants; however, these exceedances do not appear to be the dominant trend.



**Figure 2.2-9** pH measurements collected at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), 2005-2007.



**Figure 2.2-10** DO measurements collected at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), 2005-2007.

### 2.2.3.2 Turbidity

At Wells Dam, Secchi disk readings are taken daily during the adult fish passage assessment period of May 1 to November 15 to examine turbidity. A standard Secchi disk is lowered into the forebay on the west side of Wells Dam near the exit to the west fishway. Measurements are recorded in meters of visibility and records have been made since the early 1970s; however, continuous, reliable information adhering to a standard protocol has been collected since 1998. General trends of Secchi disk data suggest relatively lower periods of visibility (0.6 meters to 1.2 meters) during the spring and early summer. These relatively low periods of visibility are highly correlated with high flows during the spring runoff period. As the high flow period subsides, Secchi disk values increase to between 3.4 and 4.6 meters for the remainder of the monitoring period. In 2008, Douglas installed a fixed turbidity sensor near the east fishway exit in the Wells forebay and collected turbidity data in the Wells Dam forebay.

## 2.3 Project Water Quality Studies

### 2.3.1 Total Dissolved Gas

Each year from 2003-2008, Douglas implemented spill testing activities to examine the relationship between water spilled over the dam and the production of TDG. These results were subsequently used by IIHR-Hydrosience and Engineering of University of Iowa to develop and calibrate an unsteady state three-dimensional (3D), two-phase flow computational fluid dynamics (CFD) tool to predict the hydrodynamics of gas saturation and TDG distribution within the Wells tailrace. These tools were then used to reliably predict TDG production at Wells Dam and establish how preferred operating conditions and spillway configurations can be used as methods to manage TDG within WQS numeric criteria (Politano et al. 2009b).

#### 2.3.1.1 Project TDG Assessments 2003-2005

In 2003 and 2004, Douglas hired Columbia Basin Environmental (CBE) to determine the effectiveness of the tailwater sensor relative to the tailwater cross section profile for TDG and better define the relationship between spillway releases and TDG production (CBE 2003, 2004). CBE deployed TDG sensors along two transects. Based on the results of these studies, the tailwater station provided an accurate record of daily average TDG values in the Wells Dam tailrace. The studies also showed that at times, gas levels from some turbine flows were being affected by spill.

In spring 2005, Douglas contracted with CBE to implement a TDG study at Wells Dam designed to measure TDG pressures resulting from various spill patterns at the dam (CBE 2006). An array of water quality data loggers was installed in the Wells Dam tailwater for a period of two weeks between May 23, 2005 and June 6, 2005. The Wells Dam powerhouse and spillway were operated through a predetermined range of operational scenarios that varied both total flow and shape of the spillway discharge. A total of eight configurations were tested including flat spill patterns (near equal distribution of spill across the entire spillway), crowned spill patterns (spill is concentrated towards the center of the spillway) and spill over loaded and unloaded units (Table 2.3-1).

**Table 2.3-1 Test matrix for 2005 Wells Dam TDG Production Dynamics Study.**

Test	Description
1A	Spill over load, east spill/east generation
1B	Spill over unloaded units, east spill/west generation
1C	Spill over unloaded units, west spill/east generation
1D	Spill over load, west spill/west generation
2A	Crowned spill, modest flow
2B	Dentated spill, modest flow
2C	Crowned spill, high flow
2D	Flat spill, high flow

Results from the study indicated that spill from the west side of the spillway resulted in consistently higher TDG saturations than similar spill from the east side. All Dentated spill patterns and flat spill patterns at high river flow yielded higher TDG saturations than crowned spill for similar total discharges. The results of this study also indicated that TDG levels of powerhouse flows may have been influenced by spill.

#### 2.3.1.2 EES Consulting 2006 Project TDG Production Dynamics Study

In 2006, Douglas continued TDG assessments at the Project by examining the best spillway configurations and project operations to minimize the production of TDG. Douglas hired a team of hydraulic and TDG experts from the Pacific Northwest to help design a monitoring program for a study that would examine various operational scenarios and their respective TDG production dynamics.

Thirteen sensors were placed along three transects at 1,000, 2,500, and 15,000 feet below Wells Dam. There were also three sensors placed across the forebay, one being the fixed monitoring station midway across the face of the dam and two more a distance of 300 feet from the dam. The sensors were programmed to collect data in 15-minute intervals for both TDG and water temperature. Each test required the operations of the dam to maintain static flows through the powerhouse and spillway for at least a three-hour period. While there were 30 scheduled spill events, there were an additional 50 events where the power house and spillway conditions were held constant for a minimum three-hour period. These “incidental” events provided an opportunity to collect additional TDG data on a variety of Project operations that met study criteria and are included in the results of the 2006 TDG Abatement Study. Spill amounts ranged from 5.2 to 52% of project flow; the volume of spill ranged from 2.2 to 124.7 kcfs and the total discharge ranged from 16.4 to 254.0 kcfs. There were six tests that were done at flows that exceeded the Wells Dam 7Q10 flows of 246 kcfs.

Results of the study indicated that two operational scenarios, spread spill and concentrated spill, produced the lowest levels of TDG. The EES Consulting team recommended continued testing of operational measures to ameliorate TDG production at Wells Dam (EES Consulting et al. 2007). The 2006 study confirmed that the current locations of the forebay and tailwater TDG compliance monitoring station are appropriate in providing representative TDG production information both longitudinally and laterally downstream of Wells Dam.



### 2.3.1.3 IIHR-Hydroscience and Engineering TDG Modeling

A study was initiated with the University of Iowa IIHR-Hydroscience and Engineering in 2007 to develop a numerical model capable of predicting the hydrodynamics and TDG concentrations in the tailrace of the Wells Project. The purpose of the model was to assist in the understanding of the underlying dynamics of TDG production allowing an accurate evaluation of the effectiveness of various spill configurations and plant operations in reducing TDG at Wells Dam. The modeling efforts were divided into three phases. Phase I was a developmental stage for calibration and validation. The results from Phase I were successful and the model was proven to provide a reliable predictor of tailrace TDG and therefore a useful tool to identify Project operations that can minimize TDG concentrations downstream of Wells Dam (Politano et al. 2008). Phase II was a series of model runs using varying spill configurations based on typical 7Q10 events observed over the past decade. The final model run, referred to as Scenario-9, showed that preferred operating conditions and spillway configurations are able to reduce tailrace TDG to levels within Washington State WQS (< 120%) during a 7Q10 flow (Politano et al. 2009a).

Phase III included a final series of model runs aimed at gaining further reductions in tailrace TDG by reconfiguring the spillway operations used to achieve the tailrace standard in Phase II (Scenario-9). In addition to gaining additional reductions in TDG, IIHR-Hydroscience and Engineering ran a “Standard Compliance Comparison” scenario. The Standard Compliance Comparison scenario included a forebay TDG of 115%, along with 9 of 10 units operating at full capacity (i.e., 90% of total powerhouse capacity), to provide results comparable to downstream hydroelectric project TDG evaluations. The Phase III report also demonstrated compliance with two other requirements of the state WQS: (1) the ability to meet 115% in the forebay of Rocky Reach Dam during fish spill; and (2) the ability to maintain 110% in the tailrace during non-fish spill periods (Politano et al. 2009b).

### 2.3.1.4 Project TDG Playbooks

Since 2007, spill playbooks have been developed annually for operators at Wells Dam. The original spill playbook in 2007 focused on a range of operations to evaluate TDG production along with potential operational constraints. The subsequent playbooks evolved to the current 2009 format that simply focuses on strategies that have been identified to effectively manage TDG production in the tailrace of Wells Dam. The resulting spill strategies are based on three basic principles:

- Spill operations concentrated through a single spillbay (as opposed to spread through several spillbays) reduce TDG production and increase degasification at the tailwater surface.
- Discharge from spillbays (denoted S hereafter) located near the middle of the dam (e.g., S7) prevent water with high TDG from attaching to the shoreline.
- Forced spill exceeding Juvenile Bypass System (JBS) flows of 2.2 kcfs must be increased to  $\geq 15$  kcfs to ensure that the submerged spillway lip below the ogee is engaged. The resulting force creates flows that are surface oriented, ultimately promoting degasification at the tailwater surface.

The above principles are used as a guideline for Project operators to spill at a range of outflows to ensure the future compliance with the Washington State WQS for TDG.

### 2.3.2 EES Consulting 2006 Project Limnology

In 2005, Douglas implemented a study to collect baseline limnological information for waters within the Project (EES Consulting 2006). The objectives of this study were to further document existing water quality conditions within the Project and to collect information to fill water quality data gaps identified by Douglas to support the water quality certification process administered by Ecology. A total of nine sampling sites, consisting of 5 mainstem sites, 2 tributaries and 2 littoral habitats, were selected to represent the spatial variability within the Project (Table 2.3-2). The year-long study began in May 2005 and investigated various water quality parameters at each of the nine sampling sites. Sampling included physical, chemical and biological water quality characteristics. A total of 22 water quality characteristics were sampled. All procedures used for the purpose of collecting, preserving and analyzing samples followed established EPA 40 CFR 136 protocol.

**Table 2.3-2 Water quality sampling sites for the 2005-2006 Project Limnological Investigation.**

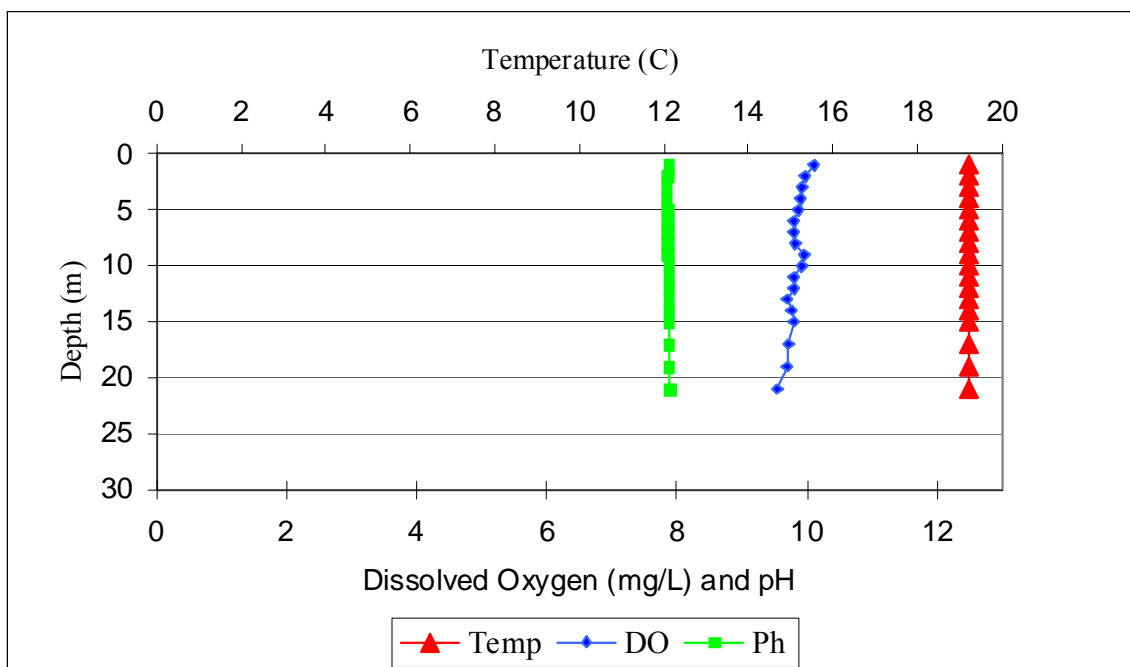
Site	Description
1	Downstream of Chief Joseph Dam (at Hwy 17 bridge)
2	Columbia River just downstream of the Brewster Bridge
3	Bridgeport Bar littoral site
4	Columbia River downstream of Pateros where the thalweg approaches maximum depth in the lower Wells Reservoir
5	Okanogan River upstream of confluence with Columbia River
6	Methow River upstream of confluence with Columbia River
7	Lower Wells Reservoir/Starr Boat Launch littoral site
8	Wells Forebay
9	Wells Tailrace

Results from the limnological investigation showed that the Project is characterized by low to moderately low levels for nutrients, slightly basic pH (range 7.5–8.5), well-oxygenated water and low turbidity with moderately low algae growth. Average Secchi depth for the Wells Reservoir varied minimally during May through August with only a slight increase as the season progressed (study average per site range 4.1 meters to 4.5 meters). Secchi depth (transparency) increased to a seasonal peak in September of 6.25 meters before slightly decreasing in October to a mean depth of 5.3 meters. Transparency increased downstream at the Brewster Bridge and Wells Forebay relative to the head of the reservoir at the Chief Joseph Dam tailrace for all months.

Turbidity in the Columbia River showed little seasonal variation with an annual average of 0.98 NTU and a variation of 0.38 NTU in September, 2005 (Wells Forebay site) to 3.81 NTU in February, 2006 (Brewster Bridge site). Longitudinal variation in turbidity was also minimal; sampling did not occur within the mixing zone plume of the Okanogan River. Turbidity in the Okanogan River was consistently higher than the Columbia River. Turbidity in the Methow

River was higher than in the Columbia River in May (due to sediment load) and in August due to phytoplankton growth. The only turbidity reading over 5.0 NTU was in the Methow River during May where turbidity was 5.6 NTU.

Under the EES Consulting limnology study, water temperature in the Wells Reservoir is primarily governed by the temperature of inflowing water at Chief Joseph Dam with little warming occurring as water traverses the Wells Reservoir's length. Similar to the Wells hourly temperature monitoring data (Section 2.2.2), results of the study indicate that the Project waters remained unstratified throughout the entire study period and was vertically homogeneous for DO. Figure 2.3-1 shows a vertical water profile of the Project. Low respiration rates at depth, a lack of vertical stratification and short water retention times resulted in homogeneous DO levels at all depths within the Project.



**Figure 2.3-1 Vertical water quality profile of the Project forebay from sampling date August 17, 2005.**

DO levels at one meter depth increased from upriver to downriver; the average difference (May through October) was 1.07 mg/L. The difference was more pronounced during May through August. The difference in September and October was 0.3 mg/L, which is at the limit of instrument reliability. Upstream to downstream differences in surface DO were negligible for the February 2006 sampling event. Littoral DO was similar or slightly higher than pelagic DO for surface waters. DO saturation levels were equal to or greater than 100% for all sites and all depths in all months except October when DO percent saturation for surface waters ranged from 110% to 91% saturation. The lower saturation levels in October may be due to reduced primary productivity while water temperatures were still relatively warm. All DO readings were above 8.0 mg/L and in compliance with the WQS numeric criteria.

Nitrogen and phosphorus are the two primary macronutrients needed for plant growth. Silica is important for diatomaceous phytoplankton. Ammonia (Nitrogen) levels were near or below detection levels for pelagic and littoral Columbia River Project waters as well as the Okanogan River for May through August and in February. Ammonia levels were only slightly higher in September and October. Ammonia peaked in the Methow River in August. Nitrates/Nitrites (Nitrogen) for Columbia River Project waters were higher in May before leveling off during the summer and fall. Nitrates/Nitrites were significantly higher at all sites for the February sample than any other month. Nitrates within littoral waters were lower than pelagic waters except in February when levels were similar. Nitrates/Nitrites in both the Okanogan and Methow rivers showed an increasing trend during the growing season. Total nitrogen levels for Columbia River pelagic and littoral waters were similar and relatively constant with the exception of significantly higher levels at most sites during February.

Orthophosphorus peaked for all stations in July. Orthophosphorus levels for pelagic and littoral waters were similar in all months except July when littoral orthophosphorus concentrations were significantly higher than observed for pelagic areas. Orthophosphorus levels in the Methow and Okanogan rivers were higher than in the Columbia River. Orthophosphorus was partially depleted in the Okanogan River but not in the Methow River at the time of the August sampling. Total phosphorus was slightly higher in littoral waters than in pelagic areas. Wave disturbance to bottom sediments may be a factor for this difference. Total phosphorus levels in pelagic surface waters ranged from below detection limits to 30.8 ug/L. Total phosphorus was higher for the Okanogan River than elsewhere, which is likely due to the higher sediment load. Total phosphorus for all stations peaked in July before gradually declining throughout the rest of the growing season.

The range in Nitrogen to Phosphorus (N:P) ratios for the Project waters was 2.5 to 30.8. The average Total Nitrogen to Total Phosphorus (TN:TP) ratio in the Project waters was 13.7 for the photic zone and averaged 14.8 for samples from all depths. These values are within the suggested literature ranges for phosphorus limitation. The N:P ratios peaked in July with pelagic and littoral waters showing similar trends. A decreasing N:P ratio through the major part of the algae growing season is typical of moderate to low nutrient waters as algae assimilate available nutrients. The N:P ratios were higher in the tributary rivers relative to the Columbia River. The N:P ratios are an indicator but not an absolute confirmation of factors limiting productivity.

Moderate to low chlorophyll *a* concentrations (range 0.5 ug/L to 5.8 ug/L) occurred throughout the sample period with peaks in July and October for the Project waters. Concentrations were lowest in August and also had the least variability among sites for the August sampling event. Pelagic and littoral waters were similar for chlorophyll *a* concentrations in most months except October when littoral waters reported twice as high chlorophyll *a* levels.

Phytoplankton were dominated by diatoms for all months at all sites sampled with Chryptophyta (small unicellular flagellates) being second dominant based on biovolume. Diatoms and Chryptophyta are both considered a good food source for the rest of the aquatic food web. Diatoms comprised 75% to 84% of the total phytoplankton biomass for the Project sites. Chlorophytes (green algae) were sub-dominant in the tailrace but only a minor component elsewhere. Total phytoplankton biomass was relatively low for all Project sample sites; total

biomass was generally less than 200,000  $\mu\text{m}^3/\text{ml}$ . Biomass peaked in July and August for pelagic areas of the Project waters and minor peaks occurred in October for littoral sites. The timing of peaks varied among all stations. Cyanophyta (blue-green algae) were only recorded in the Project sites for the July sample at Brewster Bridge where they comprised 16% of the total biomass; however, the biomass of Cyanophytes were comprised of relatively few but very large multicellular units. Cyanophytes also were recorded in the Wells Tailrace (4.7% biomass) in July. Diatoms dominated phytoplankton in the Methow River where peak biomass occurred in August (1,455,158  $\mu\text{m}^3/\text{ml}$ ). This peak is much higher than biomass observed anywhere else in the Project. Biomass levels in the Okanogan River were only slightly higher than in the Columbia River for most months with minor peaks occurring in May and October. Cyanophytes were a small proportion of the August biomass sample for the Okanogan River.

Diatoms also dominated periphyton. Seasonal lows occurred in July for all sites except Bridgeport shallows where the trend was decreasing periphyton biovolume as the season progressed.

Zooplankton density for pelagic waters was greatest in July (6,080/ $\text{m}^3$ ) and lowest (1,289/ $\text{m}^3$ ) in August. Copepods dominated the zooplankton population. Zooplankton densities in the tributary river mouths peaked in May. Although rotifers were present in all months, their density dropped to very low levels after May. Cladocera were the third most prevalent group with a minor peak occurring in July for this group.

Trophic Status Index (TSI) developed by Carlson (1977, 1996) and modified for nitrogen by Kratzer and Brezonik (1981) is an indication of the productivity of a lake based on Secchi depth, TP, TN and chlorophyll *a* concentrations for summer months (June through September). Project waters are classified as oligo-mesotrophic based on a mean TSI score of 36.5 with 40 to 50 being the range for mesotrophic classification (EES 2006).

### **2.3.3 Okanogan River Sediment Loading Analysis**

In 2006, Douglas, at Ecology's request, conducted an analysis to assess sediment accumulation within the Project portion of the Okanogan River (lower 15.5 miles). The request was based upon concerns that Project operations might be contributing to the accumulation of DDT and PCB-laden sediment that could impact aquatic life designated use. Douglas contracted with Erlandsen and Associates to collect bathymetric information at nine transects (RM 0.8, 1.3, 2.7, 4.9, 8.2, 10.5, 14.4, 16.6, and 19.0) within and above the Project portion of the Okanogan River. Bathymetric data of these same nine transects were collected previously by the Bechtel Corporation in 1997. A comparison of the bathymetric data for all nine transects between 1997 and 2006 indicated that sediment is not accumulating in the Project portion of the Okanogan River. It was concluded that with regard to sediment loading, the Okanogan River is exhibiting natural riverine processes and is not affected by Project operations. Douglas presented the results of the information to Ecology and the issue has been resolved.

## **2.3.4 Temperature, Dissolved Oxygen, pH, and Turbidity**

### **2.3.4.1 Water Temperature Modeling**

To assess compliance with the State temperature standards, two 2D laterally-averaged temperature models (using CE-QUAL-W2) were developed that represent existing (or “with Project”) conditions and “without Project” conditions of the Wells Project including the Columbia River from the Chief Joseph Dam tailrace to Wells Dam, the lowest 15.5 miles of the Okanogan River, and the lowest 1.5 miles of the Methow River. The results were processed to develop daily values of the seven-day average of the daily maximum temperatures (7-DADMax), and then compared for the two conditions (West Consultants, Inc. 2008).

The model analyses demonstrated that “with Project” temperatures in the Columbia, Okanogan and Methow rivers do not increase more than 0.3°C compared to ambient (“without Project”) conditions anywhere in the reservoir, and that the Project complies with state water quality standards for temperature. The analyses also show that backwater from the Wells Project can reduce the very high summer temperatures observed in the lower Okanogan and Methow rivers. The intrusion of Columbia River water into the lowest 1-2 miles of the Okanogan River and lowest 1.5 miles of the Methow River can significantly decrease the temperature of warm summer inflows from upstream, and can also moderate the cold winter temperatures by 1-3°C, reducing the extent and length of freezing.

### **2.3.4.2 Dissolved Oxygen, pH, and Turbidity**

A study to collect additional DO, pH, and turbidity data from within the Wells Project was proposed by the Aquatic Resource Workgroup in 2007. The goal of this study was to obtain required DO, pH, and turbidity information for the Wells Dam forebay and lower Okanogan River, both above and within the Wells Project boundary. The information gathered from these monitoring efforts demonstrated that the Project, as proposed to be operated under the new license, will meet the numeric criteria for WQS (Parametrix, Inc. 2009).

DO measurements demonstrated that the Okanogan River and the forebay of Wells Dam were in compliance with WQS. Project effects on DO concentrations in the Okanogan River were not evident as incoming water quality closely resembled that of the inundated portions of the Okanogan River. Changes in background minimum DO levels at Malott (above Project boundary) have a strong and significant linear relationship ( $P < 0.0001$ ) with minimum values recorded within Project boundaries at both Monse and the Highway 97 Bridge. These results indicate that there is no statistically significant difference between minimum DO measurements collected above the Project and within the Project. DO concentrations in the forebay of Wells Dam remained well above the minimum numeric water quality criterion, excluding an instrument-related malfunction observed in early October (Parametrix, Inc. 2009).

Only on one occasion did pH within the Project exceed background measurements, but only by 0.06 units, well within the water quality allowance for human caused conditions. These results indicate that pH measurements within the Project boundary are well within the numeric criteria for WQS (Parametrix, Inc. 2009).

It is not clear what effect, if any, the Wells Project may have had on turbidity. Elevated turbidity values appeared to coincide with snowmelt and precipitation causing increased river flow. Turbidity levels in the Okanogan River above the Project (at Malott) were inconsistent with readings collected at both Monse (5 of 122 comparable days, or 4%) and Highway 97 (8 of 165 comparable days, or 5%), suggesting that such events are not widespread or persistent within the Wells Project (Parametrix, Inc. 2009). In 2009, Douglas contracted Columbia Basin Environmental to continue monitoring turbidity for an additional year. Results from the 2009 field season indicate that turbidity decreases from the background monitoring location (Malott, RM 17.0), to both Monse (RM 5.0) and the Highway 97 Bridge (RM 1.3). No exceedances were observed and the data showed that the Wells Project is in compliance with the Washington State water quality standards for turbidity (DCPUD and CBE 2009).

### 2.3.5 Summary of Compliance with WQS

Based on the Initial and Updated Study Reports the Aquatic SWG was able to determine that waters within the Wells Project currently meet state numeric criteria of WQS as defined in Chapter 173-201A WAC. The following table presents supporting studies, by standard:

Standard	Studies	Result(s)	Continued Monitoring
TDG	Politano et al. 2008, 2009a, 2009b.	Compliance met under preferred operating conditions and standard compliance scenario.	Yes
Temperature	West Consultants, Inc. 2008	Compliance met, zero exceedances. Potential future TMDL.	Yes
DO	Parametrix, Inc. 2009	Compliance met, zero exceedances	No
pH	Parametrix, Inc. 2009	Compliance met, zero exceedances	No
Turbidity	Parametrix, Inc. 2009; DCPUD and CBE 2009.	Compliance met, zero exceedances	No

## 3.0 GOAL AND OBJECTIVES

The goal of the WQMP is to protect the quality of the surface waters affected by the Project with regard to the numeric criteria. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Douglas, in collaboration with the Aquatic SWG, has agreed to implement measures in support of the WQMP. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State WQS, Chapter 173-201A WAC. The measures presented within the WQMP (Section 4.0) are designed to meet the following objectives:

Objective 1: Maintain compliance with state WQS for TDG. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

The WQMP is intended to be compatible with other water quality management plans in the Columbia River mainstem, including TMDLs. Furthermore, the WQMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Aquatic Nuisance Species Management Plan through the protection of designated uses (WAC 173-201A-600) in Project waters. The WQMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

The schedule for implementation of specific measures within the WQMP is based on the best information available at the time the Plan was developed. As new information becomes available, the measures proposed in the WQMP may be adjusted through consultation with the Aquatic SWG.

## **4.0 WATER QUALITY MEASURES**

In order to fulfill the goals and objectives described in Section 3.0, Douglas, in consultation with the Aquatic SWG, has agreed to implement the following measures.

### **4.1 TDG Compliance (Objective 1)**

#### **4.1.1 Monitoring**

Douglas shall continue to maintain fixed monitoring stations in the forebay and tailrace area of Wells Dam to monitor TDG and barometric pressure. TDG will be monitored hourly during the fish spill season each year. Data from the Wells forebay and tailrace stations will be transmitted on a daily basis to the applicable web-accessible database used by Ecology and regional fish management agencies. Douglas shall maintain this monitoring program consistent with activities described in the then-current Wells Gas Abatement Plan (Section 4.1.3).



Douglas shall provide an annual report of all spill (and predicted TDG levels in the tailrace) occurring outside the fish passage season (currently October 1 to March 15).

#### **4.1.2 Spill Operations**

Within one year of issuance of the new license, Douglas shall coordinate the annual HCP Project Fish Bypass/Spill Operations Plan with the Aquatic SWG and the GAP, using best available information to minimize the production of TDG during periods of spill. All operations identified within the plan shall require the approval of the Wells HCP Coordinating Committee and the Aquatic SWG in order to ensure that spill operations are aimed at protecting designated uses and complying with the WQS numeric criteria for TDG in the Columbia River at the Project. In consultation with the Wells HCP Coordinating Committee and Aquatic SWG, the spill operations plan will be reviewed and updated, as necessary.

#### **4.1.3 Project Gas Abatement Plan and TDG Exemption**

Pending Ecology's approval of each subsequent GAP (which provides for the TDG exemption), Douglas shall continue to implement the activities identified within the previously-approved plan. Douglas shall submit the GAP to Ecology by February 28<sup>th</sup> of each year, or on a less frequent basis, as documented by Ecology in writing. Douglas shall submit the GAPs through the term of the new license or until no longer required by Ecology.

The GAP will include the Spill Operations Plan (Section 4.1.2) and will be accompanied by a fisheries management plan and physical and biological monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.

It is anticipated that: (1) the TDG monitoring activities described in Section 4.1.1 will be adequate for the physical monitoring plan requirement; and (2) the Wells HCP and Aquatic Resource Management Plans in the Aquatic Settlement Agreement with respect to fish passage will be adequate for fish management plans, for the purposes of the GAP. Additional biological monitoring studies for purposes of Gas Bubble Trauma Monitoring may be required.

Douglas shall provide an annual TDG report as required by the Ecology-approved GAP.

#### **4.1.4 Measures to Address Non-Compliance**

Douglas shall report all occurrences of non-compliance with TDG numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration.

If the Project is found to be consistently out of compliance with TDG at any time during the new license term, Douglas shall, in coordination with the Aquatic SWG, take the following steps:

(A) Evaluate any new reasonable and feasible technologies that have been developed; and

(B) After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

## **4.2 Water Temperature Compliance (Objective 2)**

### **4.2.1 Monitoring**

Douglas shall continue to monitor temperature at the Wells Dam forebay and tailrace in conjunction with its TDG monitoring program (currently April 1-September 15). Temperature data from the TDG monitoring program will be recorded hourly and reported daily to regional databases. Water temperatures shall also be monitored at all boundary conditions of the Project (Methow River RM 1.5, Okanogan River RM 10.5, and Columbia River RM 544.5) and in the Well Dam forebay and tailrace as required by the Aquatic SWG.

Douglas shall continue to collect hourly fish ladder temperatures 24 hours a day during the fish passage season (May 1 to November 15) at Pool No. 39 on the east ladder. Water temperatures shall also be monitored hourly in the auxiliary water supply system and near the east shore of the Wells Dam forebay (bottom, middle, and surface depths) during this same time period.

### **4.2.2 Temperature TMDL Development and Implementation**

Douglas shall participate in EPA Region 10's water temperature TMDL development for the U.S. portion of the Columbia River, in coordination with the Parties of the Aquatic SWG. Temperature data from the monitoring program at Wells Dam (Section 4.2.1) and software and results of the CE-QUAL-W2 model will be made available to EPA and other entities to assist in the development of the Columbia River temperature TMDL.

Where the measures identified in the TMDL are more protective than other measures in this plan, provisions of the temperature TMDL and implementation plans relevant to the Project and its operations, including specified time frames for implementing improvement measures, shall be implemented at the Project.

If a TMDL is not timely approved by EPA, Ecology may establish an allocation. In this case, Ecology will work with the Aquatic SWG and other interested parties to identify reasonable and feasible measures.

This plan does not exclude the option of the Aquatic SWG to consider modifying the water quality standard through a use attainability analysis or other process.

### **4.2.3 Measures to Address Non-Compliance**

Douglas shall report information indicative of non-compliance with water temperature immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. Such information may include changes in Project operations likely to increase water temperature or observations inconsistent with related environmental parameters.

If the Project is found to be consistently out of compliance with water temperature at any time during the new license term, Douglas shall, in coordination with the Aquatic SWG, take the following steps:

(A) Evaluate alternative Project operations or any new reasonable and feasible technologies that have been developed; and

(B) After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

### **4.3 Compliance with Other Numeric Criteria (Objective 3)**

Douglas shall report information indicative of non-compliance with other numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. This includes existing or developed criteria for toxic substances in water or sediments within Project Boundaries. The Aquatic SWG shall evaluate the information, and, if needed, require Douglas to develop a plan to identify and address Project-related impacts, if any.

After the evaluation, if no reasonable and feasible improvements have been identified, Douglas may propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

### **4.4 Spill Prevention and Control (Objective 4)**

#### **4.4.1 Spill Prevention and Control Requirements**

Douglas shall operate the Project in a manner that will minimize spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill. The Project Spill Prevention Control and Countermeasures Plan (SPCC) will be updated pursuant to FERC requirements and recommendations as provided by Ecology. Douglas shall comply with the updated version(s) of the SPCC.

#### **4.4.2 Participation in the Columbia and Snake River Spill Response Initiative**

Douglas shall continue participation in the Columbia and Snake River Spill Response Initiative (CSR-SRI). The CSR-SRI is a collaborative effort made up of local, state, and federal oil spill response community as well as members of industry and was developed to address the immediate need for oil spill preparedness and response in the area along the Columbia and Snake rivers. In addition to participation in the CSR-SRI, Douglas shall continue to operate the Project in accordance with its SPCC (Jacobs 2007).

#### **4.4.3 Inspections**

For the term or the new license, Douglas shall, upon reasonable notice, allow Ecology staff or representatives access to inspect the Project, including inside the dam, for the purpose of assessing Spill Prevention and Control measures and compliance with Section 4.4.1. Following inspection, Douglas shall address oil and hazardous material prevention and control issues identified by Ecology.

## **4.5 Regional Forums (Objective 5)**

### **4.5.1 Participation in Regional Water Quality Forums**

Douglas shall continue its participation in both the Water Quality Team and Adaptive Management Team meetings to address regional water quality issues, including sharing the results from monitoring, measuring, and evaluating water quality in the Wells Project. However, Douglas will not advocate for any water quality measures in regional forums without consulting with the Aquatic SWG.

### **4.5.2 Project Operations**

Douglas may, following notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with other mid-Columbia hydroelectric operations to the extent practicable. Coordinated operations are intended to reduce spill, increase generating efficiencies and thereby reduce the potential for exceedances of the TDG numeric criteria. These coordinated operations should be beneficial to TDG compliance and Aquatic Resources.

## **4.6 Reporting**

Douglas shall provide a draft annual report to the Aquatic SWG summarizing the previous year's water quality activities and activities proposed for the coming year, in accordance with the WQMP and as determined by the Aquatic SWG. The report will include any decisions, statements of agreement, evaluations, or changes made pursuant to this WQMP. If significant activity was not conducted in a given year, Douglas may prepare a memorandum providing an explanation of the circumstances in lieu of the annual report. A summary of monitoring results, any analyses and compliance with the WQS numeric criteria will be included in an appendix to the annual report.

### **4.6.1 Study Plans**

Douglas shall prepare study plan(s) that include quality assurance project plan(s) (QAPP) for each parameter to be monitored. The QAPPs shall follow the Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (July 2004 Ecology Publication Number 04-03-030) or its successor. The QAPPs shall contain, at a minimum, a list of parameter(s) to be monitored, a map of sampling locations, and descriptions of the purpose of the monitoring, sampling frequency, sampling procedures and equipment, analytical methods, quality control procedures, data handling and data assessment procedures and reporting protocols.

Douglas shall review and update the QAPPs annually based on a yearly review of data and data quality. Ecology may also require future revisions to the QAPP based on monitoring results, regulatory changes, changes in Project operations, and/or the requirements of TMDLs.

The initial QAPPs and any changes shall be submitted to the Aquatic SWG for review and are subject to approval by Ecology. Implementation of the monitoring program shall begin upon Ecology's written approval of the QAPP, unless otherwise provided by Ecology.

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