

Signed

**Water Resources Management Agreement for Lake Roosevelt
Between
The Confederated Tribes of the Colville Reservation
And
The State of Washington**

A. Introduction and Purpose

This is an Agreement between the Confederated Tribes of the Colville Reservation ("Colville Tribes" or "Tribes"), acting by and through its federally recognized governing body the Colville Business Council, and the State of Washington ("State"), acting by and through the Office of the Governor. The Tribes and State are the parties to this Agreement. The purpose of this Agreement is to implement the parties' Agreement In Principle ("AIP") for the Lake Roosevelt Component of the State's Columbia River Water Resources Program, as executed on January 4, 2005 and modified by the Addendum executed on November 9, 2005 and by Addendum No. 2 executed on December 22, 2006.

B. Background Facts and Issues

As acknowledged in part in Section 1 of the AIP:

1. The Confederated Tribes of the Colville Reservation (Colville Tribes) has critical and fundamental sovereign and propriety interests in the upper mainstem Columbia River, as well as in Lake Roosevelt and in any activities that affect its operations.
2. The Executive Order of July 2, 1872, which established the Colville Reservation States that the Reservation is "bounded by" the Columbia and Okanogan Rivers. A subsequent agreement between the Colville Tribes and the United States, and a related Act of Congress stated that the southern and eastern boundary of the Colville Reservation is "in the middle of the channel of the Columbia River," and the western boundary is "in the Okanogan River." Agreement of May 9, 1891, and Act of July 1, 1892, 27 Stat. 62. Based on various federal executive orders, agreements, legislation, and legal opinions (including the Executive Order of July 2, 1872 that established the Colville Reservation, the Agreement of May 9, 1891, the Act of July 1, 1892, and the Interior Department Solicitor's Opinion of June 3, 1974, M-36887, 84 Interior Dec. 72), the Colville Tribes has had a long-standing understanding of its ownership of the beds of the Columbia and Okanogan Rivers within these Reservation boundaries.
3. Nothing in this Agreement is intended to determine or settle the location of the boundaries of the Colville Reservation, and nothing in this Agreement shall be construed as recognizing or affecting the precise location of the boundary between the Spokane Indian Reservation and the Colville Reservation along the Columbia River.

4. The Colville Tribes is a major landowner along the upper Columbia River, including within current Reservation boundaries, and also acts as the primary manager and regulatory entity for lands within Reservation boundaries.
5. The Colville Tribes' traditional fishing territories include, but are not limited to, the Columbia and Okanogan Rivers from their confluence to the Canadian border.
6. Nothing in this Agreement is intended to determine or settle the location of the fishing territories of the Colville tribes.
7. The Colville Tribes has established significant water rights within the Reservation for consumptive and instream fisheries purposes, and asserts claims for analogous rights in the Reservation boundary waters. The Tribes seeks to protect, conserve, develop, and administer those rights for present and future purposes.
8. The impoundment of Lake Roosevelt has had significant, long-term effects on the culture, resources, and economy of the Colville Tribes, both upstream and downstream from Grand Coulee Dam.
9. The Colville Tribes' federally protected fishing rights within the Reservation and former North Half thereof include, but are not limited to, the right to harvest a fair share of Upper Columbia River (UCR) salmon and steelhead originating from the Reservation, the North Half, and all boundary waters thereof, and the right to manage tribal fisheries on the Colville Reservation and the North Half. UCR steelhead and Spring Chinook salmon are listed as endangered under the Endangered Species Act (ESA) and have the greatest survival and recovery gaps of any Columbia River runs listed under the ESA. The Tribes and the State have a common interest in promoting the recovery of listed UCR anadromous fish.
10. The State of Washington (State) is seeking to implement an agreement with the United States Bureau of Reclamation to make water available below Grand Coulee Dam during certain critical months (April through August) to improve streamflows for out-migrating juvenile anadromous fish and to provide water rights for new consumptive uses by drawing down Lake Roosevelt; and,
11. The State is aggressively pursuing other new sources of water supplies in the Columbia River Basin, including conservation, conjunctive uses of ground and surface waters, aquifer storage and recovery, acquisition, alternative management of existing storage, and new physical storage facilities.
12. The enactment of Engrossed Substitute House Bill 2860 (RCW 90.90) in 2006 created a framework for developing and sharing the benefits of a new water supply program within the State's portion of the Columbia Basin;

13. The Colville Tribes and the State share an interest in a collaborative and constructive, long-term relationship that ensures the River's resources are managed to the benefit of all citizens.

C. Terms of Agreement

The Colville Tribes and the State, as the parties hereto, enter into this binding Agreement in full recognition and understanding of the following mutual commitments and conditions:

1. The State's Proposed New Incremental Storage Release from Lake Roosevelt and Terms of the Tribe's Support

a. The State's Proposed New Incremental Storage Release from Lake Roosevelt

The State will attempt to contract with the U.S. Bureau of Reclamation to provide an initial supply of water for the Columbia River Water Management Program (CRWMP) through a new incremental storage release from Lake Roosevelt in the amount of approximately 82,500 acre feet (AF) in a year in all years and to a maximum of 132,500 AF in years of significant drought, as have occurred every 26 years on average in the past ("CRWMP incremental storage release"). A year of significant drought is defined as when the March 1 forecast of April-September runoff at The Dalles, Oregon (as published by the National Weather Service in Water Supply Outlook for the Western United States) is 60 million acre feet or less. Such new incremental storage release would result in lowering of Lake Roosevelt elevations by 1.0 foot to 1.80 feet (corresponding to the 82,500 AF and 132,500 AF volumes referred to above) below levels of the benchmark of existing operations. For purposes of this Agreement, existing operations benchmark levels are 1280 feet elevation in the wettest 50% of water years and 1278 feet elevation in the driest 50% of water years, as set forth in the August 2007 Proposed Action, Biological Assessment, and Reasonable and Prudent Alternative prepared by the federal action agencies for the FCRPS Biological Opinion, in collaboration with the Colville Tribes and the State, Appendix B, Attachment B.1-4, ("2007 RPA," which is attached hereto as Exhibit A), at p. B.1-4-6. Under this proposal, reservoir elevations would return to elevations not affected by the CRWMP incremental storage release by September 30 of each year. Through the CRWMP, the State proposes to develop a long-term water supply to reduce the CRWMP incremental storage release from Lake Roosevelt in an effort to keep it from becoming permanent.

b. Tribes' Support for Incremental Storage Release

The State desires the Colville Tribes' support for the CRWMP incremental storage release, and this Agreement sets forth the terms under which the Colville Tribes shall provide such support.

c. Agreement Not a Sale or Other Transfer of Colville Tribes' Water Rights or Claims

Nothing in this Agreement shall be construed as a sale, lease, assignment or any other type of transfer of any of the water rights of the Colville Tribes to the State of Washington or any other party. This Agreement does not diminish in any way the water rights of the Colville Tribes, nor does it limit, waive, or affect in any way the Tribes' water rights claims, now or in the future.

d. State Not to Seek or Support Further Incremental Storage Releases

For the duration of this Agreement, the State will neither seek nor support further incremental storage releases from Lake Roosevelt for any purpose except, upon consultation with the Colville Tribes, in cases of public safety emergency. In addition, the State will make every reasonable effort to secure Lake Roosevelt operations modifications that minimize the effects of the CRWMP incremental storage release on the Lake and the Colville Tribes, and to secure a long-term water supply from one or more sources to replace the CRWMP incremental storage release from Lake Roosevelt. The parties will work to define the CRWMP incremental storage release in terms of specific reservoir levels and specific operational practices that will be conducted to meet these levels.

2. Mitigation

a. Mitigation Evaluations

For the purposes of this agreement the 2000 Biological Opinion ("BiOp") issued by NOAA provided a benchmark reservoir elevation level from which to measure potential reservoir level draw down impacts on the Colville Tribes. The benchmark level is set forth in the 2007 RPA, Exhibit A hereto and referred to in Section C.1 a of this Agreement. Both parties understand that this bench mark is likely to vary because changes in the BiOp are currently being proposed and the U.S. Bureau of Reclamation (BOR) is in the process of modeling withdrawals from Lake Roosevelt in conjunction with the Odessa Sub Area project and other uses. By entering into this Agreement the Tribes does not express any position on new allocations of water by BOR to the Odessa Sub Area beyond the 30,000 AF allocated thereto by the State's proposal for the incremental storage release, as shown in the 2007 RPA, Exhibit A hereto at p. B.1-4-5.

The Colville Tribes, with the financial assistance of the State, has evaluated the impacts that the incremental storage release proposed by the State will have on Lake Roosevelt, and the mitigation provisions of this section are based on those evaluations.

b. Resident Fisheries Mitigation

The State agrees to provide funding by July 1, 2008, on a one-time basis, in the amount of \$15 million for the design, construction and initial monitoring and evaluation

of pilot projects intended to mitigate for impacts of reservoir levels below 1278 feet elevation, allocated as follows: Barnaby Creek kokanee passage, \$250,000.00; artificial macrophyte placement, \$600,000.00; and floating spawning beds, \$300,000.00. Based on the results of the pilot projects, the State will work with the Tribes to support continued funding by the Bonneville Power Administration or other appropriate federal agency.

c. Funding for Gifford Ferry Ramp

The State agrees to support a federal appropriation to the United States Bureau of Indian Affairs for ongoing maintenance and repair of the Gifford Ferry ramp. In addition, the State agrees to support ongoing federal evaluations of a bridge at this location.

d. Cultural Resources Protection and Mitigation

The State agrees to provide funding by July 1, 2008 in the amount of \$150,000.00 to establish a fund from which the Tribes may draw for costs associated with culturally appropriate reburial of human remains inadvertently discovered or exposed along Lake Roosevelt due to the effects of the incremental storage releases described in section C.1.a of this Agreement, for costs of Traditional Cultural Properties studies along Lake Roosevelt, and related purposes. This funding is for an initial period of 10 years, and after 10 years the parties will review the uses of this fund and the adequacy of the amount in order to consider renewing for an additional 10 year period. The State is committed to providing funding for culturally appropriate reburial of human remains inadvertently discovered or exposed along Lake Roosevelt due to the effects of the incremental storage releases described in section C.1.a of this Agreement.

In addition, the State shall provide annual funding in the amount of \$20,000.00, beginning July 1, 2008, to ensure that tribal cultural resources are protected through additional archaeological monitoring and Archaeological Resources Protection Act patrols by tribal staff.

e. Recreation Resources

The State agrees to provide funding by July 1, 2008, on a one-time basis, in the amount of \$31,200.00 to cover the cost of replacing inadequate boat docks at tribal campgrounds on Lake Roosevelt.

f. Contaminated Sediments Mitigation

Both parties recognize that the completion of the Remedial Investigation/Feasibility Study (RIFS) currently evaluating toxic metal and organic pollution (dioxins, furans, PCBs) in Lake Roosevelt, eventual clean up activities arising out of the RIFS, and possible natural resources damage mitigation will take at least several more years. If it is determined that the CRWMP adversely impacts the

environment by re-entraining toxic pollutants into the air or water the State agrees to fund a working group, which it will form with the Tribe to develop mitigation measures. The State agrees to pursue funding for these mitigation measures along with the Tribes.

g. Hydro-Power Revenues

In order to implement Section 2.C of the AIP, which provides for mitigation of any adverse impacts to the Tribes' hydro-power revenues attributable to the incremental storage release described in section C.1.a of this Agreement, in accordance with a mutually acceptable manner of determining and compensating for said impacts, the parties agree that such impacts will be evaluated as the release is implemented to determine the net annual impacts to the Tribes' revenues of the actual, specific operating measures reflecting the magnitude and timing of releases and storage replacement in Lake Roosevelt. The parties will negotiate any mitigation that may be appropriate for adverse impacts to the extent they exceed positive impacts in any year in accordance with the procedures for amending this Agreement in section C.5.g below.

3. Partnership Package

a. Fisheries Enhancement Funding

The State will transfer \$500,000 per year to the Colville Tribes to enhance Reservation fisheries in Lake Roosevelt, Lake Rufus Woods, the Okanogan River, or other rivers, streams or lakes within the Reservation. Eligible uses of these funds may include, but are not limited to, the development or operation and maintenance of hatcheries, acclimation ponds, gauging stations, fishing sites or other projects related to fisheries enhancement needs deemed appropriate by the Colville Tribes. For projects occurring in or releasing fish into the boundary waters, the Colville Tribes will solicit input from the Washington Department of Fish and Wildlife in making decisions on how to use the funds. The Washington Department of Fish and Wildlife and the Colville Tribes will collaborate on the issuance of any necessary permits for funded projects. This payment to the Colville Tribes will commence July 1, 2008 and continue annually for the duration of this Agreement.

b. Water Resources Planning Funding

The State will transfer \$255,000 per year to the Colville Tribes to support ongoing, collaborative water resources planning activities on the Reservation and to create the capacity for the Colville Tribes to participate in the State's water supply development activities affecting the Columbia River. This payment to the Colville Tribes will be made on July 1, 2008 and annually thereafter for the duration of this agreement.

**c. Governmental Support and Economic Development Funding;
Cultural Resources Protection, Education, and Related Funding**

In order to directly share a portion of the benefits derived from the State's Columbia River water supply development activities with the Colville Tribes, the State will transfer to the Colville Tribes \$3.0 million on July 1, 2008, and \$2.85 million annually thereafter, beginning July 1, 2009, for the duration of this Agreement.

The funds provided on July 1, 2008 shall be used for bank stabilization for the Tribes' cultural site near Kettle Falls. Any funds not needed for that bank stabilization may be expended at the direction of the Colville Business Council for other cultural resources protection and mitigation, economic development, and governmental support as described in the following paragraph.

The funds provided for in this paragraph are intended to support long-term and strategic economic and governmental infrastructure development initiatives and for cultural resources protection and mitigation as determined by the Colville Business Council. Examples of contemplated uses include, but shall not be limited to: cultural resources protection and mitigation, establishing educational scholarships or reduced tuition programs for Colville tribal members at Washington State colleges and universities, land acquisition or consolidation, water infrastructure projects, electrical supply infrastructure, or for other economic development infrastructure investments deemed to further the long-term goals of the Colville Tribes. Consistent with Section 3.B of the AIP, it is agreed that these funds shall not be used for general or *per capita* distribution to individual tribal members.

4. Ongoing Government-to-Government Relationship

a. Okanogan River Flow, Habitat, and Storage Evaluation

The State will continue to work with the Colville Tribes, the United States, British Columbia, and Canada to improve habitat and flow conditions in the Okanogan River. To further this objective, the Colville Tribes will actively participate in the review of Similkameen River storage options, in part to evaluate the efficacy of storage to address habitat and flow conditions in the Okanogan River.

b. Tribal Participation in Discussions and Negotiations Regarding Reclamation Operations and for Access to Canadian Storage

The State will continue to advocate for the Colville Tribes to be directly represented in negotiations with Canada regarding the timing and purposes of water releases from Canadian facilities, including emerging discussions regarding the renewal of the Columbia River Treaty.

In addition, the Tribes and State will establish a process for discussion of operational issues that affect Lake Roosevelt and release of water for fisheries in the

mainstem Columbia River. Under the general policy of the CRWMP, it is understood that one-third of the incremental storage release will be allocated to outmigration flows for anadromous fish. Consistent with the parties' understandings with the federal action agencies regarding release of the fisheries flow portion of the new incremental storage release, as set forth in the 2007 RPA, Exhibit A hereto at p. B 1-4-6, in the driest 20% of water years, the State acknowledges that the fisheries flow water will be released during April-June to benefit the Upper Columbia River Evolutionarily Significant Units as defined by the National Oceanic and Atmospheric Administration -- Fisheries (steelhead and spring Chinook).

c. Federal Legislation

The Colville Tribes and the State will provide mutual support for any necessary Congressional authorization of or funding for operational provisions of this agreement, which may include, but not be limited to, the development of irrigation or other water development projects on the Colville Reservation concurrent with the provision of water supply for the Columbia River Basin Project in the Odessa subarea and feasibility analysis of offstream storage sites on the Colville Reservation concurrently with State investigations.

d. Adjustment for Inflation

All State funding commitments in this Agreement shall be adjusted for inflation annually based upon the Implicit Price Deflator provided by the State Office of Financial Management.

5. Other Provisions

a. Legislative Approval of Funding Commitments and Termination By Tribes

State funding commitments in this Agreement are subject to approval and ongoing funding by the Washington Legislature. Should the State legislature fail to approve the provisions of this Agreement by June 30, 2008, or act at any time to diminish the financial provisions established herein, the Colville Tribes may terminate this Agreement at its sole discretion 15 days after written notice to the State. Such written notice shall be sent to:

Director
Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Or by facsimile to (360) 407-6989.

b. Termination by State

If the Colville Tribes take action of any kind to prevent the CRWMP incremental storage release pursuant to paragraph 1, the State may terminate this Agreement at its sole discretion 15 days after written notice to the Colville Tribes. Such written notice shall be sent to:

Chair, Colville Business Council
Colville Confederated Tribes
P.O. Box 150
Nespelem, WA 99155

Or by facsimile to (509) 634-4116.

c. Effective Date and Duration

This Agreement shall be in effect from the date of the last signature on the Agreement ("effective date") until the State and the Colville Tribes mutually agree to terminate it, or until there has been no incremental storage release used by the State pursuant to paragraph 1 of this Agreement for 2 consecutive years and the State notifies the Tribes that it intends to discontinue the incremental storage release, or a party terminates the Agreement pursuant to paragraphs C.5 a or C.5 b, or the State secures replacement water for the CRWMP incremental storage release, whichever is earlier.

The one-time-only payments pursuant to paragraphs C.2.b, C.2.d, and C.2.e shall be contingent on the State and the U.S. Bureau of Reclamation ("BOR") first either entering into a contract after the date of this Agreement for the provision of an initial supply of water through a CRWMP incremental storage release, as contemplated in paragraph C.1.a of this Agreement, or the State issuing a secondary use permit to the BOR, whichever is earlier. These one-time only payments shall be made on the on the later of the two following dates: (1) July 1, 2008, or (2) not later than two months after the earlier of the date the State and the BOR enter into such a contract, or the State issues a secondary use permit to the BOR.

d. Communications

Except as provided regarding notice of termination in paragraphs C.5.a and C.5.b, the program manager for each of the parties shall be responsible for and shall be the contact person for all communications and billings regarding the performance of this Agreement. A party whose Program Manager or address has changed will provide written notice of such change to the other party within 30 days of the change.

The Program Manager for the State is:

Water Resources Program Manager
Department of Ecology

Olympia, Washington 98504-7600

The Program Manager for the Colville Tribes is:

Natural Resources Director
Colville Confederated Tribes
P.O. Box 150
Nespelem, WA 99155

e. Dispute Resolution

In the case of any dispute and at the written request of a party, each party will appoint, within 10 calendar days of receipt of the written request, a knowledgeable, responsible representative to meet and negotiate in good faith to resolve any dispute arising under this Agreement. The location, form, frequency, duration, and conclusion of these discussions will be left to the discretion of the representatives. Upon agreement of both parties, the representatives may utilize other alternative dispute resolution procedures such as mediation or binding arbitration. To the extent permitted under existing law, the parties may agree on venue for any adjudication of an arbitration decision.

f. Costs, Attorneys Fees, and Damages

Each Party is responsible for the Party's own costs and attorney's fees in connection with this case and any dispute related to the proper interpretation or implementation of this Agreement. No damages may be awarded to either party due to failure to perform any obligation under this Agreement.

g. Amendment of Agreement

This Agreement may be amended at any time by mutual agreement of the State and the Colville Tribes. Such amendments shall not be binding unless they are in writing and signed by personnel authorized to bind each of the parties. No alteration or modification of any term of this Agreement shall be valid unless made in writing and signed by personnel authorized to bind each of the parties. The State and the Colville Tribes agree to meet and confer concerning whether any amendments are appropriate and desirable at least every ten years, beginning September 1, 2018.

h. Entire Agreement

This Agreement constitutes the entire agreement between the State and the Colville Tribes, and supersedes all previous written or oral agreements between them. No other understandings, oral or otherwise, regarding the subject matter of this Agreement shall be deemed to exist or to bind the State or the Colville Tribes. However, the State and the Colville Tribes may enter into other stand-alone agreements on specific subjects. All such agreements shall be in writing and signed by the parties.

i. Successors and Assigns

This Agreement and each of the terms, provisions, conditions and covenants hereof shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns. The above notwithstanding, none of the rights or duties hereunder may be assigned by either party without the written consent of the other party.

j. Authority to Execute

Each signer for the State and the Colville Tribes, by executing this Agreement, represents and states that the signer has taken the necessary administrative and legal actions to procure the actual authority to bind the signer's principal.

k. Principle of Construction

This Agreement has been prepared jointly by the State and the Colville Tribes following negotiations between them. The State and the Colville Tribes were represented by legal counsel of their choosing. It shall be construed according to its terms and not for or against the State or the Colville Tribes.

l. Governing Law and Venue

This Agreement shall be governed by the laws of the United States, the State of Washington, and the Confederated Tribes of the Colville Reservation. The venue of any arbitration shall be at a mutually agreeable location.

m. Liability

Each party shall be responsible for the actions and inactions of itself and its own officers, employees, and agents acting within the scope of their authority.

6. Execution

EXECUTED this 17th day of December, 2007, by the Governor of the State of Washington and the Chairman of the Colville Business Council.


Christine O. Gregoire
Governor


Michael E. Marchand
Chairman

**Appendix B—Description of the Proposed Reasonable and Prudent Alternative
Section B.1—Operations for Flood Control, Irrigation, Navigation, and Power
Generation and Transmission**

**Attachment B.1-4
U.S. Bureau of Reclamation Storage Projects**

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ACRONYMS AND ABBREVIATIONS

AIP	Agreement In Principle
BiOp	Biological Opinion
BPA	Bonneville Power Administration
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CRWMP	Columbia River Water Management Program
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FEIS	Final Environmental Impact Statement
FELCC	Firm Energy Load Carrying Capacity
M&I	municipal and industrial
MOU	Memorandum of Understanding
MW	megawatt
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPPC	Northwest Power and Conservation Council
NWQA	National Water Quality Assessment
PUD	Public Utility District
Reclamation	U.S. Bureau of Reclamation
ROD	Record of Decision
RPA	Reasonable and Prudent Alternative
SEPA	State Environmental Policy Act
TMT	Technical Management Team
URC	upper rule curve
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VDL	Variable Draft Limit

1. GENERAL DESCRIPTION

The Bureau of Reclamation (Reclamation) operates two storage projects that function as part of the Federal Columbia River Power System (FCRPS). These two projects are the Columbia Basin Project and the Hungry Horse Project.

The Columbia Basin Project is a multipurpose development on the Upper Columbia River in central Washington. The major facilities of the Columbia Basin Project are Grand Coulee Dam and its impoundment, Lake Roosevelt, the Grand Coulee Powerplant complex, the pump/generating plant, Banks Lake, and Potholes Reservoir. In addition, the project includes a well-developed system of canals, dams, reservoirs, drains, wasteways, laterals, and other structures.

The Hungry Horse Project, on the South Fork of the Flathead River in northwestern Montana, is operated primarily for flood control and power generation as part of the FCRPS. The dam is situated in a deep, narrow canyon, approximately 5 miles southeast of the South Fork's confluence with the mainstem Flathead River. The project includes a dam, reservoir, powerplant, and switchyard. The project plays an important role in meeting the need for power in the Pacific Northwest and in providing a storage system for flood control.

2. AUTHORIZATION

Congress allocated funds for construction of Grand Coulee Dam under the National Industrial Recovery Act of June 16, 1933. The Columbia Basin Project was authorized by Congress through Public Law 74-409 on August 30, 1935, and reauthorized through Public Law 78-8, which brought the project under the provisions of the Reclamation Project Act of 1939. Units 7, 8, and 9 of the Right Powerplant were approved by the Secretary on January 5, 1949. Congress authorized the Third Powerplant through Public Law 89-448 on June 14, 1966, and Public Law 89-561 on September 7, 1966. The authorized project purposes include flood control, navigation, hydroelectric generation, irrigation, and other beneficial uses including fish and wildlife.

Congress authorized the construction of Hungry Horse Dam through Public Law 78-329 on June 5, 1944. The authorized purposes of the Hungry Horse Project are irrigation, flood control, navigation, streamflow regulation, hydroelectric generation, and other beneficial uses. The project's irrigation component has not been developed.

The projects described here are authorized, funded, or carried out by Reclamation by virtue of Congressional or Secretarial authorizations, Congressional appropriations, and contracts with Reclamation. Reclamation received authorization for each of its projects from either Congress or the Secretary of the Interior, who had authority under the 1902 Reclamation Act to approve construction after a finding of feasibility. The Congressional and Secretarial authorizations state the purposes to be served by each project. Congress has directed in the Reclamation laws that Reclamation enter into contracts with project water users. These contracts set out, among other things, Reclamation's obligations to store and deliver project water to irrigation districts, municipalities, and other entities. Additionally, the 1902 Reclamation Act requires that Reclamation comply with State law with regard to control, appropriation, use, and distribution of waters. Water can only be stored and delivered by a project for authorized purposes for which Reclamation has asserted or obtained a State water right in accordance with Section 8 of the Reclamation Act of 1902 and applicable Federal law. Reclamation must honor senior or prior water rights in storing and diverting project water. Conversely, project water is protected from diversion by junior appropriators by State watermasters. The active cooperation of the State water rights administrators is essential in ensuring that any water Reclamation delivers for flow augmentation or any other purpose reaches the targeted points of delivery.

3. AUTHORIZED PURPOSES

Congress authorized Reclamation to operate Grand Coulee Dam for the multiple purposes of flood control, navigation, generation of electricity, storage and delivery of water for irrigation, and other beneficial uses including fish and wildlife.

Grand Coulee Dam, the primary storage and diversion structure for the Columbia Basin Project, was constructed from 1933 to 1941 and modified from 1967 to 1974 and 1982 to 1988. Hydroelectric generating units were installed to supply electric power for the war effort. After the war, construction centered on the associated pumping plant and irrigation facilities.

The first irrigation water was delivered to about 5,400 acres in 1948 from the Pasco Pumping Plant on the Columbia River. In 1950, the Burbank Pumping Plant began delivering water to about 1,200 acres on the Snake River south of Pasco. In 1952, the Grand Coulee Pumping Plant began delivering irrigation water to about 66,000 acres. The original plans anticipated about 1.1 million irrigated acres. Current contract acreage is about 671,500 acres. These lands produce potatoes, sweet corn, onions, seed and other specialty crops, grapes, fruit, sugar beets, dry beans, grain, alfalfa hay, and ensilage crops.

The Grand Coulee Dam Powerplant complex consists of three powerhouses and 27 generating units, with a total generating capacity of 6,495 megawatts (MW). The average net generation of the Grand Coulee Powerplants from 2001 to 2006 was about 20 billion kilowatts, which is a large share of the power requirements of the Pacific Northwest. The third powerplant alone can produce enough energy to meet the needs of Portland, Oregon, and Seattle, Washington.

Hungry Horse Dam and Powerplant were constructed between 1948 and 1953. The dam creates a large reservoir by withholding water in times of heavy runoff to minimize downstream flooding. This stored water is released for power generation when the natural flow of the river is low. Downstream power benefits are of major importance since more than five times as much power can be produced from water releases downstream than is produced at Hungry Horse Powerplant.

The Hungry Horse Powerplant consists of four 107-MW generators with a total installed capacity of 428 MW. Current transmission limitations restrict generation to around 350 MW when Libby Dam on the Kootenai River is operating to full powerplant capacity and could potentially restrict generation even further in the future.

Summary information is presented for the two projects in Table 1.

Table 1. Reclamation Storage Projects Summary Information

Facility	Type of Facility	Year Completed	River	River Mile	Reservoir Name	Total Reservoir Capacity (million acre-feet)
Grand Coulee	Storage	1941 ^{1/}	Columbia	596.6	Franklin D. Roosevelt Lake (Lake Roosevelt)	10.1 ^{2/}
Hungry Horse	Storage	1953	South Fork of the Flathead River	5	Hungry Horse Reservoir	3.46

^{1/}Grand Coulee Dam was constructed from 1933 to 1941 and modified from 1967 to 1974 and 1982 to 1988.
^{2/}This total includes both Lake Roosevelt (9.4 million acre feet) and Banks Lake (0.7 million acre feet). Banks Lake is a re-regulating reservoir. Water is pumped from Lake Roosevelt to Banks Lake for irrigation delivery.

3.1 COLUMBIA BASIN PROJECT

Grand Coulee Dam is the primary storage and diversion structure for the Columbia Basin Project. The dam, the largest concrete structure ever constructed, is 550 feet high and 5,673 feet long. The dam was constructed from 1933 to 1941 and was modified from 1967 to 1975 by constructing a 1,170-foot-long and 210-foot-high forebay dam along the right abutment as part of the construction for the Third Powerplant. The lake elevation at minimum pool is 1208.0 feet; lake elevation at full pool is 1290.0 feet. Lake Roosevelt has a total storage capacity of 9.4 million acre-feet (5.2 million acre-feet of active space) and extends more than 150 miles upstream to the Canadian border. Reclamation operates Grand Coulee Dam in coordination with other projects in the Columbia River basin to provide system flood control space in Lake Roosevelt to control the flow of the Columbia River at The Dalles.

The Grand Coulee Powerplant complex consists of powerplants on the right and left sides of the spillway and the Third Powerplant on the right bank of the dam. The right and left powerplants have a total of 18 units of 125-MW capacity plus 3 units of 10-MW capacity for a total capacity of 2,280 MW. The third powerplant contains 3 units of 600-MW capacity and three units of 805-MW capacity for a total capacity of 4,215 MW.

The pump/generating plant on the left bank was designed to accommodate 12 pumping units to pump water from Lake Roosevelt to Banks Lake for irrigation delivery. Six pumps, each with a capacity of 1,600 cfs, were installed by 1951, 2 pump/generators with a pumping capacity of 1,605 cfs each and a generating capacity of 50 MW were installed in 1973, and 4 pump/generators units with a pumping capacity of 1,700 cfs each and a generating capacity of 53.5 MW were installed between 1983 and 1994. The pumping/generating plant lifts water to the 1.6-mile-long feeder canal that leads to Banks Lake. Elevation 1240 is an elevation of note because below it, Reclamation cannot meet the full pumping demand at the pumping plant.

Banks Lake, located in an old ice-age channel called the Grand Coulee, is a re-regulating reservoir. This 27-mile-long reservoir is formed by the North Dam, located about 2 miles southwest of Grand Coulee Dam, and the Dry Falls Dam, located about 29 miles south of Grand Coulee Dam. Banks Lake has an active storage capacity of 715,000 acre-feet, feeds water to the Main Canal, and provides water to operate the pump/generators in generation mode.

The irrigation season extends from about mid-March to November 1. About 2.7 million acre-feet are diverted annually for the irrigation of about 671,500 acres of land.

3.2 HUNGRY HORSE DAM

Facilities at the Hungry Horse Project include the dam, reservoir, and powerplant. The 564-foot-high dam is a variable-thickness concrete arch structure with a 2,115-foot-long crest. The hydraulic capacity of the powerplant is about 12,000 cfs if generating at full capacity. There are three hollow jet valves with a combined capacity of 13,980 cfs at elevation 3560.0 feet and a “glory hole” spillway with a capacity of 50,000 cfs at elevation 3565.0 feet. The total storage capacity of the reservoir is 3.5 million acre-feet.

The Hungry Horse Powerplant originally included four 71.25-MW generators (a total of 285 MW installed capacity). The capacity of the generators was up-rated from 70.25 MW each to 107 MW each in the 1990s, which increased the installed capacity from 285 MW to 428 MW. However, current transmission limitations restrict generation to around 350 MW when Libby Dam on the Kootenai River is operating to full powerplant capacity and could potentially restrict generation even further in the future. Columbia Falls Aluminum Company, when operating to full capacity, uses 350 MW of power. In 2001,

the plant reduced operations to 20 percent capacity¹. The transmission system was built with the assumption that power generated at Hungry Horse would be used locally so there is a limit on how much power can be transmitted out of the valley. When the aluminum plant was fully operational, little of the energy generated at Hungry Horse Dam had to be transmitted out of the valley. Now, with little of the power used locally and a limitation on what can be transmitted out of the valley, there could be a restriction on power generation.

In 1995, Reclamation installed a selective withdrawal system on all four unit penstock intakes. This system is used from June 1 to the end of October to increase the water discharge temperature to reduce the thermal shock for downstream fisheries and to increase aquatic insect communities for bull trout growth and reproduction.

4. PROJECT ACTIVITIES

4.1 COLUMBIA BASIN PROJECT

4.1.1 Operation and Maintenance

Reclamation operates and maintains all of the Columbia Basin Project's major facilities. The Quincy-Columbia Basin Irrigation District, East Columbia Basin Irrigation District, and South Columbia Basin Irrigation District operate and maintain all of the irrigation distribution facilities within their geographic areas.

Operations for the Columbia Basin Project primarily include:

- Storage in and release of water from Lake Roosevelt, Banks Lake, Billy Clapp Lake, Potholes Reservoir, Scooteny Reservoir, and Soda Lake
- Diversion of water at the Grand Coulee Pump/Generating Plant and subsequent diversions into the Main, West, East Low, and Potholes Canals
- Power generation at the Grand Coulee Left, Right, and Third Powerplants and the Pump/Generation Plant, and the provision of surplus power to Bonneville Power Administration (BPA) for marketing
- Routine maintenance of project facilities.

The section below on Grand Coulee Dam's multiple-purpose operations more fully describes the operations of Grand Coulee Dam and its associated facilities. Aside from operations of Grand Coulee Dam and flow augmentation from Banks Lake, Reclamation does not further coordinate the operation of the Columbia Basin Project with the FCRPS. Reclamation also incorporates by reference the standing operating procedures for Dry Falls, Grand Coulee, O'Sullivan, North, and Pinto dams; Soda Lake Dike; and the Grand Coulee powerplants, which more fully describe the physical facilities, operational criteria, and operating thresholds.

Operation and maintenance of the Columbia Basin Project outside of the FCRPS includes parts of four water management programs: the Quincy Groundwater Subarea Program, the use of conserved project surface water to replace existing deep well pumping from the Odessa aquifer, the 508-14 program, and a small part of the Columbia River Water Management Program.

¹ There is a temporary contract for 2007 that increases Columbia Falls Aluminum Company to 60 percent capacity, which raises the restriction at Hungry Horse to 400 MW. This contract may or may not be extended beyond 2007.

Quincy Groundwater Subarea Program – This ongoing program involves the use of groundwater artificially stored in the Quincy subarea as a result of project irrigation development and operation. Reclamation issues licenses for the use of this project groundwater. It does not involve any additional diversions from the Columbia River and does not impact return flows to the Columbia River since groundwater in the subarea flows to Potholes Reservoir.

East District Conserved Water Program – This program involves the use of a portion of conserved project water (through facility improvements) within the East Columbia Basin Irrigation District. The conserved water is allocated to replace deep well pumping in the Odessa subarea. The program does not involve any additional diversions from the Columbia River.

508-14 Program – This program involves Reclamation issuing licenses for groundwater pumping from project water supplies in the Franklin County portion of the groundwater area (as designated in Washington Administrative Code 508-14). This program does not involve any additional diversions of water from the Columbia River. The U.S. Geological Survey estimates the Columbia River flow reduction associated with this program to be equal to or less than 0.1 cfs.

Washington State's Columbia River Water Management Program (CRWMP): Early Actions - Lake Roosevelt Drawdown - The 2006 Washington State Legislature passed the Columbia River Water Resource Management Act (HB 2860) directing the Washington Department of Ecology (Ecology) to pursue development of new water supplies in the mainstem Columbia River, over the next 20 years, for both instream and out-of-stream uses. The new water supplies are to be developed through storage, conservation, improved management of existing facilities, voluntary regional water management agreements, water rights transfers and exchanges, and potentially increased access to Canadian storage. Consistent with advice provided by the National Academies of Science, Water Science and Technology Board, the intent of the statute and the program is to bind state allocation of new economic uses of water to concurrent actions that result in positive contributions to streamflows and salmon recovery during critical periods.

Ecology describes how it intends to implement the new legislation in a Final Programmatic Environmental Impact Statement (FEIS) for the CRWMP dated February 15, 2007 (2007 FEIS) that was prepared pursuant to the State Environmental Policy Act (SEPA). Three early implementation actions are also evaluated, two of which, a new Lake Roosevelt Drawdown and Potholes Reservoir Supplemental Feed Route, involve Reclamation cooperation.

In 2004, Reclamation entered into a Memorandum of Understanding (MOU) with the State of Washington and the Columbia Basin Project irrigation districts (the South Columbia Basin Irrigation District, the East Columbia Basin Irrigation District, and the Quincy-Columbia Basin Irrigation District). The MOU describes roles and expectations of those parties during conduct of the then anticipated CRWMP (known then as the Columbia River Initiative), and specifically contemplates the new Lake Roosevelt Drawdown. The MOU and subsequently the 2007 FEIS specifically describe the allocated use of the stored water as follows:

In non-drought years (wettest 96 percent of water years), 82,500 acre-feet will be provided as follows:

- 25,000 acre-feet of municipal/industrial (M&I) supply
- 30,000 acre-feet of irrigation water to replace ground water supply in the Odessa Subarea
- 27,500 acre-feet for streamflow enhancement downstream of Grand Coulee Dam

In drought years (driest 4 percent of water years when the March Final water supply forecast for April through September at The Dalles is less than 60 million acre-feet, statistically 1 in 26 years of record), an additional 50,000 acre-feet broken down as follows:

- 33,000 acre-feet for Columbia River mainstem interruptible water right holders
- 17,000 acre-feet for streamflow enhancement downstream of Grand Coulee Dam.

For any withdrawal from Lake Roosevelt, the CRWMP provides that one-third of the water would be available to supplement water for fish flows during the juvenile salmon migration periods (April through August period). This “no net loss plus 33 percent” formula delivers water below Grand Coulee Dam that would not be available under current operations to benefit ESA-listed fish anytime from April through August.

The current understanding of flow and survival is changing as is the evolutionarily significant unit (ESU) most in need of further flow management. Although past operations prioritized summer migrants, these priorities are changing. Ecology has indicated that in the driest 20 percent of water years, the water allocated for streamflow enhancement would be released in the April through June period. For the remainder of water years, the sovereigns’ governance process would identify the best use of the water such that it provides the maximum biological benefit to the ESUs most in need of survival improvement to ensure their survival and opportunity for recovery. This process would also address overall cost-effectiveness, and include an analysis of impacts on tribal interests in resident fish and cultural resources in Lake Roosevelt.

When implemented as described, the new CRWMP drawdown would result in a net increase to instream flows from McNary Dam during the April through August flow augmentation period. When used in the summer months, the increase in instream flows would be roughly 225 cfs average (corresponding to the 27,500 acre-feet listed above) in non-drought years and roughly 360 cfs average (44,500 acre-feet, which represents the sum of the 27,500 acre-feet and 17,000 acre-feet listed above) in drought years². However, the instream component of the new drawdown could also be utilized at any time from April through August. In the lowest 20 percent of water years, the fish flow enhancement will be provided in the April through June period to aid spring migrants, and in the rest of the years the water will be provided for the ESU most in need of survival improvements. This is a very small increase in stream flow; however, the purpose of the flow is to ensure that there is no flow reduction during the juvenile salmon migration period.

The proposed delivery would result in an additional drawdown of approximately 1-foot in non-drought years, and another 0.8 foot in drought years. Recent operations provided that during July-August, Lake Roosevelt may be drafted to elevation 1280 feet in the wettest 50 percent of water years, and to 1,278 feet in the driest 50 percent for flow augmentation. Therefore, when conjoined with recent operations, the new CRWMP drawdown would lower the end of August elevation to 1279 feet in the wettest 50 percent of water years, to elevation 1276.2 feet in the driest 4 percent of water years, and to elevation 1277 feet in the other years (between 4 percent driest and 50 percent wettest years). Computer models indicate that refill of Lake Roosevelt would not be affected by the implementation of this additional draft.

According to a 2005 Government-to-Government Agreement in Principle (AIP) between the State of Washington and the Confederated Tribes of the Colville Reservation, the reservoir space vacated by the new draft would be refilled by September 30th of each year to ensure access to spawning habitat for resident kokanee populations in Lake Roosevelt. This action would add to the reduction in September flow that occurs after the end of prescribed flow augmentation in August; however, this action is part of a

² Flow numbers may increase slightly due to return flows from M&I supply.

suite of actions in this Proposed Reasonable and Prudent Alternative (RPA), certain elements of which have the potential to offset this reduction.

In accordance with Section 24 of the 2004 MOU regarding ESA consultation, Reclamation proposes to implement the Lake Roosevelt drawdown as described above. This consultation is intended to cover only the Early Action - Lake Roosevelt Drawdown component of the CRWMP. Implementation of any non Lake Roosevelt drawdown program components will require separate ESA compliance at the appropriate time. Fundamental commitments made in the AIP, indicate that for the duration of the CRWMP, the State will not seek further drawdowns from Lake Roosevelt for use in meeting stream flow requirements or out-of-stream water supply needs along the mainstem of the Columbia River.

Section 23 of the 2004 MOU recognizes that the primary effects of the drawdown would be to Lake Roosevelt elevations and may affect the interests of the Confederated Tribes of the Colville Reservation and the Spokane Tribe of Indians (Tribes). Reclamation will not implement this drawdown unless the State of Washington has secured the concurrence of the Tribes and Reclamation has separately consulted with them on a Government-to-Government basis.

In addition, the State as well as Reclamation must comply with the State Environmental Policy Act (SEPA) and National Environmental Policy Act (NEPA). Finally, Reclamation would need to submit a water permit application for approval by and the State.

Actions Associated with the 2000 Biological Opinion Reasonable and Prudent Alternative (RPA) – Reclamation completed its investigation of listed salmon and steelhead use of project wasteways (RPA Action 37 from the 2000 Biological Opinion [BiOp]). A report was completed in April 2005, which concluded that there was only minimal use of the wasteways by spawning steelhead. The study goes on to say that, although steelhead did spawn in two of the wasteways, the systems do not offer abundant, suitable year-around habitat conditions that favor successful production of juvenile steelhead. Reclamation concluded that a barrier should be constructed to prevent steelhead from entering either DCCI or RB4C wasteways to force steelhead to spawn in more suitable habitat.

Reclamation will also continue its water quality monitoring of surface return flows through 2007 (RPA Action 39). A final report will follow. Although not part of RPA Action 39, Reclamation contracted with the U.S. Geological Survey (USGS) to conduct additional water quality monitoring in coordination with their ongoing National Water Quality Assessment (NWQA) program. Between July 2002 and October 2004, the USGS collected and analyzed water quality samples for pesticides from four irrigation return-flow drainage basins in the Columbia Basin Project. Of the 107 analytes of concern, 42 pesticides and 5 pesticide metabolites were detected. Of the 47 total detections, three insecticides and one herbicide exceeded benchmarks for the protection of aquatic life. A final report was completed in January 2006. Reclamation does not use any of the four analytes detected and does not have regulatory authority over the irrigation districts or irrigators, but will make the report available to those who do.

Drum Gate Maintenance – The standing operations program requires annual inspections and dam safety maintenance for the 11 Grand Coulee Dam 135-foot-long and 30-foot-high drum gates. Inspection and maintenance activities can only occur when the lake is operated at or below elevation 1255 feet for at least 6 weeks (but preferably 60 days) to provide safe working conditions. During extended droughts when flood control operations do not require the reservoir to draft below elevation 1255 feet for 6 weeks, a forced draft may be required to perform maintenance. This forced draft can reduce the chance of reaching the upper rule curve (URC) elevation by April 10 and reduce downstream flows during refill.

Maintenance on Facilities on and around Banks Lake – Banks Lake Equalizing Reservoir is located in the upper Grand Coulee and was built to store and supply irrigation water to the Columbia Basin Project.

Banks Lake is formed by the construction of two dams: North Dam, which is near Grand Coulee Dam; and Dry Falls Dam, which is at the south end of the reservoir. Water is pumped from Lake Roosevelt through a set of pumps and pump/generators up to the Feeder Canal, which then discharges into Banks Lake. Water is released for irrigation to the Columbia Basin Project from Banks Lake through a set of gates at the headworks of the Main Canal at Dry Falls Dam.

Historically, Banks Lake has been operated with water surface fluctuation of as much as 27 feet on an annual basis. Routine maintenance was generally coordinated within this annual cycle. Reclamation voluntarily changed this operation during the 1980s when facilities such as the Second Bacon Siphon and Tunnel and the third powerplant were completed. This increased the opportunity for recreation but reduced the opportunity to perform routine maintenance on project-reserved works. Now special operations have to be performed to do routine maintenance. Every 12 to 15 years or so Banks Lake will need to be drafted up to 35 feet to perform routine maintenance.

Reclamation would coordinate with other agencies, facilities etc. with interest around Banks Lake so that all could take advantage of the drawdown to perform any necessary maintenance activities. The full hydrologic effects of the maintenance operations would span two different water years with drawdown starting in August of the first water year, by shutting off the pumps from Lake Roosevelt and allowing irrigation withdrawals to draft the lake. This would result in a slight increase in flows at McNary during drawdown as water typically pumped to Banks Lake would be released from Lake Roosevelt during August. Banks Lake would be down by the end of irrigation season, around the end of October. Maintenance would be performed during the winter and would be completed by March 1. Refill would occur during the second water year and would be coordinated with BPA to take advantage of high flows and low power demand to refill Banks Lake by April 15. In most years, there would be no effect to the Columbia River flow objectives during refill of Banks Lake.

During low water years, refill of Banks Lake would occur based on in-season water management decisions. For modeling purposes, minimum flows through Hanford Reach were maintained causing a deeper draft of Lake Roosevelt from March 1 through April 30. This deeper draft (in 24 percent of the water years) resulted in a decrease of up to 4,800 cfs in the spring flow objectives during refill of Lake Roosevelt.

At this time there are no procedures developed that would forecast water supply prior to the first of January. As drawdown would need to be done from August through October it would need to be scheduled without prior knowledge of what the water supply forecast might be during refill. Every effort will be made to complete maintenance in a timely manner to allow time to refill with minimal effects on spring flows.

4.1.2 Grand Coulee Dam Multiple-Purpose Operations

Congress has authorized Reclamation to operate Grand Coulee Dam for the multiple purposes of flood control, navigation, generation of electricity, storage and delivery of water for irrigation, and other beneficial uses including fish and wildlife. Reclamation also operates the dam in coordination with the Mid-Columbia Public Utility District (PUD) projects and other FCRPS facilities. Not only does Grand Coulee Dam's operation reflect multiple factors, such as water supply conditions, hydroelectric power generation requirements, and flow needs for fish, but the specific operating purposes also change from month to month and season to season. Reclamation seeks to balance the needs of the multiple purposes. This section discusses the general operating scheme for the project, by month and season.

4.1.2.1 Fall Operations, September through December

During the fall season, Reclamation's operating priorities are power generation and minimum flows for anadromous fish. Reclamation will attempt to refill Lake Roosevelt to a minimum elevation of 1283 by

the end of September to support resident fish in the reservoir. A significant start to refill typically occurs during Labor Day weekend as it is one of the lowest load periods of the year.

By the beginning of October, Reclamation will have refilled Lake Roosevelt to elevation 1283 or higher. Reclamation then operates Lake Roosevelt for two purposes: to augment flows for fish, if necessary, and to meet hydropower operational targets for these months (its portion of the Firm Energy Load Carrying Capacity, or FELCC). Reclamation limits any drafts for power to elevation 1283 in October, elevation 1275 in November, and elevation 1270 in December. The release of these flows provides spawning and incubation flows for lower Columbia River chum salmon and also spawning and protection flows for Hanford Reach fall Chinook salmon. Banks Lake is drafted to elevation 1565 during the month of August, which is 5 feet from full pool. During the fall months, Reclamation will coordinate with BPA to refill Banks Lake to its normal operating range between elevation 1568 and elevation 1570. The refill is done in a manner that avoids impacts to power generation or minimum flows for fish.

4.1.2.2 Winter Operations, January through March

During the winter season, Reclamation's operating priorities are flood control, power generation, and minimum flows for fish. Reclamation generally drafts Lake Roosevelt below the required flood control elevations to generate power. The limits to this winter power flexibility are set to provide an 85 percent probability of refilling to the URC on April 10, to increase stream flows for juvenile migration in the spring. The draft of Lake Roosevelt can help provide protection flows for Hanford Reach fall Chinook salmon redds and also augment flows below Bonneville Dam to provide protection to chum salmon redds. The U.S. Army Corps of Engineers (Corps) has established the Lake Roosevelt flood control rule curves, which include an adjustment that is based on the runoff forecast minus the space available upstream of The Dalles.

During these 3 months, Reclamation releases water while maintaining the reservoir elevation at or above the higher of two figures: the winter draft limits (elevation 1260 at the end of January, elevation 1250 at the end of February, and elevation 1240 at the end of March) or the Variable Draft Limit (VDL)³ for winter power flexibility. The VDL is set based on an assumed inflow volume that has an 85 percent probability of occurrence while still providing the required flows at Vernita Bar. The VDL is calculated each month after the official water supply forecasts and flood control elevations are issued. This winter power flexibility is an important tool that is used to meet the winter power demands in the northwest without affecting minimum fish flows or Reclamation's ability to be at the URC on April 10.⁴

Reclamation schedules drum gate maintenance during March, April, or May when the water surface elevation is typically well below elevation 1255 for at least 45 days and preferably 60 days (typical flood control operations usually provide this opportunity). In dry years with low water supply forecasts,

³ A VDL is a computed end-of-month elevation limit for drafting Grand Coulee Dam for the periods January, February, and March. The VDLs are used to provide winter power flexibility while maintaining an 85 percent probability of achieving refill of the project to its April 10 URC elevations (see April 10 URC definition). The VDLs have lower limits and are set at elevations 1,260 for January, 1,250 for February, and 1,240 for March. The only variables in the computation of the VDLs are the flood control elevation computed by the Corps, which is based on the water supply forecast and the space available in storage reservoirs upstream from The Dalles. The basic computation assumes an inflow that has an 85 percent probability of occurrence from which both the volume of upstream storage that must be filled and the volume needed to meet minimum flows at Vernita Bar are subtracted. The remainder is the volume available for winter power flexibility.

⁴ The flood control elevation is based on water supply forecasts. It is a common misconception that maintaining reservoirs at their flood control elevations from January through March would provide 100 percent probability of achieving refill to the April 10 URC. Modeling has shown that there is very little difference in the likelihood of achieving refill to April 10 URC between an operation that only drafts the project to URC or to meet the minimum flow requirements downstream and an operation that allows a measured draft for winter power flexibility.

Reclamation would typically not vacate as much flood control space, which would necessitate a forced draft to lower the water surface elevation to allow for the maintenance. Maintenance could be deferred in dry years based on the March final water supply forecast and criteria developed for in-season management, but would have to occur at least once in a 3-year period, twice in a 5-year period, and three times in a 7-year period. Maintenance would be done in emergency situations regardless of water conditions, and if during maintenance inspection, critical damage is discovered then the project may be drawn down for maintenance in the following water year regardless of water conditions. If critical damage is discovered then the draw down would extend until the damage is repair which could exceed 60 days. Criteria developed for in-season management decision making will be included in the Technical Management Team (TMT) Water Management Plan. Based on the above listed constraints forced drawdowns would occur in about 5 percent of years, deferred maintenance about 23 percent of years, and routine maintenance operations in about 72 percent of years.

4.1.2.3 Spring Operations, April through June

During the spring season, most of Grand Coulee Dam's authorized purposes come into play as Reclamation operates the facilities for flood control, power generation, spring flow augmentation for fish, and irrigation storage and delivery. During early and mid-spring, Reclamation operates Grand Coulee Dam primarily for flood control, flow augmentation for juvenile salmon and steelhead migration, and power generation; Reclamation then adds irrigation storage and delivery in mid-April. On April 30, Lake Roosevelt is typically at its lowest elevation to maintain adequate space to capture high flows to reduce downstream flooding. The reservoir's minimum pool is at elevation 1208.

If Lake Roosevelt is drafted below elevation 1240, numerous inundated cultural resource sites become exposed and susceptible to damage from wave action, vandalism, and looting. At this elevation, the Keller Ferry dock site must be moved, which adds 12 to 15 minutes travel each way. Also at elevations below 1240 feet, four of the pump/generators are out of service and cannot pump full irrigation demand to Banks Lake. At elevations below 1225 feet, the Inchelium Ferry, an important transportation connection for medical services, can no longer be operated. In the last 10 years, flood control operations have caused this to occur in 2 years (39 days in 1997 and 33 days in 1999), and power emergencies caused this to occur in 1 year (60 days in 2001). When the reservoir elevation approaches elevation 1226, Reclamation tries to avoid drops in elevation during the day that would put the ferry out of service and strand travelers.

As spring flows increase, Reclamation captures some of these flows to help refill the reservoir, and also releases flows to provide flow augmentation to help juvenile salmon and steelhead travel downstream. From April 30 through the end of May, Reclamation may draft Lake Roosevelt to the lower of flood control or elevation 1280 to support Priest Rapids and McNary flow augmentation targets.

Reclamation holds Columbia River water rights for about 2.7 million acre-feet to irrigate over 670,000 acres within the Columbia Basin Project. Reclamation pumps water from the Lake Roosevelt forebay to Banks Lake through six pumps and six pump/generators to supply the project's irrigation water. Lake Roosevelt must be at elevation 1240 by the end of May for the pumping plant to deliver full irrigation demand to Banks Lake. When Lake Roosevelt is below elevation 1240, four of the pump/generators are unavailable to deliver water to Banks Lake; when the lake is below elevation 1233, none of the pump/generators is able to deliver water. In years when the water surface elevation is not high enough to allow sufficient irrigation water delivery from Lake Roosevelt, Reclamation must draft Banks Lake water to meet irrigation demands and then replace this water when Lake Roosevelt is above elevation 1240.

By June 1, Reclamation attempts to have Lake Roosevelt at or about elevation 1265 to benefit the net pen program for rainbow trout, which must be released by this date to avoid diseases associated with warmer water. During the month of June, Reclamation will make releases to support the Priest Rapids and

McNary flow targets for salmon and steelhead. The reservoir is generally refilled by the end of the July 4 holiday weekend. The refill in May and June is generally accomplished to best provide the required flows in the mid-Columbia River.

During spring or early summer in higher water years when required releases exceed the power demand, water has to be spilled (bypass the turbines) at some of the Columbia and Snake River powerplants. A spill priority list has been established to guide operators on how to operate during high flows. Grand Coulee Dam is low on the spill priority list. Above elevation 1260 at Lake Roosevelt, water can be spilled over the spillway, below elevation 1260 water must be spilled through the low-level outlet works. Reclamation tries to avoid spilling water when the reservoir is below elevation 1260 because spilling through the low-level outlet works causes significant gas problems. The Corps is installing flow deflectors at Chief Joseph Dam (to be completed in 2008), the next dam downstream from Grand Coulee, to further reduce the generation of gas at the dam. When this work is completed, Reclamation will transfer as much spill as possible to Chief Joseph Dam when Lake Roosevelt falls below elevation 1260, and Chief Joseph Dam will transfer generation to Grand Coulee. If water must be released through the outlets, then it is released evenly through the upper and lower gates. If only two gates are required, then an upper gate and the lower gate immediately below it will be used (and not two side-by-side gates). Involuntary spill operations typically only occur during flood control operations in the spring and early summer from about April into early July.

When Lake Roosevelt is above elevation 1260, Grand Coulee will spill water evenly across the 11 spillway gates, which can reduce gas up to a certain point.

4.1.2.4 Summer Operations, July through August

During the summer season, Reclamation's operating priorities are irrigation, augmentation for fish, and power generation. In July and August, Reclamation continues to supply irrigation water to Banks Lake for the Columbia Basin Project. In August, Reclamation will reduce pumping to Banks Lake and allow the reservoir to sag 5 feet to elevation 1265.

Reclamation will draft Lake Roosevelt to as low as elevation 1278 to support Priest Rapids and McNary flow augmentation targets. If the July final forecasted runoff volume for the April through August period at The Dalles is less than 92 million acre-feet, the draft limit is elevation 1278; otherwise, the draft limit is elevation 1280. During the summer flow augmentation period, Reclamation will release no more water from Lake Roosevelt than necessary to meet the McNary flow objective.

4.1.2.5 Daily Operations

The above sections describe how Reclamation operates Grand Coulee Dam across months and seasons to meet a variety of authorized purposes. Reclamation's daily operations also show how Reclamation meets the multiple purposes of power generation, safety, and resource protection while shaping flows to benefit anadromous fish.

Reclamation's hourly coordination on regional power generation can cause releases from Grand Coulee to vary widely during the day. The Mid-Columbia projects, Chief Joseph Dam, and Grand Coulee Dam are operated as one system to provide the reliability required to meet the regional power demand. Reclamation also operates Grand Coulee Dam to meet peaking operations so it runs high during heavy load hours and could be shut back to almost no flow during light load hours.

Reclamation limits the draft of Lake Roosevelt to 1.5 feet measured on a rolling 24-hour period to preserve reservoir bank stability. During BPA-declared emergencies, draft rates can be as high as 2 feet per day but only after BPA has clearly demonstrated that all other reasonable actions have been taken to

meet the emergency. During these situations, Reclamation requires aerial or ground inspections of the shoreline to determine the potential for landslides.

Grand Coulee Dam also has limits to the minimum tailbay elevation and hourly tailbay drawdown rates to maintain the river banks' stability. The allowable minimum tailbay elevation is the higher of the average tailbay elevation for the previous 24 hours minus 11 feet; the average tailbay elevation for the previous 5 days minus 11 feet; or elevation 951. If either the 24-hour average or the 5-day average exceeds elevation 966 for 5 consecutive days, then 10 feet will be subtracted rather than 11 feet. The tailbay hourly drawdown limit is 5 feet per hour above elevation 962; 4 feet per hour between elevation 957 and 962; 3 feet per hour between elevation 953 and 957, and 2 feet per hour between elevation 951 and 953.

Although there are no flow restrictions at Grand Coulee Dam to reduce gas levels, there are priorities for how the water is released. The first priority is to generate power. If no power is needed, then the second priority is to operate units at speed-no-load. If releases are in excess of the powerplant capacity, then the water is released in the following order:

1. If the water elevation is above 1260 feet, Reclamation releases the water evenly across the 11 spillway gates.
2. If the water surface elevation is below elevation 1260, Reclamation seeks a generation swap with Chief Joseph Dam (as described above). This allows additional generation at Grand Coulee and addition spill from Chief Joseph Dam. This is advantageous because spilling at Chief Joseph Dam generates much less total dissolved gas than spilling through the low-level outlets at Grand Coulee Dam. The Corps is working to install flow deflectors at Chief Joseph Dam (to be completed in 2008) that would further reduce the generation of gas at the dam; when this work is completed, Reclamation will transfer as much spill as possible to Chief Joseph Dam when Lake Roosevelt falls below elevation 1260.
3. If water is to be released through the outlets, then it is released evenly through the upper and lower gates. If only two gates are required, then an upper gate and the lower gate immediately below will be used (and not two side-by-side gates).

4.1.3 Related ESA Consultations

In 2000, the U.S. Fish and Wildlife Service (USFWS) provided a BiOp for FCRPS effects to Columbia Basin bull trout and Kootenai River white sturgeon. The preceding discussion includes measures from this consultation that Reclamation implements to benefit resident listed species.

4.2 HUNGRY HORSE PROJECT

4.2.1 Operation and Maintenance

Reclamation operates and maintains all of the project's major facilities. Operations for the Hungry Horse Project primarily include:

- Storage in and release of water from Hungry Horse Reservoir
- Power generation at the Hungry Horse Powerplant
- Routine maintenance of project facilities.

The following discussion more fully describes the operations of Hungry Horse Dam and its associated facilities. Reclamation also incorporates by reference the standing operating procedures for Hungry

Horse Dam, which more fully describes the physical facilities, operational criteria, and operating thresholds.

4.2.2 Hungry Horse Dam Multiple-Purpose Operations

Congress has authorized Reclamation to operate Hungry Horse Dam for the multiple purposes of irrigation, flood control, navigation, streamflow regulation, hydroelectric generation, and other beneficial uses. Reclamation also operates the dam in coordination with other FCRPS facilities. Not only does Hungry Horse Dam's operating range reflect variability in multiple affecting factors, such as water supply condition, hydroelectric power generation requirements, and flow needs for downstream anadromous and resident fish, but the specific operating purposes also change from month to month and season to season. This section discusses the general operating scheme for the project, by month and season.

4.2.2.1 Fall Operations, September through December

During the fall season, Reclamation has two operating priorities: minimum flows at Columbia Falls for fish and flood control. The Action Agencies propose to implement the Northwest Power and Conservation Council's (NPPC) 2003 mainstem amendments on an interim basis to analyze impacts to both resident and anadromous fish from this operation. After a 3-year study, a decision will be made concerning long-term implementation of the mainstem amendments. Under the mainstem amendments Hungry Horse will be drafted to elevation 3550 feet by the end of September in all but the lowest 20 percent of years; in those 20 percent of years, the reservoir will be drafted to elevation 3540 feet by the end of September. Since implementation of the 2000 USFWS and National Marine Fisheries Service (NMFS) FCRPS BiOps, ramping rates, minimum flows and the need to meet refill dates have limited the power operations at Hungry Horse Dam. In many years, Hungry Horse Reservoir continues to draft throughout the fall to meet minimum flows at Columbia Falls and can be an additional 15 to 20 feet down by the end of December.

To provide local flood protection in wetter falls, the Corps has established flood control criteria for Hungry Horse Reservoir. The reservoir is required not to exceed elevation 3555.7 from October 31 through November 30 and elevation 3549.2 by December 31. Also in wetter years, Hungry Horse can be operated to help meet hydropower operational targets (its portion of the FELCC); however, Reclamation limits any drafts for power to the flood control elevation of 3549.2 by the end of December to maintain a 75 percent probability of being at the URC on April 10.

4.2.2.2 Winter Operations, January through March

During the winter season, Reclamation's operating priorities are flood control, minimum flows for resident listed fish, and power generation. Reclamation generally drafts Hungry Horse Reservoir below the required flood control elevations to meet minimum flow requirements at Columbia Falls for resident listed fish. In water years when minimum flows do not draft the reservoir below the required flood control elevations, there is some flexibility to operate for power generation. The limits to this winter power flexibility are set to provide a 75 percent probability of refilling to the URC on April 10. Hungry Horse operates to the VARQ (which is short for variable flow) flood control rule curves.⁵

During these 3 months, Reclamation releases water while maintaining the reservoir elevation at or between the VDL⁶ and the URC. The VDL is set based an assumed inflow volume that has a 75 percent

⁵ A FEIS has been completed for the Upper Columbia Alternative Flood Control and Fish Operations, which selected the VARQ operations as the preferred alternative; however, as a Record of Decision (ROD) has not been completed at this time, VARQ will continue to be implemented on an interim basis until such time as a ROD has been signed.

⁶ The variable draft limit is a computed end-of-month elevation limit for drafting Hungry Horse Dam for the periods January, February, and March. The VDLs are used to provide winter power flexibility while maintaining a 75 percent probability of achieving refill of the project to its April 10 URC elevation (see April 10 URC definition).

probability of occurrence while still providing the required flows at Columbia Falls. The VDL is calculated each month after the official water supply forecasts and flood control elevations are issued. This winter power flexibility is an important tool that is used to meet the winter power demands in the northwest without affecting minimum fish flows or Reclamation's ability to be at the URC on April 10.

4.2.2.3 Spring Operations, April through June

During early and mid-spring, Reclamation typically operates Hungry Horse Dam for flood control, power operations, and minimum flow requirements. On April 30, Hungry Horse Reservoir is typically at its lowest seasonal elevation in order to capture the high flows from spring runoff and to reduce downstream flooding.

Hungry Horse flood control rule curves are designed for both local and system flood control. For the system flood protection, Reclamation coordinates with the Corps of Engineers on when Hungry Horse Reservoir can begin refill in the spring. The Corps computes the initial control flow at The Dalles and estimates the day that control flow is expected to be reached. When unregulated flows at The Dalles are equal to the initial control flow, the reservoirs can start refill. Hungry Horse Reservoir can actually start refill 10 days prior to the date that the initial control flow is expected to be met.

As spring flows increase, Reclamation no longer needs to make releases to meet minimum flows at Columbia Falls but does have a minimum flow requirement below the project on the South Fork Flathead River. As flows in the mainstem Flathead River increase, Reclamation must balance refill of Hungry Horse while attempting to control flows at Columbia Falls at or below the flood stage of 14 feet (52,000 cfs). At the same time, Reclamation must limit spill (flows that bypass the power plant) from the project in order to maintain total dissolved gas below the State of Montana standard of 110 percent. With the current transmission limit in the valley, this sometimes requires delaying refill to the first week in July when inflows drop below what can be put through the generators either due to unit availability or transmission limitations. Hungry Horse may also be operated to be below the April 30 flood control point so that it can reduce the outflows during refill to prevent spills that would result in total dissolved gas above the limit.

Reclamation typically tries to refill Hungry Horse reservoir by June 30.

4.2.2.3 Summer Operations, July through August

During the summer season, Reclamation's operating priorities are augmentation for fish, and refill for resident fish.

In accordance with the mainstem amendments, Reclamation will draft Hungry Horse Reservoir to as low as elevation 3550 in the top 80 percent of water years and to elevation 3540 feet in the lowest 20 percent of water years to support Priest Rapids and McNary flow augmentation targets. Hungry Horse releases are calculated to either operate at a constant release from July through September or for gradually reduced outflows in an attempt to prevent "double peaking" below the project. As the natural flows recede on the

The only variable in the computation of the VDLs is the flood control elevations. The basic computation assumes an inflow that has a 75 percent probability of occurring. The volumes needed to meet minimum flows at the project and at Columbia Falls are subtracted from the assumed inflow. The remainder is the volume available for winter power flexibility. The minimum flow required at Columbia Falls is computed based on flows in the Middle and North Forks of the Flathead River that have a 75 percent probability of occurring.

The flood control elevations are computed based on water supply forecasts; however, minimum flow requirements often draft the reservoir below the computed flood control elevation. It is a common misconception that maintaining reservoirs at their flood control elevations in January through March would provide 100 percent probability of achieving refill to the April 10 URC. Modeling has shown that there is very little difference in the likelihood of achieving refill to April 10 URC between an operation that limits drafts to URC or minimum flow and an operation that allows a measured draft for winter power flexibility.

mainstem Flathead River, Hungry Horse outflows are set to fill in the recession. Occasionally, Reclamation will not “fill” Hungry Horse but will transition from flood control releases to flow augmentation releases; this prevents dropping outflows to a minimum (900 cfs) to fill then increasing at the start of flow augmentation.

4.2.2.4 Daily Operations

The above sections describe how Reclamation operates Hungry Horse Dam across months and seasons to meet a variety of authorized purposes. Reclamation’s daily operations also show how Reclamation meets the multiple purposes of power generation, resident fish operations, and local flood protection.

First, changes in Hungry Horse discharges are limited by ramping rates, as described in the 2000 USFWS FCRPS BiOp and Table 2. These ramping rates are based on flows in the Flathead River at Columbia Falls. These ramping rates protect bull trout and other fish from stranding.

Second, minimum releases set at Hungry Horse are determined by either the flow requirement below Hungry Horse or the flow requirement at Columbia Falls, depending on whichever one is greater. The minimum flows are calculated using the Hungry Horse inflow forecast and guidelines as set forth in the USFWS FCRPS BiOp and Table 3. The minimum flows at Hungry Horse and Columbia Falls are updated every month between January and March after the final inflow volume forecast for the month is issued. The March final forecast sets the minimum flows for the rest of the calendar year.

Table 2. Ramping Rate Guidelines at Hungry Horse Dam

Ramp Up Rates – Hungry Horse dam		
Flow Range (measured at Columbia Falls)	Ramp Up Unit (Daily Max)	Ramp Up Unit (Hourly Max)
3,500-6,000 cfs	Limit ramp up 1,800 cfs per day	1,000 cfs/hour
>6,000-8,000 cfs	Limit ramp up 1,800 cfs per day	1,000 cfs/hour
>8,000-10,000 cfs	Limit ramp up 3,600 cfs per day	1,800 cfs/hour
>10,000 cfs	No limit	1,800 cfs/hour
Ramp Down Rates		
Flow Range (measured at Columbia Falls)	Ramp Up Unit (Daily Max)	Ramp Up Unit (Hourly Max)
3,500-6,000 cfs	Limit ramp down to 600 cfs per day	600 cfs/hour
>6,000-8,000cfs	Limit ramp down to 1,000 cfs per day	600 cfs/hour
>8,000-12,000 cfs	Limit ramp down to 2,000 cfs per day	1,000 cfs/hour
>12,000 cfs	Limit ramp down to 5,000 cfs per day	1,800 cfs/hour

Table 3. Minimum Flows

At Hungry Horse Dam	
April through August Forecast	Minimum flow
>1,790 thousand acre feet (KAF)	900 cfs
<1,190 KAF	400 cfs
Between 1,190 KAF and 1,790 KAF	Linearly interpolated between 400 and 900 cfs
At Columbia Falls	
April through August Forecast	Minimum flow
>1,790 thousand acre feet (KAF)	3,500 cfs
<1,190 KAF	3,200 cfs
Between 1,190 KAF and 1,790 KAF	Linearly interpolated between 3,200 and 3,500 cfs.

Third, local flood control affects the daily operations at Hungry Horse. When flood control is required in the Flathead River above Flathead Lake, Hungry Horse Dam releases will be reduced to prevent the Flathead River at Columbia Falls from exceeding a stage of 14.0 feet (the official flood stage from the National Weather Service). Also, the zero damage level (level at which flood damages begin to occur) is listed at 14.0 feet in the Hungry Horse Dam Water Control Manual (Corps 2005). The outflow from Hungry Horse Reservoir should not exceed 300 cfs when the river stage is at or above 14.0 feet, or when a greater outflow would cause the river to rise above 14.0 feet at Columbia Falls.

There may be instances when Hungry Horse Dam has enough space to control the stage at Columbia Falls to below 14.0 feet. In those cases, reservoir operators will adjust outflows from Hungry Horse Dam as necessary (to a minimum discharge of 300 cfs) in order to maintain the Flathead River at Columbia Falls to a lower stage (generally starting at around 13.0 feet). The ability to control flows at Columbia Falls between 13 and 14 feet is dependent upon volume of runoff remaining, timing of flows, space remaining in the reservoir, and flows in the North and Middle Forks of the Flathead River.

4.2.3 Related ESA Consultations

In 2000, the USFWS provided a BiOp for FCRPS effects to Columbia Basin bull trout and Kootenai River white sturgeon. This action includes measures from this consultation (which include the minimum flows and ramp rates listed above) that Reclamation implements to benefit resident listed species.

REFERENCES

Corps (U.S. Army Corps of Engineers). 2005. Hungry Horse Dam and Reservoir Water Control Manual (Table 4-10 and Chart 4-6). Seattle District. June.