Appendix A.
Memorandum of Understanding Concerning the State of Washington's Columbia River Initiative

Memorandum of Understanding
Concerning the State of Washington's
Columbia River Initiative

PARTIES

This Memorandum of Understanding (MOU) is entered into between the State of Washington (State), acting through the state agencies which are signatories hereto; the Pacific Northwest Region of the U.S. Bureau of Reclamation (Reclamation); and the South Columbia Basin Irrigation District, the East Columbia Basin Irrigation District, and the Quincy-Columbia Basin Irrigation District (collectively, the Districts). The State, Reclamation, and the Districts are collectively referred to as the "parties" herein.

EFFECT

Section 1. This MOU is intended only to coordinate and facilitate cooperation between the parties to advance the actions described in this MOU and is not intended to and does not create a legally binding contract or any right or benefit, substantive or procedural, enforceable at law or in equity by any party against another party, its directors, officers, employees or other persons. This MOU does not constitute an explicit or implicit agreement by the parties to subject any of the parties to the jurisdiction of any federal or state court over and above any rights or procedures presently available to the parties. This MOU does not create any right or benefit, substantive or procedural, enforceable at law or in equity, by any person or entity against the parties. This MOU shall not be construed to create any right to judicial review involving the compliance or noncompliance of the parties with this MOU.

Section 2. Nothing in this MOU shall (a) result in any impairment to the existing water supplies or water rights for the Columbia Basin Project (Project), (b) result in an amendment or modification of the rights and obligations of the Districts and Reclamation under the existing Project repayment contracts, (c) affect the priority dates of any existing water rights, (d) impair the current operations of the Project, (e) impair or interfere with eventual completion of the Project as congressionally authorized, or (f) result in an increase in the Districts' construction cost obligations and operation and maintenance obligations under the existing Project repayment contracts.

PURPOSE AND OBJECTIVES

Section 3. The parties will use their best efforts in working collaboratively and in good faith to secure economic and environmental benefits from improved water management both within the federal Project and along the mainstem of the Columbia River by advancing the actions described in this MOU.

Section 4. Through the Columbia River Initiative (CRI), the State is developing a program for the mainstem of the Columbia River that will allow access to the river's water resources while

providing support for salmon recovery. The objectives of the CRI are to meet the water needs of growing communities and their rural and agricultural economies along the mainstem of the Columbia River, and to do so in a manner that reduces the risk to fish resulting from out-of-stream use of water. While the CRI is focused on the mainstem of the Columbia River, the State recognizes that there are important needs within the Project that remain unmet and that require and warrant increased attention and resources from the State. As established in state statute and state-based water rights, the parties hereby affirm their long-standing and mutual commitment to the Project as congressionally authorized.

MAINSTEM STORAGE PROGRAM

Section 5. The parties recognize the growing water needs of the region will require development and use of new water storage facilities that are properly designed, constructed and managed to meet both economic and environmental needs – including power production, municipal water supplies, irrigation development, and improved stream flows to assist salmon recovery.

Section 6. The parties will cooperate in initiating an appraisal level assessment of the potential to store additional water from the Columbia River mainstem, including an assessment of the costs and benefits of alternative water storage sites (the Storage Assessment). The State will be responsible for conducting the Storage Assessment with existing state funds. The State will, in consultation with other parties, develop a scope of work for the Storage Assessment by December 31, 2004. The State will also secure by February 28, 2005, a contractor to conduct the Storage Assessment. The State will request additional state funding for the Storage Assessment for the coming state fiscal biennium. Reclamation will participate in and support the Storage Assessment to the extent funding is available to it within its Washington Investigations budget line item in federal fiscal years 2005 and 2006, as determined by it.

Section 7. If and as warranted by the initial results of the Storage Assessment, the State and the Districts will propose by July 2005 federal legislation to authorize and fund a mainstem storage program, including feasibility studies by Reclamation for proposed storage projects; provided, however, the Districts may participate and support one or more of these feasibility studies, as they determine. By December 20, 2004, the State will submit a budget request to support the new mainstem storage program during the state 2005-2007 biennium to include funding for feasibility studies. Reclamation's position regarding the authorization and funding of the mainstem storage program and feasibility studies will be determined by the views of the Administration at the time Congress considers authorizing legislation and appropriations. If and as authorized by Congress, the State and Reclamation will negotiate and enter into one or more feasibility study contracts. If federal authorization is not secured by January 2006, the State will fund the initiation of one or more feasibility studies to evaluate potential new storage sites, while continuing to pursue federal authorization. By July 2006, the parties will develop a schedule of future milestones for the mainstem storage program.

Section 8. If and as warranted by the feasibility studies, the State and the Districts agree to pursue federal authorization of mainstem storage projects to be undertaken by Reclamation, with the State as local sponsor for the storage projects. As authorized and as necessary to support the

new mainstem storage program, or as specific storage projects are identified for feasibility studies, Reclamation and the State will work together to secure a new federal withdrawal of water from the mainstem pursuant to Chapter 90.40 RCW.

MAINSTEM DROUGHT RELIEF

Section 9. Reclamation and the State, acting through the Department of Ecology (Ecology), will use their best efforts to negotiate and enter into a contract by March 31, 2005 (the Drought Relief Contract), to make available up to 50,000 acre-feet from the Project storage rights from Lake Roosevelt for release into the Columbia River in any year in which the March 1 runoff forecast at the Dalles for April through September, as provided by the National Weather Service in their "Water Supply Outlook for the Western United States," is less than 60 MAF, and in which the Governor of the State of Washington makes a formal request in accordance with the Reclamation States Drought Relief Act of 1991 (P.L. 102-250) (the Drought Relief Act).

Section 10. The Drought Relief Contract, if entered into, will allow the use of the water to be made in accordance with applicable state and federal laws by existing water rights which divert from the Columbia River downstream of Grand Coulee Dam and to benefit fish in the Columbia River. Of the amount to be made available under the Drought Relief Contract, if entered into, up to 33,000 acre-feet would be made available for existing state-based water rights along the mainstem and up to 17,000 acre-feet would be made available for improving stream flows for fish during the drought. The Drought Relief Contract, if entered into, will be effective for a term not exceeding the maximum period authorized by law and will, as needed and if and when allowed by law, provide for renewal of the contract for a longer period of time.

Section 11. The parties acknowledge that the Drought Relief Act is set to expire on September 30, 2005, and that any subsequent renewals of the Drought Relief Contract, if entered into, will be contingent, in part, upon the Drought Relief Act being extended or otherwise reauthorized. The State and the Districts agree to seek and support favorable congressional action to extend or otherwise reauthorize the Drought Relief Act and to pursue authorization for drought relief contracts that could exceed the current two-year statutory limit. Reclamation's position will be determined by the views of the Administration at the time Congress considers any such extension, amendment or reauthorization. The State will request support for reauthorization of the Drought Relief Act from the Western States Water Council and the Western Governor's Association and will introduce federal legislation by no later than March 2005.

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Section 12. Reclamation and the State, acting through Ecology, will use their best efforts to negotiate and enter into a water service contract, in accordance with subsection 9(c) of the Reclamation Project Act of 1939 (53 Stat. 1187) by December 31, 2005 (the M&I Contract) to make available up to 37,500 acre-feet of water annually from the storage rights of the Project, of which up to 25,000 acre-feet would be available for municipal and industrial purposes and up to 12,500 acre-feet would be available to benefit stream flows and fish in the Columbia River. Most of this water would be delivered to the State by Reclamation in the Columbia River at the foot of Grand Coulee Dam, though a smaller portion of this water would be made available for

direct withdrawal from Lake Roosevelt. Under the terms of the M&I Contract, if entered into, the State would accept this water and place it into the state trust water rights program as a water right for instream flow purposes to serve as mitigation for new water rights to be issued to qualifying municipalities and industries along the Columbia River.

Section 13. The term of the M&I Contract, if entered into, will be as allowed under federal reclamation law and policy and may be renewed as provided by the Act of June 21, 1963 (77 Stat. 68) pertaining to the renewal of certain municipal, domestic, and industrial water supply contracts entered into under the Reclamation Project Act of 1939. Allocation of water under the M&I Contract shall be in increments of time and quantity based on satisfactory performance in meeting the terms and milestones provided for the Odessa Subarea in Section 14 of this MOU. Water allocated for a given increment will be made available for the duration of the M&I Contract, while the remaining portion of the unallocated water will remain subject to satisfactory performance under this MOU. The initial increment for the contract will be the period of January 2006 through December 2007. Thereafter, the increments will run for a six-year period, to align water supply decisions with the next increment of municipal growth as projected through municipal water supply plans required by state law. These timeframes may be amended by the parties during negotiation of the contract. Release of future increments of water is subject to performance deemed satisfactory by all parties to this MOU. A decision to limit access to water under the contract based on unsatisfactory performance shall not result in loss of water previously committed and distributed under the contract. The amount of water available during the initial increment shall be specified in the contract, and the amount of water available for future increments shall be based on projected municipal and industrial water supply needs.

ODESSA SUBAREA

Section 14. The parties will cooperate to support and pursue the diversion and delivery of an additional 30,000 acre-feet of water from Lake Roosevelt to the Odessa Subarea. In an effort to satisfy this objective, Reclamation will file by March 2005 an application with the State for a water right permit to divert 30,000 acre-feet of water from the federal withdrawal and storage rights for the Project to serve the Odessa Subarea. The State will process the application and issue a permit decision by September 2005. If the permit decision is challenged, the State commits to active and good faith defense of the permit, with assistance from Reclamation and the Districts, as appropriate. The goal is to make up to 30,000 acre-feet of water available to the Odessa Subarea no later than December 2006 for use during the 2007 irrigation season. Use of this water is limited to existing agricultural lands, with priority for use on lands currently irrigated under state ground water permits in areas where the Odessa aquifer is declining. Lands receiving water under this section which are also covered by state ground water permits shall not divert water under the permits. This water is separate from and in addition to other ongoing programs to deliver water within the Project.

Section 15. In addition to the quantity of water described in Section 14, the parties will cooperate to explore opportunities for delivery of water to additional existing agricultural lands within the Odessa Subarea. As opportunities become known, the State will seek state funding to cost share the potential development of infrastructure to deliver this water. Reclamation's

position regarding the future delivery of water under this section will be determined by the views of the Administration at the time.

Section 16. In addition, the State will conduct an appraisal level assessment of the potential to store additional water from the Columbia mainstem in the Odessa aquifer (the Odessa Assessment). Reclamation will participate in the Odessa Assessment to the extent funding is available in its Washington Investigations program. The Districts will assist in evaluating the infrastructure implications of delivering water to the aquifer.

POTHOLES RESERVOIR OPERATIONS

Section 17. The parties will cooperate in completing by March 2006 an appraisal level assessment of alternatives for managing Potholes Reservoir, including an alternative water feed route, changes in the storage rule curves, improving the water evacuation route, and evaluating potential solutions to the delivery constraints of the East Low Canal below Interstate 90 (the Potholes Assessment). The parties will cooperate to develop and execute a study contract to define and assign the remaining tasks of the Potholes Assessment. As part of the Potholes Assessment, Reclamation will initiate by January 2005 an appraisal level analysis of the hydrology of Potholes Reservoir and the implications of changes in the feed route, increased seasonal storage and flood evacuation. The State will request funding for its 2005-2007 biennium to complete the Potholes Assessment. Reclamation and the Districts will make available, subject to Reclamation security policies, studies and cost estimates previously prepared for the Potholes feed and evacuation routes, and for the improvements to the East Low Canal.

Section 18. The purpose of the Potholes Assessment is to determine whether changes in operations could secure additional benefits without jeopardizing existing Project benefits. These additional benefits could include increased reliability of irrigation water supply, the ability to irrigate additional lands, improved water quality in Project reservoirs, increased fish and wildlife habitat within the Project, and reduced reliance on the Columbia mainstem during the summer months. The parties recognize that Potholes Reservoir is first and foremost a water supply for two of the Project districts, and agree that the actions under this MOU are not intended to, and shall not, jeopardize the reliability of this water supply. The parties further recognize that any evaluation of the reservoir must be conducted within the context of the overall Project, as the feed route, reservoir operations and evacuation route must be considered together, and that the reservoir is central to the proper functioning of the Project as a whole.

Section 19. If and as warranted by the results of the Potholes Assessment, the State and the Districts will pursue appropriate feasibility level studies, including the authorization and funding of feasibility studies by Reclamation. Reclamation's position regarding authorization and funding of such feasibility studies will be determined by the views of the Administration at the time Congress considers authorizing legislation and appropriations. The State will cost share in any such feasibility studies should Reclamation be authorized and funded to conduct the studies. The State will request feasibility study funds for the next state fiscal biennium. The tasks and responsibilities for feasibility studies will be specified by contract. If and as warranted by the results of such feasibility studies, the parties will work in good faith to develop and implement a

specific proposal for changes to the operation of Potholes Reservoir. Subject to congressional authorization, feasibility studies, if undertaken, would be completed by June 2008.

WATER FROM CANADA

Section 20. The parties acknowledge that the State will seek to secure, through the United States, water from Canadian reservoir storage facilities. The State and Reclamation will use their best efforts to cooperate in ensuring that water released from Canadian facilities is moved through Lake Roosevelt in an acceptable manner. In this regard, the State and Reclamation will consider whether a written agreement regarding the delivery of water from Canada through Lake Roosevelt would be desirable. If so, they will endeavor in good faith to negotiate and execute an operating agreement in this regard during calendar year 2005 and invite the Bonneville Power Administration to be a signatory to any such operating agreement.

ADDITIONAL PROVISIONS

Section 21. Reclamation will submit to the State a proof of appropriation form to request issuance of a state water right certificate for the perfected portions of the existing permit held by Reclamation for the Project. The State will issue a water right certificate reflecting the amount of Project water and land developed under the existing permit, and will issue a superceding permit for the amount of Project water and land that may continue to be developed under the superceding permit.

Section 22. In partial consideration of the State's contribution toward the Storage Assessment, the Potholes Assessment including an alternative feed route, improved evacuation route and solutions to East Low Canal delivery constraints, and the State's timely implementation and performance of other actions described in this MOU, the parties will cooperate to make available up to 15,000 acre-feet of water annually from the Project storage rights in Lake Roosevelt to benefit stream flows for fish. This water will be made available after December 2006. The timing of release of the water will be determined by Reclamation, in consultation with parties responsible for salmon recovery on the mainstem.

Section 23. The State will consult with the Colville Confederated Tribes and the Spokane Tribe of Indians regarding the CRI and will secure the concurrence of these tribal governments. Given the concurrence obtained by the State, Reclamation will be responsible for Government to Government consultation with the Tribes.

Section 24. The State will consult with NOAA Fisheries and the US Fish and Wildlife Service (USFWS) regarding the CRI and will obtain their concurrence. Given the concurrence obtained by the State, Reclamation will consult with NOAA Fisheries and USFWS as required by the Endangered Species Act.

IMPLEMENTING CONTRACTS

Section 25. Implementation of the actions described in this MOU is subject to the authority of the parties and the availability of funding as approved by the State Legislature and Congress and

will be undertaken pursuant to any contracts that may be subsequently entered into among the parties as described in this MOU. The contracts involving Reclamation as a party shall be prepared, negotiated, and executed in accordance with federal reclamation laws, rules and regulations, and policies.

Section 26. Any contracts prepared under this MOU shall be available for review by all parties to this MOU prior to execution of the contract. Where a party will not be a signatory to a contract, such party may request consultation with the other MOU parties to address any questions or concerns with a proposed contract. Any party requesting consultation concerning a contract shall be provided an opportunity for consultation before the contract is executed.

OVERSIGHT PANEL

Section 27. The parties will create an Oversight Panel to provide oversight and coordination for all aspects of this MOU. The Oversight Panel shall consist of one designated representative of each of the signatories to this MOU. The Oversight Panel's functions include, but are not limited to: (a) monitoring implementation of the actions set forth in this MOU, (b) tracking and reporting of performance by the parties under any contract executed under this MOU, (c) reviewing and evaluating, at least on an annual basis, this MOU and its implementation by the parties, and (d) resolving disagreements between the parties.

Section 28. In the event disagreements arise between the parties and cannot be resolved, any party to this MOU may request the Oversight Panel to attempt to resolve the disagreement. Within 45 days of any such request, the Oversight Panel shall notify the parties of its recommended proposal for resolving the disagreement; provided, however, such decision or proposal shall be advisory only and not binding on the parties.

GENERAL PROVISIONS

Section 29. The period of performance of this MOU shall commence on the date when it is signed by the last signatory. This MOU shall terminate on December 31, 2014, unless it is extended by mutual written consent of the parties. Termination of this MOU does not invalidate contracts executed under the MOU.

Section 30. Notwithstanding Section 29 above, any party desiring to terminate its participation in this MOU will give 90 days written notice to the other parties. Upon receipt of a notice of termination, the parties may meet or elect to convene the Oversight Panel within 45 days in a good faith effort to resolve any disagreements relating to the notice of termination. Termination by a party does not in any way invalidate contracts executed under this MOU; contracts may be terminated only through the provisions of the contract. Where one party terminates from this MOU, other parties may agree to continue to implement the MOU within the scope of their authority and funding.

Section 31. This MOU may only be amended by mutual written consent of the parties. No amendment shall be effective for any purpose unless it is made in writing and signed by authorized representatives of all the parties to this MOU.

Section 32. Notwithstanding any other provision of this MOU, the parties acknowledge that Reclamation's actions are subject to federal reclamation law, as amended and supplemented, and the policies, rules and regulations promulgated by the Secretary of the Interior under federal reclamation law; and applicable federal law, including but not limited to, the National Environmental Policy Act (NEPA), and the Endangered Species Act (ESA). NEPA compliance activities may include public scoping meetings and hearings, Fish and Wildlife Coordination Act and cultural resource consultations, and consultations with Tribes on Indian Trust Assets. ESA activities may include consultation with NOAA Fisheries and the USFWS.

Section 33. Notwithstanding any other provision of this MOU, the parties acknowledge that any contract executed under this MOU where Project benefits are afforded shall be subject to federal reclamation law, policies, and rules and regulations governing recovery of Project costs. The parties further acknowledge that the costs of development, review and approval of proposed actions, including but not limited to, environmental compliance activities, preparation, negotiation and execution of contracts, and any costs of mitigation determined to be required, shall be incurred by the benefiting contractor. Costs to the benefiting contractor may be mitigated by other enhancements or contributions that benefit the parties to this MOU, at the discretion of Reclamation. Any contract executed under this MOU that implements a joint federal and state program, as authorized and directed by federal law and funded through federal appropriations, shall be subject to federal cost sharing laws, policies and practices.

Section 34. The signatures of the Districts on this MOU shall not be interpreted as an acknowledgment or endorsement by the Districts of the technical conclusions and proposed policies of the State related to the Columbia River mainstem water management program, or in any way to be acceptance of or agreement with a "no net loss" policy for management of water resources in the Columbia River.

Section 35. As necessary to support budget development and legislative review of budget requests, the State and/or the Districts may request an estimate of costs for actions proposed under this MOU. Reclamation will provide estimates based on information available at the time of the request.

Section 36. All actions and schedules called for by this MOU are subject to and contingent upon the availability and allocation of future federal and state appropriations, existing and future limitations on a party's statutory authorities, and state and federal regulatory approvals as needed. The parties recognize that if any necessary authority and/or funding is not forthcoming, the schedules identified in this MOU will be reviewed and adjusted as necessary, by mutual consent.

Section 37. This MOU is executed in multiple originals, with one originally executed copy for each of the below signatories.

SIGNATORIES

Director, Pacific Northwest Region, U.S Bureau of Reclamation — DATE: Dec 17, 2004

Governor, State of Washington — DATE: Dec 17, 2004

Director, Washington State Department of Fish and Wildlife — DATE: Dec 17, 2004

Attest:

Secretary

SOUTH COLUMBIA BASIN IRRIGATION DISTRICT
PO Box 1066
Pasco WA 99301

By _____
President, Board of Directors

Attest:

Secretary

EAST COLUMBIA BASIN IRRIGATION DISTRICT
PO Box E
Othello WA 99344

By _____
President, Board of Directors

Attest:

Asst Secretary

QUINCY-COLUMBIA BASIN IRRIGATION DISTRICT
PO Box 188
Quincy WA 98848

By _____
President, Board of Directors

Appendix B.
Summary of Scoping Comments

Comment	Discussion/EIS Section Reference
Describe existing conditions for fish in the reservoir including primary and secondary production, interactions among impacted species.	Refer to Section 3.7 of the Supplemental EIS.
Lake Roosevelt Impacts: Quantify the loss of fish and impacts to hatchery programs, nesting, spawning, and access to tributaries by resident fish. Describe impacts of change in reservoir conditions on fish distribution.	Refer to Section 4.2.1.6 of the Supplemental EIS.
Address the likelihood of undesirable material becoming entrained.	Refer to Section 4.2.1.4 of the Supplemental EIS.
Operation: Discuss timing and rate of the incremental releases; assess impacts to immediate project vicinity, downstream of the release site, habitat losses associated with conveyance systems and development. Display exposed shorelines, lake depths, and refill rates/downstream flow in graph/table format.	Refer to Sections 4.2.1.3, 4.2.2.3, 4.2.3.3, 4.2.1.7, 4.2.2.7, and 4.2.3.7 of the Supplemental EIS.
Odessa: Add more analysis of impacts associated with new conveyance system. Establish impact baseline for fish and wildlife impacts on East Low Canal. Impacts of new infrastructure for Odessa to wildlife and wildlife habitat.	The locations of new conveyance systems for Odessa are not known at this time. Additional information in the East Low Canal is provided in Sections 3.7, 3.8, 4.1.3.6 and 4.2.3.7 of the Supplemental EIS.
Storage Reservoir Impacts: Describe impacts to fish and fisheries in Banks Lake, Moses Lake, and Potholes Reservoir.	Refer to Section 4.2.2.6 of the Supplemental EIS.
Downstream impacts on fish migration, entrainment, and disease.	Refer to Section 4.2.2.6 of the Supplemental EIS.
Impacts to the Hanford Reach.	Refer to Sections 4.2.2.6 and 4.2.2.7 of the Supplemental EIS.
Impacts to tribal burial areas on Columbia River islands.	Refer to Section 4.2.2.8 of the Supplemental EIS.
Describe impacts to recreation, including economic impacts.	Refer to Sections 4.2.1.11, 4.2.2.11, 4.2.3.11, 4.2.1.12, 4.2.2.12, and 4.2.3.12 of the Supplemental EIS.
Impacts of additional municipal water.	This was evaluated in the Programmatic EIS.
Species Info and Impacts: Provide a brief narrative of each priority species and provide a more detailed impact analysis.	Information on priority species was provided in the Programmatic EIS. Refer to Sections 4.2.1.6, 4.2.2.6, and 4.2.2.3 of the Supplemental EIS.

Comment	Discussion/EIS Section Reference
Impacts to Wildlife species of concern.	
Evaluate cumulative impacts of this proposal in conjunction with Reclamations plans.	See Section 4.3 of the Supplemental EIS.
Effect on water available in river during July and August and fish flows that could be imposed by Judge Redden.	See Sections 4.2.2.3, 4.2.2.5 and 4.2.2.6 of the Supplemental EIS.
Effect on return flow/seepage from Odessa.	See Section 4.2.2.3 of the Supplemental EIS.
Effect on area between Lake Roosevelt and area where water from Odessa would return to the river.	See Section 4.2.2.3 of the Supplemental EIS.
Include history of Odessa Subbasin area and the interruptible water rights on the Columbia.	This information was provided in the Programmatic EIS.
Include an alternative that explores a return to dry-land farming.	This potential is discussed under the No Action Alternative and was evaluated under Socioeconomics in the Programmatic EIS.
More detailed explanation of the proposal's effect on stream flow.	See Section 4.2.2.3 of the Supplemental EIS.
Provide a detailed water budget showing where and when flow would be reduced in the river.	See Section 4.2.2.3 of the Supplemental EIS.
Stop piece-mealing the Columbia water supply development program. Describe the relationship between related projects.	The related projects and the separate environmental evaluations being conducted on them are described in Chapter 1.
Alternatives: add an aggressive water conservation alternative.	See Section 2.5.2 of the Supplemental EIS.
Add a discussion of global warming.	See Section 3.3 and Section 4.2.1.2 of the Supplemental EIS.
Add discussion of future changes in the Columbia River Treaty with Canada. Consider impacts on Canadian reservoirs with future changes to the Treaty.	See Sections 3.6 and 4.2.1.5 of the Supplemental EIS.
Explain why Washington State has rejected NAS recommendations.	The analysis and conclusions of the National Academy of Sciences were described in the Programmatic EIS. The legislature considered the recommendations when the Columbia River Water Management Act was developed.
Impact of the project on the CELP-Quad Cities Settlement Agreement.	The incremental storage releases may be used as mitigation for the agreement. See Section 2.4.1.3 of the Supplemental EIS.
Discuss how released water may be used to offset or mitigate for new out of stream water rights.	See Chapter 2 of the Supplemental EIS.

Comment	Discussion/EIS Section Reference
Describe shrub-steppe habitat losses from increased agriculture and urban sprawl	This was evaluated in the Programmatic EIS.
Analyze costs to Washington and federal taxpayers.	SEPA does not require a cost benefit analysis of projects. An evaluation of the socioeconomic impacts of the storage releases is included in this Supplemental EIS. The federal government will undertake a separate cost benefit analysis of construction projects as part of appraisal and feasibility level studies.
Impacts on current and future water rights.	See Sections 4.2.1.5, 4.2.2.5, and 4.2.3.5 of the Supplemental EIS.
What actions or mitigation will be taken to guard against water interruption for well water users?	See Section 4.2.1.4 of the Supplemental EIS.
Discuss how potential water rights will impact the economic growth needs of Ferry County.	Socioeconomic impacts were evaluated in the Programmatic EIS and in Sections 4.2.1.11, 4.2.2.11, and 4.2.3.11 of the Supplemental EIS.
A portion of released water should be set aside for adjacent upstream counties.	This is one alternative that Ecology is considering. See Section 2.4 of the Supplemental EIS.
Discuss impacts to boat launch facilities and recreation.	See Section 4.2.1.11.
Will Washington State compensate communities other than the tribes for impacts?	See Section 1.3.1 of the Supplemental EIS.
Will draw downs be discontinued if up stream impacts are negative?	This Supplemental EIS has concluded that no significant negative impacts will occur.
What is the process for terminating the project if it is not effective?	The incremental storage releases are intended as a temporary measure to address water management issues until more permanent solutions can be developed.
Evaluate issues identified in the comment letter submitted on the Draft Programmatic EIS.	These issues were reviewed and are evaluated in the appropriate sections of the document.
Discuss mitigation measures proposed for exposed cultural resources.	See Section 4.2.1.8 of the Supplemental EIS.
Add alternatives that encourage conservation.	See Section 2.5.2 of the Supplemental EIS.
Concerns that state and tribal agreements ignore the economic needs of local governments.	See Section 1.3.1 of the Supplemental EIS.
Impacts to upstream areas of allocating water to downstream uses should be evaluated and efforts made to stabilize water use in the upstream area.	One of the allocation efforts that Ecology is consider would allow withdrawals for municipal and industrial uses upstream of Grand Coulee Dam (Section 2.4.1.4). Ecology is also exploring

Comment	Discussion/EIS Section Reference
	options to ensure water resources are available for their current and future needs as part of ESSSB 6874.
Engage adjacent WRIAs in planning process.	Ecology has met with adjacent WRIAs during development of the Proposal.
Document existing conditions.	Refer to Chapter 3 of the Supplemental EIS.
Every alternative should include a thorough evaluation of impacts to resources. Use best available science. Consider both direct and cumulative impacts.	Refer to Chapter 4 of the Supplemental EIS.
Consider a reasonable range of alternatives including the no action alternative and an alternative with reduced impacts. For example reduce the amount of water released for M&I uses.	Refer to Chapter 2 of the Supplemental EIS.
Explore options for reducing consumptive use.	Refer to Chapter 2 of the Supplemental EIS.
New water rights should not be issued until basic water management data can be gathered and a realistic water budget can be developed. Include basic data-gathering needs in the EIS—list provided in comment.	Ecology continues to collect water management data on the Columbia River.
Include the analysis and conclusions of the National Academy of Sciences report.	The analysis and conclusions of the National Academy of Sciences were described in the Programmatic EIS. The legislature considered the recommendations when the Columbia River Water Management Act was developed.
EIS should discuss mitigation for the issuance of new permits.	See Sections 4.2.1.5, 4.2.2.5, and 4.2.3.5 of the Supplemental EIS.
The allocation of the drought year releases does not accurately reflect the 1/3-2/3 requirement of the legislation. Agriculture is short changed by 333 acre-feet.	Interruptible water rights are allocated 33,000 acre-feet during drought years and stream flows are allocated an additional 17,000 acre-feet. That allocation meetings the 1/3-2/3 requirement.
What is the economic impact to the counties and small businesses surrounding Lake Roosevelt?	See Section 4.2.1.12 of the Supplemental EIS.
Discuss impacts on adjacent drainages including Hunters Creek and the Colville River. Include economic impacts and mitigation.	These areas were considered in the impacts analysis in Section 4.2.1 of the Supplemental EIS.
Impacts on adjacent aquifers including the Colville River Aquifers. Include	See Sections 4.2.1.4 of the Supplemental EIS.

Comment	Discussion/EIS Section Reference
economic impacts and mitigation.	
How will the Spokane River be impacted by further lowering Lake Roosevelt and how will this be mitigated?	See Section 4.2.1.3 of the Supplemental EIS.
Impacts to upper Columbia Basin should be analyzed through Canada, Idaho, Montana, and the reservoir and backwater regions behind Libby Dam.	The Proposal is not expected to impact upstream areas.
What guarantees that the increased stream flows will be available downstream? Downstream dam operators are not part of the agreement and have no requirement to release the flows.	The flows will be managed as part of the Trust Water Rights Program. The downstream dams are not storage dams, so flows will pass through those reservoirs.
EIS should evaluate how the re-timing of releases will result in predictable "new" downstream water supplies.	The impact of the Proposal on downstream water supplies is discussed in Section 4.2.2.4 of the Supplemental EIS.
Examine the risks and potential impacts of granting new perpetual water rights for out of stream uses when Reclamation is under only a short term contractual obligation to modify its reservoir operations.	See Sections 4.2.1.5 and 4.2.2.5 of the Supplemental EIS.
The SEIS should address cumulative effects to riparian vegetation, specifically rare plants, downstream as well as to the riparian habitats on Lake Roosevelt.	See sections 4.1.1.7 and 4.1.2.7 of the Supplemental EIS.
Specifically evaluate the impacts to rare riparian species.	See sections 4.1.1.7 and 4.1.2.7 of the Supplemental EIS.
What are the impacts to Columbia River flows and the aquatic ecosystem during the times of year when the flow would have otherwise been released?	See Sections 4.2.2.3 of the Supplemental EIS.
Discuss impacts to the municipalities of Brewster and Pateros.	Impacts to downstream areas were considered in Section 4.2.2 of the Supplemental EIS.
Impacts to interruptible water rights.	See Sections 4.2.2.5 of the Supplemental EIS.
Potential for bank sloughing due to increased flows in the Columbia River.	See Section 4.2.2.1 of the Supplemental EIS.
Potential for stranding fish.	See Section 4.2.1.6 of the Supplemental EIS.
Temperature impacts in Lake Roosevelt and downstream on the Columbia River.	See Sections 4.2.1.3 and 4.2.2.3 of the Supplemental EIS.
Water quality impacts of increased sediment.	See Sections 4.2.1.3 of the Supplemental EIS.
Please provide the analysis of the pending demand for municipal and industrial water uses along the Columbia River and	The amount of water released is prescribed in the MOU with Reclamation and the Columbia Basin Irrigation Districts. See Section 1.3 of the

Comment	Discussion/EIS Section Reference
how that relates to the 25,000 acre-feet of water proposed to be made available, along with the list of the 128 pending applications for municipal and industrial water use.	Supplemental EIS.
Please confirm whether current interruptible water rights will no longer be deemed interruptible as a result of this proposal.	See Sections 4.2.2.5 and Section 2.2 of the Supplemental EIS.
It is unclear how the 25,000 acre feet for municipal and industrial use will be allocated.	See Section 2.4 of the Supplemental EIS.
The City of Kettle Falls supports inclusion of backwater areas in the one-mile zone that was considered in the Programmatic EIS. The Supplemental EIS should include a rationale for the alternative selected.	The one-mile zone referred to was discussed in Sections 2.2.9, 2.3.9 and 6.1.10 of the Programmatic EIS. The one-mile zone definition applies on to the implementation of RCW 90.90.030 and 90.90.050. It does not apply to the allocation of the incremental storage releases.
Is the state required to consider possible impairment of the City's existing groundwater rights before issuing new rights to water users downstream? Does this depend on whether the City's existing and planned points of diversion are inside or outside the One-Mile Zone?	See Section 4.2.2.4 regarding impacts to ground water. See above for the one-mile zone discussion.
Recommendations for interruptive water rights planning period: • Water demands for firm water right conversion should be targeted to a 2001 water-year condition. • If a water-year condition occurs with less water than a 2001 condition, the 2001 mitigation program should be implemented, with the Columbia River flow target WAC temporarily suspended in conjunction with a drought declaration by the Governor.	See Section 2.4 of the Supplemental EIS.
Recommendations for Interruptible Water Rights Allocations • Lake Roosevelt water should be allocated equitably among all the interruptible water rights with no attempt to prioritize water rights.	See Section 2.4 of the Supplemental EIS.
Interruptible Water Rights and the Critical Flow Adjustment	See Section 2.4 of the Supplemental EIS .

Comment	Discussion/EIS Section Reference
• There already exists a critical flow adjustment, the OCPI, allowed under current administrative rules. • The "lower" flow target should be a firm planning constraint for issuing future drought permits for relief/conversion of interruptive water rights. • There are no measurable fish benefits from flows beyond the OCPI during drought years and this should be used. • The utility of the "two-stage" adjustment to critical flow targets is very vague and questionable.	
Include discussion of impacts to alluvial deposits at the mouth of small tributaries.	See Section 4.2.1.1 of the Supplemental EIS.
Comments in opposition of Crab Creek and/or Hawk Creek Dams.	The Crab Creek and Hawk Creek Dams are not part of the Lake Roosevelt Incremental Storage Releases Program. They are being evaluated separately. See Section 1. 5.4.
Supplemental Feed Route project requires taking more water out of the Columbia River.	The Supplemental Feed Route was evaluated by Reclamation in a NEPA EA and the Frenchman Hills Route was evaluated in a SEPA Checklist by Ecology. See Section 1.5 of the Supplemental EIS. The Supplemental Feed Route Project does not require taking more water out of Lake Roosevelt. The Frenchman Hills Wasteway and Crab Creek Supplemental Feed Routes will route the same amount of water to Potholes Reservoir as is currently routed.
Need a long-term plan to resolve water resource problems.	The Columbia River Water Management Program is intended to address water resource problems.
Do not build more subsidized water projects.	Comment noted.
Project is not expansion of Columbia Basin Project. Water is needed to rebuild the groundwater source.	Comment noted.
Analysis should focus on management policies to maximize benefits to anadromous fish.	See Section 2.5. The purpose of the Columbia River Water Management Program is to address both instream and out of stream water needs. Several flow release alternatives and options are designed to maximize benefits to fish.
Alternative means to meet future water needs should be considered including	See Section 2.5.

Comment	Discussion/EIS Section Reference
water markets.	
Full economic costs and benefits of the proposed projects should be evaluated.	SEPA does not require a cost benefit analysis. The costs and benefits of any proposed storage projects will be evaluated separately.
Ecology should not support projects that reward wasteful practices such as the Tri-Cities and Odessa.	Ecology and Reclamation's conservation programs are discussed in Section 2.5.
Improved irrigation techniques would reduce current water use.	Ecology and Reclamation's conservation programs are discussed in Section 2.5.
Opposition to the state agreement with the Colville and Spokane Tribes.	Comment noted.
Project will impact senior water rights on Lake Roosevelt. Water level drop will add to pumping costs and make diversion points inaccessible.	See Section 4.2.1.4.
Air quality impacts of increased blowing dust and contaminated sediments.	See Section 4.2.1.9.

Appendix C.
Water Quality Parameters

Table 1

Total Dissolved Gas %	2005					2004					2003					2002				
	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max
Location																				
Columbia River (Mainstem)																				
Gifford	104.7	6.0	99	94.8	116.8	106.2	5.5	86	96.8	114.4	107.2	8.3	88	97.2	126.7	108.8	8.8	94	95.5	124.8
Seven Bays	105.1	5.5	99	97.7	115.4	106.5	4.8	85	98.9	115.5	107.3	9.2	84	96.8	132.1	107.1	7.9	84	94.8	121.3
Keller Ferry	109.4	5.4	96	101.9	123.0	106.4	7.5	73	97.5	132.6	107.0	6.3	83	97.8	122.1	107.6	7.7	91	94.4	120.0
Spring Canyon	104.3	4.1	95	98.8	112.9	104.2	4.5	85	96.7	115.3	106.9	6.0	85	97.6	121.7	106.9	7.1	92	96.6	118.7
Spokane River (Spokane Arm)																				
Little Falls[1]	103.5	3.7	68	98.4	111.8	102.9	4.3	58	96.6	110.6	101.7	3.6	42	94.7	107.2	104.3	7.5	89	95.5	119.1
Porcupine Bay	105.3	5.5	94	98.8	119.1	102.4	4.6	87	92.8	113.2	102.4	5.8	82	90.6	112.8	106.8	7.4	29	97.0	126.2
Month[2]																				
Jan	100.2	1.6	129	96.5	104.7	98.0	1.5	130	93.9	103.2	98.1	2.6	65	94.7	108.2	99.4	3.9	248	94.4	126.2
Feb	101.3	1.1	56	99.6	104.3	99.2	1.5	58	96.6	102.0	97.9	1.7	33	95.8	105.5	98.9	1.5	56	96.1	102.9
Mar	103.7	1.2	62	101.7	106.2	101.9	1.6	61	99.1	105.6	100.0	3.1	60	94.5	109.5	100.8	1.1	62	98.5	103.0
Apr	105.6	2.4	128	98.3	113.8	106.8	1.6	60	102.8	110.2	108.3	4.5	60	102.4	119.5	107.6	5.1	60	102.0	118.2
May	110.7	4.6	129	98.4	121.4	110.9	4.4	132	103.2	132.6	113.0	4.7	120	106.6	127.3	113.0	4.5	122	105.5	128.9
Jun	112.5	5.6	131	99.5	125.2	109.8	5.8	117	99.6	120.7	117.0	5.8	126	103.6	132.1	120.8	6.7	126	105.2	133.3
Jul	109.8	4.3	131	98.4	116.0	111.4	4.3	130	101.9	123.2	110.0	3.0	128	100.5	117.5	118.7	6.5	118	100.7	132.8
Aug	106.1	3.1	131	98.9	112.2	107.0	4.4	124	94.8	118.0	105.4	3.2	132	90.6	113.3	108.8	4.7	127	99.3	120.1
Sep	103.0	2.3	129	97.7	108.2	103.2	2.7	129	92.8	113.9	101.9	1.6	124	98.4	105.6	104.1	2.4	122	97.7	109.4
Oct	103.7	7.6	131	94.8	123.0	101.6	3.7	131	96.7	118.3	99.2	1.5	125	96.5	105.0	100.3	2.5	111	96.9	110.0
Nov	100.5	4.1	59	96.0	119.3	99.2	1.9	58	96.6	104.3	97.2	1.2	53	94.7	99.7	96.1	0.9	23	94.7	98.5
Dec	100.0	3.4	60	95.4	105.8	101.4	4.3	62	95.4	107.9	97.6	2.0	62	94.4	100.9	96.5	-	1	96.5	96.5
Total	105.5	5.8	1276	94.8	125.2	104.9	6.0	1192	92.8	132.6	105.4	7.4	1088	90.6	132.1	107.0	9.1	1176	94.4	133.3

Notes:

SD = standard deviation

n = sample size

1. Little Falls locations combined

2. Monthly data includes data from fixed monitoring stations at US/Canada Border and Grand Coulee dam.

References:

Scofield, et. al, 2005

Lee, et. al, 2004

Pavlik-Kunkel, et. al, 2003

Fields, et. al, 2002

Table 2

Temperature (°C) Location	2005					2004					2003					2002*				
	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max
Columbia River (Mainstem)																				
Gifford	12.7	5.8	100	1.7	21.6	13.7	5.7	88	1.4	22.1	13.9	5.0	88	3.8	21.1	12.2	5.5	94	3.1	20.2
Seven Bays	13.4	6.1	99	2.2	22.2	14.5	5.9	85	2.4	22.8	14.5	5.4	84	4.4	23.3	13.7	5.5	85	3.0	22.1
Keller Ferry	12.8	6.1	154	2.7	21.5	13.8	5.9	131	2.5	22.9	14.0	5.3	132	4.9	22.4	13.2	5.2	136	4.5	21.2
Spring Canyon	12.7	6.2	151	3.2	22.2	13.7	5.9	133	2.9	23.5	14.1	5.4	130	5.3	22.7	13.4	5.0	138	5.4	20.7
Spokane River (Spokane Arm)																				
Porcupine Bay	13.4	5.9	95	2.4	23.1	14.4	5.7	87	2.5	24.4	14.6	5.5	83	4.4	24.1	13.3	5.8	89	3.1	22.3
Little Falls Above Dam	14.1	5.6	17	3.1	19.7	15.2	5.5	14	3.6	21.3	16.2	4.4	11	4.6	19.6	-	-	-	-	-
Little Falls Boat Launch	13.7	5.6	16	3.1	19.4	15.0	5.4	15	3.2	20.3	16.2	4.4	11	4.5	19.7	-	-	-	-	-
Little Falls Spillway	13.9	5.6	17	3.3	20.0	16.2	6.0	15	3.6	23.3	16.3	4.5	11	4.4	19.9	-	-	-	-	-
Little Falls Turbine	13.3	5.5	18	3.1	19.6	14.9	5.6	14	3.2	21.4	16.1	4.3	11	4.6	19.6	-	-	-	-	-
Little Falls[1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.1	5.2	29	4	20.9
Month																				
Jan	2.7	0.5	83	1.7	3.4	2.6	0.5	82	1.4	3.6	4.7	0.5	78	3.8	5.3	4.0	1.0	198	0.4	5.8
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	5.5	1.3	81	4.1	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May	10.7	1.8	81	6.7	13.8	10.4	2.0	82	6.1	14.3	9.5	1.5	69	6.4	14.1	9.2	0.8	72	7.3	12.4
Jun	14.4	1.9	86	10.7	20.4	13.3	1.7	86	9.2	16.4	13.5	2.6	81	8.8	19.5	12.6	1.5	79	10.3	17.7
Jul	17.3	2.3	85	12.8	23.1	17.2	2.7	84	11.3	22.6	17.0	2.6	81	11.5	23.3	16.4	2.3	78	13.0	22.3
Aug	19.2	2.1	87	12.7	22.9	19.8	2.5	80	13.5	24.4	19.8	2.0	82	13.2	24.1	18.5	1.7	79	14.2	22.1
Sep	18.6	1.0	83	15.1	19.9	18.8	1.3	83	13.8	20.1	18.1	1.2	87	14.5	19.8	18.4	0.9	77	16.6	19.8
Oct	15.3	1.3	81	13.1	16.8	16.5	1.1	85	14.7	18.2	16.4	1.2	83	13.8	17.6	15.7	1.1	83	12.8	17.0
Overall	13.0	6.0	667	1.7	23.1	14.1	5.8	582	1.4	24.4	14.4	5.3	561	3.8	24.1	11.9	6.0	666	0.4	22.3

Notes:

SD = standard deviation

n = sample size

1. Little Falls locations combined

* Monthly statistics also include Evan's Landing, Kettle Falls, Hunters, Hawk Creek, Sanpoil R. Confluence and Sanpoil River sampling locations.

References:

Scofield, et. al, 2005

Lee, et. al, 2004

Pavlik-Kunkel, et. al, 2003

Fields, et. al, 2002

Table 3

Dissolved Oxygen (mg/L) Location	2005					2004					2003					2002*				
	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max
Columbia River (Mainstem)																				
Gifford	10.1	1.3	100	8.2	12.6	9.4	1.2	88	7.7	11.7	9.6	1.3	88	7.9	11.6	10.5	1.7	94	8.1	16.1
Seven Bays	9.8	1.5	99.0	7.9	12.7	9.2	1.3	85	7.0	11.2	9.5	1.5	84	7.7	12.0	10.2	1.7	85	7.7	12.9
Keller Ferry	9.6	1.7	154	5.5	12.2	8.9	1.4	131	5.1	11.2	9.0	1.7	132	1.9	11.9	9.9	1.7	136	7.2	13.3
Spring Canyon	9.6	1.6	151	6.1	12.0	8.9	1.4	133	5.4	11.1	9.0	1.6	130	5.4	11.6	9.8	1.6	138	6.7	12.5
Spokane River (Spokane Arm)																				
Porcupine Bay	8.4	2.7	95	0.2	12.4	7.9	2.0	87	0.2	10.5	8.2	2.1	83	0.5	11.4	9.4	2.4	89	3.3	12.4
Little Falls Above Dam	8.8	1.6	17	7.2	11.6	8.0	1.3	14	6.0	9.9	7.7	1.2	11	6.3	9.9	-	-	-	-	-
Little Falls Boat Launch	9.1	1.8	16	6.5	11.7	8.4	1.4	15	6.2	10.3	7.4	1.2	11	6.3	9.5	-	-	-	-	-
Little Falls Spillway	9.6	1.4	17	7.5	11.9	9.0	1.5	15	6.3	12.0	7.9	0.8	11	6.8	9.7	-	-	-	-	-
Little Falls Turbine	9.0	2.1	18	6.2	13.0	8.2	1.5	14	6.1	10.1	7.9	1.2	11	6.7	10.1	-	-	-	-	-
Little Falls[1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	2.5	29	5.6	12.8
Month																				
Jan	12.0	0.4	83	10.6	12.7	10.8	0.5	82	9.3	12.0	10.4	0.4	78	9.5	11.2	11.8	0.7	198	10.4	16.1
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	11.4	0.5	81	9.1	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May	10.7	0.5	81	8.8	11.7	9.9	0.4	82	8.1	10.5	11.3	0.3	69	10.3	11.9	11.4	0.5	72	10.6	12.4
Jun	9.5	0.9	86	6.6	10.6	9.8	0.9	86	5.6	10.8	10.4	0.8	81	7.9	12.0	11.8	0.5	79	10.7	12.8
Jul	8.9	1.2	85	3.9	10.4	8.6	0.9	84	5.0	9.7	8.6	0.8	81	4.8	9.7	10.5	0.9	78	7.3	12.9
Aug	7.7	1.6	87	0.2	9.1	7.8	1.1	80	1.6	9.4	7.4	1.5	82	0.5	9.0	8.2	0.9	79	3.9	8.8
Sep	7.7	1.1	83	0.4	9.5	6.9	1.2	83	0.2	8.6	7.5	0.9	87	1.9	8.8	7.5	1.0	77	3.3	9.1
Oct	8.3	0.5	81	7.6	9.9	7.9	0.4	85	7.2	8.9	7.7	0.6	83	6.4	9.6	8.1	0.5	83	7.0	9.0
Overall	9.5	1.8	667	0.2	13.0	8.8	1.5	582	0.2	12.0	9.0	1.7	561	0.5	12.0	10.2	1.9	666	3.3	16.1

Notes:

SD = standard deviation

n = sample size

1. Little Falls locations combined

* Monthly statistics also include Evan's Landing, Kettle Falls, Hunters, Hawk Creek, Sanpoil R. Confluence and Sanpoil River sampling locations.

References:

Scofield, et. al, 2005

Lee, et. al, 2004

Pavlik-Kunkel, et. al, 2003

Fields, et. al, 2002

Table 4

Turbidity (NTU) Location	2005					2004					2003					2002*				
	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max
Columbia River (Mainstem)																				
Gifford	0.0	0.0	100	0.0	0.0	0.0	0.0	88	0.0	0.0	0.0	0.0	88	0.0	0.0	0.0	0.0	94	0.0	0.0
Seven Bays	0.1	0.6	98	0.0	6.3	0.0	0.2	85	0.0	2.0	0.0	0.0	83	0.0	0.0	0.0	0.0	82	0.0	0.0
Keller Ferry	0.0	0.1	148	0.0	1.1	0.0	0.0	129	0.0	0.4	0.2	1.5	130	0.0	16.4	0.0	0.3	132	0.0	3.5
Spring Canyon	0.0	0.0	147	0.0	0.0	0.0	0.0	130	0.0	0.0	0.0	0.0	127	0.0	0.0	0.0	0.0	137	0.0	0.0
Spokane River (Spokane Arm)																				
Porcupine Bay	0.0	0.1	94	0.0	1.2	0.1	0.7	86	0.0	6.1	0.1	1.1	81	0.0	9.9	0.0	0.0	86	0.0	0.4
Little Falls Above Dam	2.1	4.3	17	0.0	13.5	0.8	2.3	11	0.0	7.6	0.0	0.0	11	0.0	0.0	-	-	-	-	-
Little Falls Boat Launch	0.8	2.0	14	0.0	6.2	0.1	0.3	13	0.0	1.1	0.0	0.0	11	0.0	0.0	-	-	-	-	-
Little Falls Spillway	1.9	4.3	15	0.0	12.8	0.2	0.4	12	0.0	1.2	0.8	2.5	10	0.0	7.8	-	-	-	-	-
Little Falls Turbine	2.7	6.2	18	0.0	18.2	0.0	0.0	14	0.0	0.0	1.2	3.9	10	0.0	12.2	-	-	-	-	-
Little Falls[1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	7.5	27	0.0	22.2
Month																				
Jan	0.0	0.1	83	0.0	1.2	0.0	0.0	82	0.0	0.4	0.0	0.0	78	0.0	0.0	0.4	2.9	193	0.0	22.2
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	1.2	4.0	80	0.0	18.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May	0.2	0.9	79	0.0	6.3	0.0	0.0	82	0.0	0.0	0.0	0.0	69	0.0	0.0	0.0	0.1	71	0.0	0.4
Jun	0.0	0.0	83	0.0	0.0	0.0	0.2	86	0.0	1.5	0.19	1.4	78	0.0	12.2	0.0	0.0	75	0.0	0.0
Jul	0.0	0.1	80	0.0	1.1	0.1	0.9	79	0.0	7.6	0.1	1.0	79	0.0	7.8	0.0	0.0	75	0.0	0.0
Aug	0.1	0.7	84	0.0	6.2	0.0	0.0	73	0.0	0.0	0.1	1.1	79	0.0	9.9	0.0	0.0	76	0.0	0.0
Sep	0.1	1.0	81	0.0	8.8	0.1	0.7	82	0.0	6.1	0.19	1.8	86	0.0	16.4	0.0	0.0	77	0.0	0.0
Oct	0.0	0.0	81	0.0	0.0	0.0	0.3	84	0.0	2.0	0.0	0.0	82	0.0	0.0	0.0	0.4	82	0.0	3.5
All Locations	0.2	1.5	651	0.0	18.2	0.04	0.4	568	0.0	7.6	0.09	1.0	551	0.0	16.4	0.1	1.6	649	0.0	22.2

Notes:

Turbidity values > 20 NTU not included

SD = standard deviation

n = sample size

1. Little Falls locations combined

* Monthly statistics also include Evan's Landing, Kettle Falls, Hunters, Hawk Creek, Sanpoil R. Confluence and Sanpoil River sampling locations.

References:

Scofield, et. al, 2005

Lee, et. al, 2004

Pavlik-Kunkel, et. al, 2003

Fields, et. al, 2002

Table 5

Total Dissolved Solids (mg/L) Location	2005					2004					2003					2002*				
	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max
Columbia River (Mainstem)																				
Gifford	82.1	3.5	100	75.4	86.5	79.1	5.3	88	70.5	89.0	81.0	3.0	88	76.0	87.0	77.0	4.0	93	73.0	85.0
Seven Bays	81.9	9.0	99	0.4	87.6	78.8	6.3	85	54.4	89.0	81.0	4.0	84	67.0	88.0	74.0	10.0	85	1.0	81.0
Keller Ferry	82.3	3.6	154	76.3	87.0	79.0	4.5	131	71.6	88.8	81.0	4.0	132	75.0	90.0	75.0	4.0	136	66.0	82.0
Spring Canyon	82.5	3.5	151	76.6	86.9	79.4	4.7	133	71.5	89.6	81.0	4.0	130	74.0	90.0	75.0	5.0	138	36.0	82.0
Spokane River (Spokane Arm)																				
Porcupine Bay	87.2	23.8	95	55.1	140.9	82.1	27.0	87	48.7	130.5	95.0	27.0	82	57.0	142.0	71.0	30.0	89	21.0	123.0
Little Falls Above Dam	103.7	29.9	17	59.6	154.2	95.8	34.3	14	51.6	148.9	118.0	33.0	11	69.0	155.0	-	-	-	-	-
Little Falls Boat Launch	102.4	30.2	16	59.5	150.7	95.0	33.9	15	53.0	150.6	120.0	33.0	11	70.0	159.0	-	-	-	-	-
Little Falls Spillway	99.3	30.6	17	59.1	149.8	94.6	33.4	15	53.0	150.0	118.0	33.0	11	69.0	156.0	-	-	-	-	-
Little Falls Turbine	102.9	29.3	18	59.7	150.4	95.4	34.2	14	52.5	148.2	118.0	33.0	11	70.0	155.0	-	-	-	-	-
Little Falls[1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87.0	39.0	29	33.0	142.0
Month																				
Jan	85.0	5.6	83	69.0	92.3	91.0	8.3	82	85.4	119.6	84.0	16.0	78	74.0	118.0	82.0	2.0	198	79.0	102.0
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	85.3	2.4	81	82.2	91.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May	74.5	8.8	81	55.1	86.4	72.9	12.3	82	50.5	89.6	83.0	10.0	69	57.0	90.0	70.0	15.0	72	36.0	80.0
Jun	75.7	5.0	86	61.5	79.7	67.6	9.4	86	48.7	78.8	78.0	8.0	81	60.0	88.0	62.0	16.0	79	32.0	75.0
Jul	81.5	8.8	85	65.0	106.6	73.8	5.8	84	53.4	82.7	80.0	6.0	80	66.0	100.0	67.0	13.0	77	1.0	74.0
Aug	86.4	13.6	87	71.8	125.2	83.5	12.7	80	64.2	119.7	89.0	16.0	82	76.0	135.0	75.0	11.0	79	43.0	107.0
Sep	96.8	21.3	83	82.7	154.2	93.1	21.6	83	78.6	150.6	93.0	25.0	87	77.0	159.0	84.0	18.0	77	67.0	142.0
Oct	95.2	22.2	81	0.4	140.9	86.6	16.2	85	76.6	123.1	94.0	23.0	83	79.0	147.0	84.0	17.0	83	75.0	128.0
Overall	85.0	14.9	667	0.4	154.2	81.2	16.0	582	48.7	150.6	86.0	18.0	560	57.0	159.0	76.0	15.0	665	1.0	142.0

Notes:

SD = standard deviation

n = sample size

1. Little Falls locations combined

* Monthly statistics also include Evan's Landing, Kettle Falls, Hunters, Hawk Creek, Sanpoil R. Confluence and Sanpoil River sampling locations.

References:

Scofield, et. al, 2005

Lee, et. al, 2004

Pavlik-Kunkel, et. al, 2003

Fields, et. al, 2002

Appendix D.
Flow Action under the Biological Opinion

Appendix D

Flow Action under the Biological Opinion

A. ESA Actions

1. Hydro Operations

A.1.e. Flow Actions

The Parties agree to the following actions in addition to those in the draft FCRPS BiOp:

To address the Tribes' concerns regarding dry year operations of the FCRPS, particularly Lake Roosevelt, the Parties agree as follows:

(i). Summer Drafting. As described in the draft FCRPS Biological Opinion (October 2007)(draft FCRPS BiOp), currently Lake Roosevelt is drafted to elevation 1280 feet by August 31 when the April through August water supply forecast (WSF) is greater than 92 million acre feet (MAF) (wettest 50 percent of water years) at The Dalles. When the WSF is less than 92 MAF (driest 50 percent of water years), Lake Roosevelt is drafted to elevation 1278 feet (see draft FCRPS BiOp, Reasonable and Prudent Action (RPA) No. 4, Storage Project Operations, Table 1, Grand Coulee, pages 4 and 6 of 85). A study to evaluate drafting Lake Roosevelt to 1278 feet only in the lowest 20 percent of water years and to 1280 feet in all other water years (see FCRPS Biological Assessment) (August 2007) (FCRPS BA) at Section B.2.1, page B.2.1-9) will be initiated jointly by BPA and Reclamation in consultation with the Colville Tribes within 60 days of completion of the FCRPS BiOp and a draft report will be prepared within nine months of study initiation. The study results will be reviewed by the Action Agencies and the Regional Governance Group to determine whether to draft Lake Roosevelt to elevation 1278 only in the driest 20% of water years.

(ii). Other Dry Year Operations. An investigation of Dry Water Year Operations other than summer drafting will be initiated by BPA and Reclamation and a technical workgroup formed by the Action Agencies within 60 days of the issuance of the FCRPS Bi-Op as outlined in RPA No. 14 in the draft FCRPS BiOp (RPA No. 14: Dry Year Strategy, draft FCRPS BiOp page 15 of 85). The workgroup will be composed of representatives from BPA, Reclamation, and the Colville Tribes. NOAA Fisheries and other interested parties will be invited to participate. The workgroup will report preliminary results by nine months after its formation.

The Dry Water Year Operations investigation described above will include:

(4) Washington State's Columbia River Water Management Program (CRWMP), early action Lake Roosevelt drawdown includes a streamflow enhancement component. This component would allow for an additional release of up to 27,500 acre-feet in 96 percent of water years and 44,500 acre-feet in the driest 4% of water years. In most years that water will likely be released from Lake Roosevelt in July and August to benefit summer migrants, except that pursuant to a December 17, 2007, Agreement between the State of Washington and the Colville Tribes and as set forth in the FCRPS BA Appendix B, Attachment B.1-4 at B.1-4-6, in the driest 20% of water years the CRWMP streamflow enhancement component will be released in April-

June to benefit UCR migrants. This investigation will provide additional evaluation regarding release of the CRWMP water to benefit spring migrants in the driest 20% of water years.

In contrast to the study described in paragraph (i) above ("Summer Drafting") that evaluates the effects of drafting Lake Roosevelt to elevation 1278 feet by the end of August in the driest 20% vs. 50% of water years evaluates the effects to benefit summer migrants, the study called for in this paragraph (ii)("Dry Water Year Operation") evaluates possible hydroelectric system operations to benefit UCR steelhead and spring chinook salmon and other spring migrants.

(iv)…. Any planned changes to operational criteria for Lake Roosevelt or Rufus Woods Lake will be specifically coordinated, on a government-to-government basis with the Colville Tribes.

Appendix E.
Lake Roosevelt Artificial Fish Propagation Facilities

Appendix E

Artificial Fish Propagation Information

The Spokane Tribal Hatchery

The tribal hatchery, located on the Spokane Reservation along Chamokane Creek at Galbraith Springs, was built in 1991 and has been used as the primary rearing facility (Peone 2003). Rainbow trout from the Spokane Trout Hatchery (McCloud River stock) and kokanee (originally Lake Whatcom stock) eggs are reared at the hatchery. When available, Meadow Creek kokanee eggs (British Columbia) are obtained and reared, or conversely, they are crossed with local wild kokanee to generate what is known as a 'Lake Roosevelt' stock. Eggs are incubated and fish are raised to fingerling size. All kokanee are adipose fin clipped to distinguish them from wild kokanee present in the lake. The following management actions occur at the Tribal Hatchery:

1) Post-smolt kokanee are released at Fort Spokane boat launch, Little Falls Dam, and Colville River below Meyers Falls in June (67,000 kokanee).

2) An allotment of 360,000 kokanee fingerlings are transferred to Sherman Creek Hatchery for final rearing in the fall.

3) In conjunction with WDFW Sherman Creek Hatchery, a total of 500,000 yearling rainbow trout are stocked in 46 net pens located at Keller Ferry, Seven Bays, Lincoln, Two Rivers, Hall Creek, Hunters, Gifford and Kettle Falls. Net pen rainbow trout are released in May or June depending on reservoir conditions. Half the total number stocked (250,000 total rainbow trout) are transferred from the Spokane Tribal Hatchery to the Sherman Creek Hatchery as fingerlings in July for final rearing until October.

4) Kokanee salmon fingerlings are stocked into net pens at Seven Bays in October (126,000 kokanee) to be released the following May or June.

5) Kokanee salmon fry are released into Banks Lake (400,000 kokanee).

The Sherman Creek Hatchery

Operated by WDFW, the Sherman Creek Hatchery is located 3 miles west of Kettle Falls, Washington, adjacent to Sherman Creek. The hatchery is an acclimation and rearing facility for kokanee and rainbow trout, and is a kokanee egg collection facility. The hatchery was built in 1991 and began fish releases in 1992. It currently serves as the primary kokanee salmon release and collection site, as well as a critical location for net pen rainbow trout rearing in the upper reservoir (Combs, 2001, 2002, 2003).

Sherman Creek Hatchery's primary objective is the restoration and enhancement of the recreational and subsistence fishery in Lake Roosevelt and Banks Lake. The Sherman

Creek Hatchery was designed to rear 1.7 million kokanee fry for acclimation and imprinting during the spring and early summer. Additionally, it was designed to trap all available returning adult kokanee during the fall for broodstock operations and evaluations.

Since the start of this program, the operations on Lake Roosevelt have been modified to achieve improved program goals. The Washington Department of Fish and Wildlife, Spokane Tribe of Indians and the Colville Confederated Tribe form the interagency Lake Roosevelt Hatcheries Coordination Team (LRHCT) which sets goals and objectives for both Sherman Creek and the Spokane Tribal Hatchery and serves to coordinate enhancement efforts on Lake Roosevelt and Banks Lake. The primary changes have been to:

1) Replace the kokanee fingerling program with a yearling (post-smolt) program of up to 1,000,000 fish; and

2) Construct and operate twenty net pens to handle the increased production. This program enables the Spokane Tribal Hatchery to rear additional kokanee to further the enhancement efforts on Lake Roosevelt.

Current objectives for all of the artificial propagation facilities incorporate the increased use of native/indigenous stocks where available for propagation into Upper Columbia River Basin Waters. Management actions occurring at the Sherman Creek Hatchery include:

1) Obtaining kokanee fingerlings from Spokane Tribal Hatchery in October that are reared in net pens and released the following May (376,000 kokanee).

2) Obtaining kokanee pre-smolts from Spokane Tribal Hatchery in April that are held in the hatchery raceways and released in June or July directly into the Lake. Fish average 6 to 8 inches at release (250,000 kokanee).

3) Obtaining rainbow trout fingerlings from the Spokane Tribal Hatchery in July. The fish are transferred to net pens in October for winter rearing and released the following June (250,000 rainbow trout).

4) Obtaining Phalon Lake stock rainbow trout (interior redband rainbow trout) from the WDFW Colville Hatchery for the Kettle Falls net pens (60,000 Phalon Lake rainbow trout).

5) Collecting returning adult kokanee for spawning purposes. At age three or four, kokanee released from Sherman Creek return to spawn. Sherman Creek Hatchery is outfitted with a fish ladder to collect adults and take eggs. Fertilized kokanee eggs are transported to the Spokane Tribal Hatchery for rearing.

6) Acclimating additional rainbow trout and additional kokanee during the summer months depending on fish availability and water temperatures.

The Ford Trout Hatchery

Originally funded by Bureau of Reclamation, the Ford Hatchery is now maintained by WDFW. It is located in Ford, Washington. The role of the Ford Trout Hatchery is to provide kokanee salmon for release into Banks Lake and contribute to the combined production of the other two facilities. Ford Hatchery's production (along with Sherman Creek and the Spokane Tribal Hatchery) contribute to a goal of one million kokanee yearlings for Lake Roosevelt and one million kokanee fingerlings and fry for Banks Lake. The hatchery provides 1.14 million kokanee to Banks Lake; 440,000 kokanee fry in the spring and 700,000 fingerlings in the fall.

While the origin of kokanee hatchery stock comes from Lake Whatcom, current objectives promote the use of native (or, indigenous) stocks for propagation in Lake Roosevelt, Banks Lake, and the Upper Columbia River. The BPA implemented an increased commitment to operation and maintenance funding for the kokanee program in FY 2001, which is scheduled to continue through FY 2010.

The Ford Hatchery also produces resident rainbow trout (80,584 pounds per year) to promote the sport fisheries in trout fishing lakes in eastern Washington (WDFW Management, Region 1) including Lake Roosevelt. Monitoring and evaluation of the Ford stocking programs include existing WDFW creel and lake survey programs to assess resident trout releases in trout managed waters. BPA also funds creel surveys to assess the harvest of hatchery kokanee in Banks Lake.

The WDFW Colville Hatchery

Located in Colville, Washington, this hatchery raises, among other stocks, an indigenous Kettle River tributary stock of redband rainbow trout from Phalon Lake. These rainbow trout are reared at the hatchery, placed into net pens in the reservoir and released into Lake Roosevelt as yearlings in September. Phalon Lake stock is used because it is resident to tributaries of the upper Columbia and, therefore, this stock works toward the objective of sustaining native fisheries.

Operations began at the hatchery in 1990 and have continued to the present time. Originally the project was production goal oriented (1990-1994). However, in 1995 more fisheries-related goals and objectives were developed for the program as a means to assess the impact of the program on subsistence and recreational fisheries (Truscott, 1995).

The Colville Confederated Tribes

The Colville Confederated Tribes occasionally purchase sterile (triploid) rainbow trout from Trout Lodge, Montana, or Columbia River Fish Farms for recreational fishing enhancement. In the fall of 2001, approximately 12,000 two-pound rainbow trout were released at Kettle Falls, Two Rivers, and Keller Ferry Marinas. In July 2003, approximately 8,500 of these sterile 1.5 pound rainbow trout were released throughout the reservoir. The triploid fish grow larger than fertile fish of the same species since no

energy is expended in gamete production. These fish are marked with yellow floy tags. Response from anglers has been very positive, with tag returns increasing two-fold. Annual releases vary and depend on funding.

The Lake Roosevelt Volunteer Net Pen Program

The net pen program was initiated in 1985 by Mr. Winn Self, owner of the Seven Bays Marina. He released 5,000 trout from one net pen that year. Prompted by the excellent harvest and growth rates of the net pen reared fish and limited space at the hatcheries, changes were incorporated at the hatcheries to rear 500,000 rainbow trout for Lake Roosevelt net pens. Today there are 46 net pens located throughout the reservoir that hold rainbow trout and kokanee salmon. Net pens are usually filled in the fall, and the fish released the following May or June. WDFW purchases the food, but volunteers feed the fish daily, release the fish after the spring drawdown, and maintain the nets and floats.

The current objective is to rear fish to a sufficient size to minimize predation and to release the trout following spring reservoir drawdown in a manner to help reduce entrainment through Grand Coulee Dam. Two rainbow stocks are currently used in the program. The first stock is Spokane rainbow trout (McCloud River stock), which historically provided a successful and popular sports fishery on Lake Roosevelt. Currently both fertile and sterile Spokane rainbow stocks are being tested to assess the effect these fish may have on creel returns and impacts on native fish in the system. The second stock under assessment is the wild Phalon Lake redband trout, which originate from tributaries of the Kettle River.

The Lake Roosevelt Fisheries Evaluation Program, (LRFEP), conducts the monitoring and evaluation of the rainbow trout net pen program as described below. LRFEP research indicates the Phalon Lake rainbow trout, marked and released in the Kettle Falls area, were only recaptured in the northern section of the reservoir, suggesting this locally adapted stock tends to stay in local areas without migrating downstream like the coastal stock rainbow trout (McLellen et al., 2003).

The rainbow trout are released ideally in June, but in years of deep drawdown, physical limitations require earlier releases. The net pen program produces the most successful fishery in the lake. Over 95 percent of all rainbow trout captured in the lake are from the net pens (Underwood, 2000).

Lake Roosevelt Fisheries Evaluation Program

The scientific fisheries evaluation of the artificial production is accomplished through the Lake Roosevelt Fisheries Evaluation Program (LRFEP) funded by BPA. The Spokane Tribe is the lead entity, with the Colville Confederated Tribes, Washington Department of Fish and Wildlife and Eastern Washington University as sub-contractors. Each agency focuses on specific questions to answer regarding the artificial production program. Major projects on the reservoir include:

1) Spokane Tribe of Indians:

a) Long-term monitoring and analysis of fishery and limnology in Lake Roosevelt (Griffith and Scholz, 1991; Peone et al., 1991; Thatcher et al., 1993; Shields and Underwood, 1996, 1997; Cichosz et al., 1997, 1998; Spotts et al., 2002; McLellan et at., 2003).

b) Kokanee salmon precocity study (McLellen et al., 2003).

2) Colville Confederated Tribes

a) Shoreline habitat analysis

b) Under the Chief Joseph Kokanee Enhancement Project:

1. A micro-satellite DNA genetic inventory of all kokanee stocks found in Lake Roosevelt area.

2. Entrainment study to determine if strobe lights deter fish from entraining through Grand Coulee Dam (LeCaire, 1999; BioSonics, 2000; Simmons et al., 2002).

3) Washington Department of Fish and Wildlife

a) Determine limiting factors for kokanee and rainbow trout using hydro-acoustics and bioenergetics modeling (Baldwin et al., 2003; Baldwin and Polacek, 2003).

b) Cooperative effort between Spokane Tribe, Colville Tribes, and Canadian Fisheries Agencies and stakeholders to protect, recover, and enhance white sturgeon in the Upper Columbia.

4) Eastern Washington University

a) Evaluate release strategies for kokanee salmon to maximize angler harvest and adult returns for egg collection. Including evaluation of Meadow Creek (British Columbia) stock and Lake Whatcom (Washington) stock performance in the reservoir. (Tilson et al., 1994, 1995, 1996; Tilson and Scholz, 1997,1998; McLellan et al., 2001; McLellan and Scholz, 2001, 2002a, 2003).

b) Evaluate walleye population dynamics in Lake Roosevelt (McLellan et al., 2002; McLellan and Scholz, 2002b).

c) Facilitate fish tag reward program.

d) Evaluate rainbow trout program through the tagging project.

Local Propagation Facilities for other species

Cutthroat Trout

WDFW Colville Hatchery

Currently, westslope cutthroat trout are rarely encountered in Lake Roosevelt (Cichosz et al., 1999; Underwood and Shields, 1995). Moreover, tributaries of Lake Roosevelt contain limited populations of adfluvial cutthroat stocks. Inventory projects in some of the tributaries reveal that native populations of westslope cutthroat trout are extremely limited and in many areas are not detectable. Hatchery-reared cutthroat trout are not currently released into Lake Roosevelt under one of the fish restoration programs, but area lakes are stocked with cutthroat trout originating from the Colville Hatchery, including the Kings Lake Stock of westslope cutthroat trout (Underwood, 2000).

White Sturgeon

Since impoundment of Lake Roosevelt, white sturgeon populations have declined to extremely low levels. The only known viable spawning locations exist immediately downstream of the confluence with the Pend Oreille River in British Columbia and at two sites near Northport, Washington at the Little Dalles and Dead Man's Eddy (Howell and McLellan, 2006). In 1998, a stock-indexing project (Devore et al., 2000) found only 1.5 percent of the captured white sturgeon were juveniles [less than 110 cm (3.6 feet) fork length], suggesting poor juvenile recruitment to the population. The survey revealed an age structure of 12 to 96 year old fish (Devore et al., 2000). Devore et al. (2000) concluded the white sturgeon population had severe recruitment limitations. This effort supported conclusions of research conducted in the Canadian Reach of the Columbia River (R.L. & L Environmental Services Ltd., 1996).

Devore et al. (2000) also found the relative weight for white sturgeon collected from Lake Roosevelt during the study was significantly less than for other local populations. To date, the relative weight of Lake Roosevelt sturgeon is the lowest recorded for any of the Columbia River Basin white sturgeon populations (Underwood, 2000).

Preliminary results from recent stock assessments in the upper Lake Roosevelt suggest the reproductive potential of the population is currently high based on the abundance of broodstock sized fish, good condition factors and maturation characteristics similar to mid-Columbia populations that support limited levels of exploitation with periodic recruitment events. Gamete viability is good based on the success of conservation aquaculture efforts using wild caught broodstock, high survival rates of eggs and larvae during *in situ* incubation experiments, and recent collections of larvae. Despite these findings, recent gill netting has failed to capture wild fish (Howell and McLellan, 2006). Rearing habitat appears productive based on the post-release growth rates of hatchery juvenile releases that have that exceeded those of hatchery juveniles released in the Kootenai River and are similar to those of wild juvenile "trawl and haul" transplants in the mid- Columbia. These results suggest that factors limiting recruitment may primarily be acting on life stages between the initiation of feeding and age 1. The cause of the early mortality is unknown, but could be due to a variety of factors that are primarily acting within Lake Roosevelt. Some suggest the change to reservoir habitats in the upper Columbia River basin may have altered predator/prey relationships making young-of-the-year white sturgeon more vulnerable to predation or, conversely, vulnerable to changes in

their own prey items. It is likely, local population of white sturgeon could have the potential to become a candidate species for ESA protection because of a lack of juvenile recruitment and suitable spawning habitat within Lake Roosevelt.

Kootenay Sturgeon Conservation Hatchery

Based on these findings, the Upper Columbia White Sturgeon Recovery Initiative undertook fish culture work involving adult brood capture, in-hatchery breeding and juvenile rearing of white sturgeon since 2001. The Initiative operated a pilot fish culture conservation program at Hill Creek Hatchery, near Nakusp, Britich Columbia. During the winter of 2002, the larger Kootenay Sturgeon Conservation Hatchery near Cranbrook underwent modifications to operate as a conservation hatchery for upper Columbia white sturgeon. The Kootenay Sturgeon Conservation Hatchery now cultures and rears both Kootenay River white sturgeon and upper Columbia River white sturgeon in separate locations at the same facility. Juvenile fish reared at this conservation hatchery are used to prevent the population from disappearing in the short-term and will provide young fish for research to understand the poor success of reproduction in the wild. Although extremely important, the present fish culture work is not regarded as a long-term solution to the sturgeon's decline.

During the spring months, ripe adult females and males are captured during a May-June broodstock program on the upper Columbia River. The fish are transported to the hatchery and crossed to produce as many as six families and about 12,000 juvenile white sturgeon. Since 2002, between 10,000 and 13,000 juvenile white sturgeon have been released to the Columbia River each spring. The fish are tagged with a small Passive Integrated Transponder (PIT) tag. PIT tags provide information on each fish's background when the fish are subsequently recovered.

Moses Lake Pilot Hatchery

Beginning in February 2004, a Columbia Basin white sturgeon pilot hatchery at Moses Lake began rearing 2003 brood year juveniles for release at recommended sites. The hatchery program continues to develop and refine fish culture techniques, with the goal to implement a larger conservation facility with space to permit adult holding, incubation as well as juvenile rearing facilities.

In May 2004, the first hatchery sturgeon release occurred into Lake Roosevelt, utilizing fish produced at the Kootenay Sturgeon Conservation Hatchery in Canada, and reared by the Washington Department of Fish and Wildlife (WDFW) at the Moses Lake facility. Approximately 2,000 10- to 12-inch long yearling sturgeon were released in the Kettle Falls, North Gorge and Northport areas (LRF, 2004sp). Nearly 3,800 juveniles were released in Lake Roosevelt in 2005 (Howell and McLellan, 2006) and 3,400 12- to 15-inch long age-1 yearlings of the 2006 brood class were released near Kettle Falls and Marcus Flats in May 2007 (WDFW, 2008).

The current process includes: (1) collecting 10 wild spawning adult white sturgeon broodstock (5 of each sex in advanced stages of gonadal development) from the

Northport, Washington spawning site; (2) transporting and holding these fish at Sherman Creek Hatchery in Kettle Falls, Washington; (3) spawning enough fish to produce three unique families (1 male: 1 female matings); (4) transferring 45,000 eggs from Sherman Creek Hatchery to the WDFW Columbia Basin Hatchery in Moses Lake, Washington; and (5) incubating and rearing the juveniles to produce 6,000 white sturgeon from the US sub-population for release in to the Upper Columbia River following the protocols identified in the Upper Columbia River White Sturgeon Recovery Initiative plan. There are currently 70,000 larvae on station and the WDFW anticipates a release of 4,000 yearlings in May 2008 (WDFW, 2008).

Although the cause of the poor juvenile recruitment to the local populations is poorly understood, there has been some successful recruitment in recent years. Recent sampling programs have been initiated under the BPA-sponsored Lake Roosevelt White Sturgeon Recovery Plan (LRWSRP Project #199502700) to locate juvenile upper Columbia white sturgeon in the Lake Roosevelt system and to assess limiting factors. Over a three-day fall 2002 study period, the Spokane Tribe of Indians deployed 45 benthic-set horizontal gillnets in the northern portion of Lake Roosevelt between Northport and Kettle Falls, Washington. A total of 134 fish were collected from six families. Of the samples collected, six were juvenile white sturgeon, and two possessed PIT tags. The two tagged sturgeon juveniles, identified as originating from the British Columbia-based fish culture program at Hill Creek Hatchery, were collected near the river-reservoir interface between 119 and 130 miles upstream of Grand Coulee Dam. Although movement of white sturgeon from Canada into the United States has been verified, it is unknown if these fish return to Canada at some point in their long life-cycle. The other four juvenile sturgeon collected were not marked and were captured in close proximity to each other. These fish ranged from 626 mm to 710 mm in total length, and the Tribe assumed they represented a single-year class.

During the 2004 and 2005 study season, Howell and McLellan (2006) collected 210 wild and 3 juvenile hatchery white sturgeon from the 2001 brood year between Grand Coulee Dam and the US border. A majority of these collections occurred between the mouth of the Colville River and Marcus Island. The authors acoustically tagged 13 adult fish between 6 and 8 feet in length and followed their movements. Total cumulative distance traveled during a 5-month active movement period ranged between 9 and 469 miles with an average distance covered of 191 miles. Howell and McLellan (2006) provided evidence of white sturgeon spawning in the Northport area during late June and early July, 2004. Plankton netting in late July captured early stage sturgeon free-embryos, and the authors reported no sturgeon eggs or larvae in the diets of 164 sampled predators. Nevertheless, young-of-the-year white sturgeon were not found in any sampling during the remainder of the sampling season.

Similarly, Golder Associates, Ltd. (2007) reported the collection of 212 juvenile sturgeon in the upper Lake Roosevelt area during 2005 and 2006 sampling efforts. All of these fish were located near the river bottom in water depths exceeding 50 feet (15 m). Most occurred over fine sediment or fines with some amount of gravels or cobbles. Few of these fish were located over substrates with predominately large bed-element sizes including gravel, cobble or boulder size classes (Golder Associates, Ltd., 2007).

Additional research under the LRWSRP related to juvenile white sturgeon recruitment is on-going to assess life-history characteristics and potential limiting factors to improve recovery planning efforts in the upper Columbia River. Currently no fishery exists for white sturgeon in the Lake Roosevelt area.

Appendix F.
Fish Tissue Sampling Appendix Information

Fish Tissue Sampling Appendix Information

Fish tissue sampling was conducted in 2005 as part of the Phase I RI/FS Report for the upper Columbia River (CH2M Hill, 2007). Fish species and tissue types included in this sampling program were:

- Walleye *(Sander vitreus)* – Fillet and offal at three Fish Sample Collection Areas (FSCAs) and whole body at three FSCAs;
- Rainbow trout *(Oncorhynchus mykiss)* – Fillet and offal at three FSCAs and whole body at three FSCAs;
- Lake whitefish (*Coregonus clupeaformis*) – Whole body only;
- Largescale sucker *(Catostomas macrocheilus)* – Whole body only; and
- Burbot (*Lota lota)* – Whole body only (CH2M Hill, 2007).

Six fish sampling areas were located in Lake Roosevelt at upper, middle, and lower reaches, with five samples for each species and tissue type planned at each sampling location. Fish samples were analyzed for the target analyte list, PCBs, dioxins and furans, arsenic speciation, percent lipids, and percent moisture. Significant results for all tissues types tested during the study include:

- Concentrations were similar in fillet samples across species for nine Preliminary Contaminants of Interest: aluminum, barium, cadmium, chromium, copper, iron, selenium, uranium, and zinc.
- Arsenic and lead concentrations in fillets from walleye and wild rainbow trout were about twice the concentrations for hatchery rainbow trout.
- Mean nickel concentrations in walleye fillets were about three to four times higher than in wild and hatchery rainbow trout fillets.
- Mean mercury concentrations in walleye fillets were about two times those seen in wild and hatchery rainbow trout fillets.
- Wild rainbow trout fillets had about two times the concentration of total PCBs as did walleye fillets. Hatchery rainbow trout fillets were intermediate.
- 2,3,7,8 Tetrachlorodibenzofuran concentrations were about five times greater in wild rainbow trout fillets than in fillets from either walleye or hatchery rainbow trout (CH2M Hill, 2007).

Statistical analysis for relationships between species types and location within Lake Roosevelt (upper, middle, or lower reaches) were also calculated. Results follow:

- **Walleye:** There was no significant difference in the mean whole body walleye concentrations between reaches for aluminum, barium, chromium, iron, and zinc. All other Preliminary Contaminants of Interest (PCOI) showed a significant difference (P>0.1) in mean concentrations between reaches and the highest mean concentration in the middle reach, with the exception of mercury, total PCBs, and 2,3,7,8 TCDF, which showed an increasing downstream trend.

- **Rainbow trout:** For the comparison of whole body wild rainbow trout, the mean concentrations of lead and total PCBs were significantly different (P>0.1) between the upper and middle reaches. All other PCOI showed no significant difference (P>0.1) in mean concentrations. For the whole body hatchery rainbow trout, aluminum, cadmium, copper, lead, nickel, selenium, and mercury showed significant differences (P>0.1) in mean concentrations between the middle and lower reaches. All other PCOI were not significantly different (P>0.1). For the comparison of whole body wild and hatchery rainbow trout in the middle reach, the mean concentrations of arsenic and selenium were significantly different (P>0.1). All other PCOI showed no significant difference (P>0.1) in mean concentrations.

- **Lake whitefish:** There was no significant difference (P>0.1) in the mean lake whitefish whole body concentrations between reaches for aluminum, arsenic, copper, iron, uranium, and zinc. All other PCOI showed a significant difference (P>0.1) in mean concentrations between reaches. The observed pattern between reaches varied by PCOI. Of the PCOI with mean differences, barium and arsenic were characterized by having the highest concentrations in the middle reach; chromium, nickel, and total PCB showed an increasing trend downstream.

- **Largescale sucker:** There was no significant difference (P>0.1) in the mean largescale sucker whole body concentrations between reaches for aluminum, arsenic, barium, chromium, nickel, total PCBs, and 2,3,7,8 TCDF. All other PCOI showed a significant difference (P>0.1) in mean concentrations between reaches. The observed pattern between reaches varied by PCOI. Of the PCOI with mean differences, copper, iron, and zinc were characterized by having the highest concentrations in the upper reach and similar concentrations in the middle and lower reaches. Cadmium, lead, and uranium showed an increasing downstream trend. Mercury increased from the upper to the middle reaches and was the same in the lower reach. Selenium decreased from the middle to lower reaches.

- **Burbot:** There was no significant difference (P>0.1) in the mean burbot whole body concentrations between reaches for chromium, copper, lead, nickel, uranium, zinc, total PCBs, and 2,3,7,8 TCDF. All other PCOI showed a significant difference (P>0.1) in mean concentrations between reaches. The observed pattern between reaches varied by PCOI. Of the PCOI with mean differences, aluminum, barium, cadmium, iron, and mercury were characterized

by increasing downstream concentrations. Arsenic increased between the middle and lower reaches. Selenium decreased downstream. (CH2M Hill, 2007).

The 2007 upper Columbia River Report also compared results from the study with past fish tissue sampling efforts in Lake Roosevelt. These studies were not designed for detailed comparisons, but the following general trends were noted:

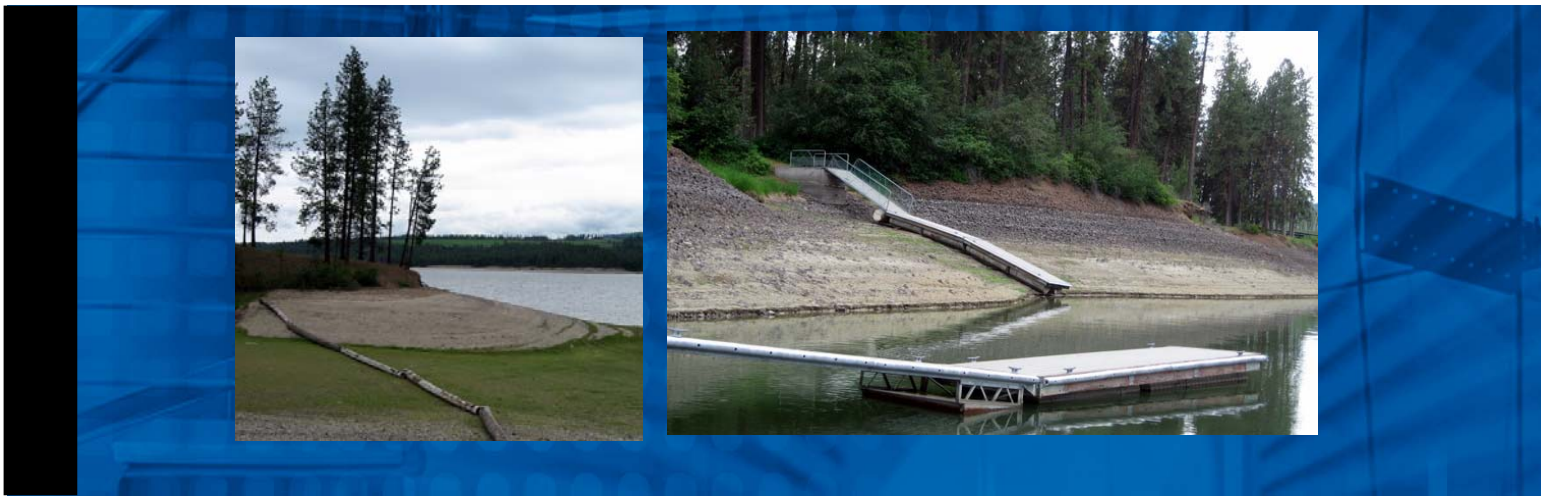
- Mercury may be declining in walleye and rainbow trout (i.e., both wild and hatchery) fillets.
- 2,3,7,8 TCDF continues to decline in lake whitefish.
- Metals appear to be unchanged in walleye and rainbow trout fillets and in largescale sucker whole body, with the exception of lower lead levels in the Northport area (CH2M Hill, 2007).

Appendix G.
Lake Roosevelt Shoreline Management Waterfront Facilities Drawdown Impact Study

Lake Roosevelt Shoreline Management

Waterfront Facilities

Drawdown Impact Study



July 17, 2008

kpff Consulting Engineers

Drawdown Impact Study

July 17, 2008

Prepared for:
National Park Service
Lake Roosevelt National Recreation Area
1008 Crest Drive
Coulee Dam, WA 99116

Prepared by:
KPFF Consulting Engineers
1601 Fifth Avenue, Suite 1600
Seattle, WA 98101
KPFF Project No. 108268

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1. Introduction

BACKGROUND

The Washington State Department of Ecology, in partnership with the U.S. Bureau of Reclamation, has developed a plan to withdraw additional water from Lake Roosevelt. This water will be used to provide additional water supply for municipal and agricultural use, to replace a portion of current ground water usage in the Odessa sub-area, to benefit fish by enhancing stream flows in the Columbia River, and to maintain a steady supply of water to interruptible water rights holders in drought years. This plan for additional water withdrawals is known as the Lake Roosevelt Incremental Storage Releases Program. For non-drought years, the additional water withdrawals will result in a lake level approximately 1 foot below normal levels for a short duration period at the end of August. For drought years, the withdrawals will result in a lake level drawdown of approximately 1.8 feet below normal levels at the end of August.

The Washington State Department of Ecology has developed a Programmatic Environmental Impact Statement (EIS) and a Draft Supplemental EIS to evaluate potential environmental impacts of the proposal, including impacts to recreational and scenic resources. The majority of the lake shoreline is publicly owned and managed by the National Park Service (NPS) as the Lake Roosevelt National Recreation Area (LRNRA). The remaining shoreline is owned and managed by the Confederated Tribes of the Colville Reservation and the Spokane Tribe of Indians.

PURPOSE OF STUDY

The purpose of this report is to evaluate the likely impacts of the Lake Roosevelt Incremental Storage Releases Program on existing public-use facilities that are part of the Lake Roosevelt National Recreation Area, managed by the National Park Service. The facilities in the LRNRA include 26 public campgrounds and boat-in-only campgrounds, 11 designated swimming beaches, and three concessionaire-operated marinas located at Kettle Falls, Keller Ferry, and Seven Bays.

2. Withdrawal Options

RESERVOIR ELEVATIONS

The Programmatic EIS describes the original proposal for timing and quantities of the additional withdrawals. The timing of release proposed concentrates the additional releases in the months of July and August. The maximum amount of additional lake drawdown would occur at the end of August and last from several days to several weeks. The Draft Supplemental EIS describes additional options for timing of the water releases that have the effect of spreading out the withdrawal over the summer and decreasing the expected drawdown at the end of August. This report analyzes the impacts of the Programmatic EIS release timings, because these timings present the greatest drawdown elevations in the late August evaluation period.

Reservoir elevations vary considerably over the course of the year (potentially up to 80 feet) with lowest elevations occurring during the month of May. The reservoir elevation quickly rises in early June so that the lake levels are above elevation 1,280 feet by mid-June. This corresponds with the start of the heavy summer recreation period. Reservoir elevations may reach an elevation of 1,290 feet by mid-July and slowly taper back down to the elevation of 1,280 feet by the end of August, when heavy recreational use is nearing an end. The lake levels quickly rise again in September. Many of the shoreline facilities are currently designed to function only within the range of average summer lake levels, because most recreational usage occurs during the summer months. Additional lake drawdown would produce the greatest impact on August 31st of each year. This coincides with the time of the maximum water level drawdown and is still within the heavy summer visitation period.

Reservoir elevations for current August 31st conditions, and for corresponding proposed elevations due to maximum potential drawdown amounts, are shown below:

Table 2-1: Reservoir Elevations on August 31st

Rainfall Year	Current Elevation (MSL)	Proposed Elevation (MSL)
Average / Wet Year	1,280.0 feet	1,278.9 feet
Dry Year	1,278.0 feet	1,276.9 feet
Drought Year	1,278.0 feet	1,276.2 feet

3. Facility Impacts

SITE VISIT

KPFF Consulting Engineers visited NPS-operated waterfront facilities located along Lake Roosevelt on June 3-6, 2008. Two engineers from KPFF, Katie Herold, a civil engineer and Chris LeVan, a structural engineer, attended all site visits. These site visits allowed KPFF to gain familiarity with the layout of each waterfront facility and to inventory the various waterfront systems in place. Over the duration of the site visits, the water elevation of Lake Roosevelt varied from 1,267.4 feet to 1,272.4 feet. A total of 24 waterfront facility sites were visited. Ray Dashiell of the NPS accompanied KPFF on all site visits for facilities located south of Hunters. Only Lake Roosevelt waterfront facilities that are operated by the NPS or their concessionaires were evaluated. The following facilities were designated as non-impact by the NPS and were not evaluated: Crescent Bay, Hanson Harbor, Lincoln Mill, Hawk Creek, Kamloops Island, Kettle River, Napoleon Bridge, and Summer Island.

There are a total of six NPS-operated boat-in only campsites that have floating facilities located on Lake Roosevelt: Plum Point, Goldsmith, Penix Canyon, Sterling Point, Detillion, and Summer Island. Due to the similarity of these facilities and the difficulty of accessing each individual site, Sterling Point was the only boat-in campsite visited. This site was considered representative of all boat-in only facilities and impacts to the other boat-in sites were judged to be similar.

The NPS also provided photos for several facilities taken after KPFF's site visits with a higher lake water elevation of 1,276.3 feet. These photos provided a closer representation of actual equipment in-service conditions at the evaluation water levels, and were used as an aid to determine the functionality of equipment at the water drawdown levels.

EVALUATION PROCESS

Each NPS facility site included various amenities such as campgrounds, boat ramps, floating docks, play areas, picnic areas, and swimming areas. Of the amenities, only the boat docks, boat ramps, and swimming areas are directly affected by water levels. Facilities were evaluated for expected water level drawdown impacts by first determining the existing level of service provided by waterfront equipment at the current August 31st reservoir elevations shown in Table 2-1. The goal of the evaluation process is to determine what additional modifications, or additions may be required to maintain the same level of service or functionality at the proposed water level drawdown elevations. For example, if a given facility has 40 feet of usable dock length at the current water level elevation of 1,278.0 feet, the goal is to provide the same amount of usable dock length (40 feet) at the lower proposed lake drawdown elevation of 1,276.2 feet.

There are several common waterfront equipment types that are found at the waterfront facilities located along Lake Roosevelt. Most of the facility sites, excluding the boat-in campgrounds, have boat launch ramps. A photo of a typical boat launch is shown in Figure 3-1. Evaluations of boat launches were performed based on the minimum elevation required to launch provided by the NPS; these elevations are included in Appendix A.

Skid docks also exist at most sites with boat launches and sit directly on the concrete surface of the boat launch. See Figure 3-2 for a photo of a typical skid dock. As the water level rises and lowers, the skid docks can be towed up and down the ramp to adjust for fluctuating water levels; thus the skid docks have no impact.

Figure 3-1 – Boat Launch (Seven Bays)

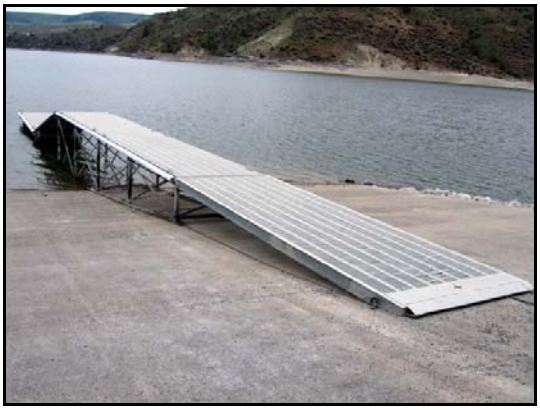

Figure 3-2 – Skid Dock (Crescent Bay)

Courtesy docks are the most common facility amenity. Courtesy docks consist of floating dock sections that are attached to a fixed mount on shore and simply rest on the ground at low water elevations. At low lake elevations, only portions of the courtesy dock may be floating and usable. See Figure 3-3 for a photo of a typical courtesy dock. The typical improvement for this situation is to add an additional dock section to the end of the existing dock system to maintain the same useable length of dock for the current August 31st water levels.

Swim beaches are typically enclosed in one or two rings of either PVC or wood log boom systems. See Figure 3-4 for a typical swimming beach surrounded by PVC and wood log boom systems. These boom systems serve to keep boaters out of the swim area to protect swimmers, to provide a resting point for tired swimmers in areas of deeper water, and to provide some wave attenuation. The mitigation solutions for swimming beaches typically involve lengthening log boom systems and extending the booms outward to enlarge the enclosed swimming area. With the increased likelihood of people swimming beyond the booms in the deeper water, it is recommended that “no boat” buoys be added beyond the outer swim boom.

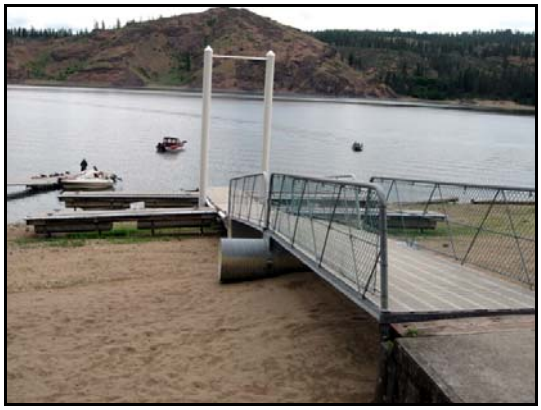

Figure 3-3 – Courtesy Dock (Porcupine Bay)

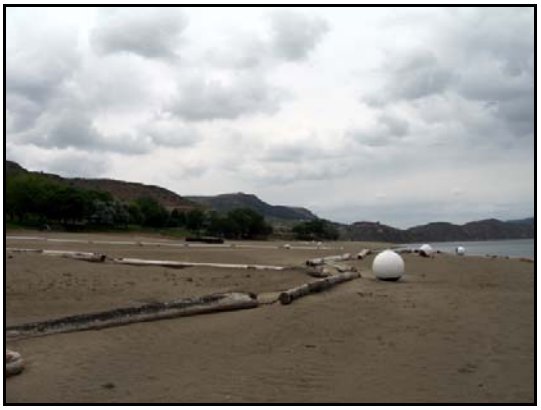

Figure 3-4 – Swimming Boom System (Spring Canyon)

The construction of most waterfront equipment is fairly consistent throughout Lake Roosevelt facility sites. However, three concessionaire-operated marinas have slightly different floating dock systems than other NPS operated facilities. These marina docks are typically wood dock systems that are anchored in place and connected to shore via ramps or stairs. The marinas also typically house floating docks for houseboat loading, fuel stations and boat repair. These are accessible via ramps that fluctuate with the water level. The marinas are all located in protected bays that tend to have large flat and shallow bottom areas. This shallow lake bottom is the restricting factor for low water level usability of the marina boat docks. Shifting docks to slightly deeper water where possible is recommended. See Figures 3-5 and 3-6 for photos of marina facilities.

Figure 3-5 – Marina Facilities (Keller Ferry)

Figure 3-6 – Marina Facilities (Kettle Falls)

The resulting drawdown impact was evaluated by comparing site investigation field notes and photos taken last year by the NPS with photos taken this year when the lake elevation was at approximately 1,276.3 feet. For NPS-attended site visits, the average expected facility functionality was discussed. This functionality was then compared with the resulting expected loss of functionality at the August 31st drought year elevation.

Ground slopes were estimated to determine the extent of beach or boat launch exposure at the drawdown depths. Facilities were evaluated without the benefit of a field survey.

4. Findings

AVERAGE OR WET YEAR

The drawdown amount expected for an average or wet year results in a lake elevation of 1,278.9 feet. This elevation is approximately 1-foot less than the current elevation seen at that time of year. However, 1,278.9 feet is still above the elevations typically seen at that time of the year during a dry or drought year. This drawdown elevation remains within the current normal range of summer elevations when considering dry or drought years. Because this elevation is within the normal facility operating range, the facilities are not newly impacted by the drawdown. There are however, several boat launch facilities that function adequately at 1,280 feet but are not recommended for use at lower elevations. Thus, although the facilities would typically remain functional around August 31st during an average or wet year, they would not now be recommended for use at that time of the year, regardless of the yearly rainfall conditions.

Table 4-1 lists NPS facilities that are not currently designed to function at elevations below 1,280 feet. The values shown for minimum boat launch elevations are published by the NPS.

Table 4-1: Non-Functional Facilities for Water Levels Below 1,280 Feet

Facility	Minimum Boat Launch Elevation	Impacts
Marcus Island	1,281 feet	No new impact.
Hawk Creek	1,281 feet	No new impact.
Evans	1,280 feet	Slight impact in average or wet year only.
North Gorge	1,280 feet	Slight impact in average or wet year only.
China Bend	1,280 feet	Slight impact in average or wet year only.
Napoleon Bridge	1,280 feet	Slight impact in average or wet year only.
Kettle Falls	-	No new impact to swim area.
Kamloops	-	No new impact. Courtesy dock on dry land above 1,280 feet.
Kettle River	-	No new impact. Courtesy dock on dry land above 1,280 feet.

For the Marcus Island and Hawk Creek boat launches, the lake level drops below the recommended launch elevation each year during the summer season. Thus, the drawdown does not directly affect those facilities, because they are already not recommended for use at that time of year.

Evans, North Gorge, China Bend, and Napoleon Bridge see lake elevations below minimum launch elevations at the end of August, during dry and drought years. The boat launches are not typically closed at the listed elevations. Site inspections reveal that all but very large boats and trailers could continue to use the ramps with the new drawdown elevation of 1,278.9 feet.

It is recommended that no improvements be made for this drawdown condition. Water elevations will typically be either already below the published boat launch elevation, or close enough to the elevation that few users would be inconvenienced. The small number of users that would need to go elsewhere to launch their boat and the length of time that this inconvenience would occur is not sufficient to justify improvements. Marcus Island, Hawk Creek, and Evans boat ramps are located in shallow surrounding areas; this is the limiting factor for extending ramps. North Gorge, China Bend, and Napoleon Bridge are in steep bank areas and would require extending the ramp on an embankment or building ramps steeper than the standard slope, neither of which is desirable.

DRY YEAR

The drawdown amount expected for a dry year would yield a lake elevation of 1,276.9 feet on August 31st. This is approximately 1 foot less than the current typical elevation occurring at that time of year. The difference between a drought year and a dry year elevation is approximately 8 inches. The specific difference in functionality that occurs between elevations 1,276.9 feet and 1,276.2 feet is too small to evaluate without the use of field survey data or site observations occurring at those two specific elevations. Therefore, site evaluations concentrated on identifying the impacts for the worst-case drawdown, which occurs during the drought year. Suggested improvements to handle drought year impacts are sufficient to mitigate the dry year drawdown.

DROUGHT YEAR

The drawdown amount expected for a drought year would yield a lake elevation of 1,276.2 feet on August 31st. This is 1.8 feet less than the current typical elevation occurring at that time of year. The drawdown amount impacts several facilities because they currently are not designed for operation at these new lower lake level elevations. The primary facilities impacted are courtesy docks and enclosed swim areas. A summary of facility impacts and recommended mitigation strategies are listed in Table 4-2.

The most common drawdown impact is the loss of floating courtesy dock space for boat moorage. Existing courtesy docks have been fabricated and installed by the National Park Service maintenance staff; the NPS has standard construction details for dock sections with 20-foot or 10-foot lengths and widths of 4 feet, 6 feet, or 8 feet. For a 1.8 feet drop in water elevation, the waterline recedes approximately 16.5 feet down the boat ramp. Many of the courtesy docks lie parallel to and at the same slope as the boat ramp. These docks lose approximately 16.5 feet of moorage space. The recommended mitigation strategy is to add an additional 20-foot length of floating dock section. For courtesy docks not adjacent to boat ramps, the existing ground slope was estimated. It was then determined whether a 10-foot section or a 20-foot dock section should be added. Specific recommendations for each facility can be found in Appendix A.

Swim areas consist of either log booms or polyvinylchloride (PVC) booms anchored to the shore and anchored out in the water. For the swim areas, rough estimates were made to determine the loss of water enclosed in the swim area. The recommendations are to add additional wood or PVC log boom sections to the existing booms and re-anchor the booms in deeper water. At areas where the inner boom already rests on dry land, the recommendation is to extend the outer log boom only. Specific recommendations for each swimming area can be found in Appendix A.

In addition to the boat ramps already impacted during an average or wet year there is one additional ramp impacted. The boat launch ramp at Snag Cove is listed as having a recommended minimum lake elevation of 1,277 feet prior to use. The proposed drought drawdown elevation is 9.5 inches lower than this recommended elevation. The recommended minimum lake boat launch elevations are typically conservative and are expected to impact only very large boats. It is estimated that few if any people will be unable to launch at this ramp during the proposed drought year drawdown. No mitigation is recommended for boat launch ramps.

Estimated costs associated with the recommended improvements are based on the assumption that the National Park Service maintenance staff will purchase materials and construct courtesy docks and swim boom units, rather than an outside contractor. It is also assumed that NPS staff will be responsible for material delivery to the installation site and for all installation work. It is expected to take three years to construct and install the recommended improvements. Cost escalation to the mid point was applied to the total estimated cost assuming 4.5 percent yearly escalation. A summary of the total improvement cost for each site in today's dollars is listed in Table 4-2, with escalation added to the total cost of all improvements at the bottom. A more detailed cost breakdown can be found in Appendix A.

Table 4-2: Facility Impacts for Dry and Drought Years

Facility	Amenities Impacted	Recommended Mitigation	Estimated Total Cost
Spring Canyon	Three Courtesy Docks, PVC and Wood Swim Booms	Add a 20-foot long dock section to each dock, add four logs, move four buoy anchors to log boom, add four "No Boat" buoys, and retrofit PVC boom for easy removal.	$58,200
Plum Point	One Courtesy Dock	Add a 20-foot long dock section.	$12,000
Keller Ferry	Two Courtesy Docks, Wood Swim Boom	Add a 20-foot long dock section to each impacted dock, add four logs, move three buoy anchors, and add four "No Boat" buoys.	$34,200
Goldsmith	One Courtesy Dock	Add a 20-foot long dock section.	$15,000
Penix Canyon	One Courtesy Dock	Add a 20-foot long dock section.	$12,000
Jones Bay	Two Courtesy Docks	Add two 20-foot dock sections and one pile to one dock.	$34,000
Sterling Point	One Courtesy Dock	Add a 20-foot long dock section.	$12,000

Table 4-2 (continued): Facility Impacts for Dry and Drought Years

Facility	Amenities Impacted	Recommended Mitigation	Estimated Total Cost
Seven Bays	Three Marina Dock Systems	Move location of two docks and shore connections. Retrofit dock to allow temporary relocation to attach to main dock.	$42,000
Fort Spokane	Seven Courtesy Docks, Wood Swim Boom	Add two 20-foot sections to one dock, and one 20-foot section to another. Mitigation of other docks not recommended, due to steep bank. Swim area mitigation not recommended, due to narrow deep channel, add three "No Boat" buoys.	$59,500
Detillion	Two Courtesy Docks	Add a 20-foot long dock section to each dock.	$24,000
Porcupine Bay	Two Courtesy Docks, PVC and Wood Swim Booms	Add two 10-foot long sections to one dock and one 20-foot long section to the other. Add one log and two PVC pipes to swim booms and anchors to enlarge swim area. Add plant prohibitory fabric to new swim beach, and add four "No Boat" buoys.	$43,100
Hunters	Three Courtesy Docks, Wood Swim Boom	Add a 20-foot long section to each dock. Add four logs to swim boom and one anchor. Add three "No Boat" buoys.	$55,100
Gifford	Two Courtesy Docks	Add one 20-foot long dock section to one dock and two 10-foot long dock sections to the other.	$35,000
Cloverleaf	Wood Swim Boom	Add five logs and one anchor and relocate shore anchor. Add one "No Boat" buoy.	$8,200
French Rocks	One Courtesy Dock	Add a 20-foot long section to dock.	$12,000
Kettle Falls	One Government Dock	Add a 10-foot long section to dock.	$6,000
Evans	One Courtesy Dock, Wood Swim Boom	Add a 20-foot long section to dock, add four logs, move two anchors, and add two anchors to swim boom.	$21,000
Snag Cove	One Courtesy Dock	Add a 20-foot long section to dock.	$12,000
		Subtotal	**$495,300**
		Escalation to midpoint	**$33,500**
		Total	**$528,800**

5. Conclusion

SUMMARY

The effect of the proposed additional water withdrawals from Lake Roosevelt is a decrease in water elevations during the summer months. The lower water level does not affect summer recreation until the end of August, when the lake level is already at its lowest point of the summer season. During average or wet years, the water elevation is estimated at 1 foot less than the current operating elevation at the same time of year. This lower elevation still remains higher than typical lake levels at that time of year during dry or drought years. Because this water elevation is within current operational elevations, no improvements are recommended.

The drawdown amount for a dry year is 1 foot less than the current operating elevation at the same time of year. There are several facilities that are not currently designed to function at this lower elevation. Courtesy boat docks and swim areas are impacted by the drawdown. A portion of docks will remain above water level and swim areas will contain less water. Improvements are recommended, but it is recommended that improvements be made to handle the additional drawdown expected for the drought year rather than for the dry year alone.

A drought year will see a decrease in elevation 1.8 feet lower than the current drought year operation elevation for that time of year. This water level drop impacts many facilities. The main effect is less usable dock area for the courtesy docks and less surface area and depth of water in the swim areas. It is recommended that facilities be retrofitted where possible to maintain the current level of service. The estimated total cost to retrofit the existing facilities is $528,800. See Table 4-2 and Appendix A for specific recommendations and cost breakdown.

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Appendix A

Facility Equipment Information and Cost Data

Facility	Facility Code	Site Visit	Boat Launch	Swimming	Marina	Boat Campsite	Campground	Waterfront System	Expected Impact For Dry or Drought Year	Current Estimated Cost
									Total for All Facilities =	**$495,300**
Crescent Bay	*CR*	6/3/08	1,265'	-	-	-	-		**Total =**	**$0**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
Spring Canyon	*SC*	6/3/08	1,222'	X	-	-	X		**Total =**	**$58,200**
								Boat Launch	No adverse impact.	-
								Skid Dock - Low-Water	No adverse impact.	-
								Skid Dock - Main	No adverse impact.	-
								Courtesy Dock - Main	Add (1) - 6' x 20' dock section.	$15,000
								Courtesy Dock - Boat Launch - East	Add (1) - 6' x 20' dock section.	$15,000
								Courtesy Dock - Boat Launch - West	Add (1) - 6' x 20' dock section.	$15,000
								Government Dock	Impact does not decrease functionality.	-
								Swim Beach	No adverse impact.	-
								Swim Boom System - PVC - Inner	Retrofit PVC boom system to detach from anchors so it can be removed from the water. Provide (2) floats to attach to anchor cables.	$2,000
								Swim Boom System - Wood - Outer	Add (4) - 30' logs to outer wood swim boom system to enlarge swimming area. Move (4) buoy anchors further outward. Add (4) "No Boat" buoys w/ anchors.	$11,200
Plum Point	*PP*	-	-	-	-	X	-		**Total =**	**$12,000**
								Courtesy Dock	Add (1) - 4' x 20' dock section.	$12,000
Keller Ferry	*KY*	6/3/08	1,229'	X	X	-	X		**Total =**	**$34,200**
								Boat Launch	No adverse impact.	-
								Skid Dock - Low-Water	No adverse impact.	-
								Skid Dock - Main	No adverse impact.	-
								Courtesy Dock - Boat Launch	Add (1) - 6' x 20' dock section.	$15,000
								Courtesy Dock - East	Add (1) - 6' x 20' wood dock section.	$8,000
								Courtesy Dock - West	No adverse impact.	-
								Service Dock - D	No adverse impact.	-
								Moorage Dock	No adverse impact.	-
								Swim Beach	No adverse impact.	-
								Swim Boom System - Wood - Inner	Inner boom on dry land and outer boom becomes new swim area boundary. No need to extend inner boom.	-
								Swim Boom System - Wood - Outer	Add (4) - 30' logs to outer wood swim boom system to enlarge swimming area. Move (3) buoy anchors further outward. Add (4) "No Boat" buoys w/ anchors.	$11,200
Goldsmith	*GS*	-	-	-	-	X	-		**Total =**	**$15,000**
								Courtesy Dock	Add (1) - 6' x 20' dock section.	$15,000

Facility	Facility Code	Site Visit	Boat Launch	Swimming	Marina	Boat Campsite	Campground	Waterfront System	Expected Impact For Dry or Drought Year	Current Estimated Cost
									Total for All Facilities =	**$495,300**
Hanson Harbor	*HH*	6/3/08	1,253'	-	-	-	-		**Total =**	**$0**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
Penix Canyon	*PC*	-	-	-	-	X	-		**Total =**	**$12,000**
								Courtesy Dock	Add (1) - 4' x 20' dock section.	$12,000
Jones Bay	*JB*	6/3/08	1,268'	-	-	-	X		**Total =**	**$34,000**
								Boat Launch	No adverse impact.	-
								Courtesy Dock - Boat Launch	No impact. (dock section added to Courtesy Dock - Campground instead)	-
								Courtesy Dock - Campground	Add (2) - 4' x 20' dock sections. Add (1) new pile.	$34,000
Sterling Point	*SP*	6/4/08	-	-	-	X	-		**Total =**	**$12,000**
								Courtesy Dock	Add (1) - 4' x 20' dock section.	$12,000
Lincoln Mill	*LM*	6/4/08	1,268'	-	-	-	-		**Total =**	**$0**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
Hawk Creek	*HC*	6/4/08	1,281'	-	-	-	X		**Total =**	**$0**
								Boat Launch	No new impact. Shallow bay is limiting factor.	-
								Courtesy Dock - Boat Launch	No new impact. Shallow bay is limiting factor.	-
								Courtesy Dock - Campground	No new impact. Shallow bay is limiting factor.	-

Facility	Facility Code	Site Visit	Boat Launch	Swimming	Marina	Boat Campsite	Campground	Waterfront System	Expected Impact For Dry or Drought Year	Current Estimated Cost
									Total for All Facilities =	**$495,300**
Seven Bays	*SB*	6/4/08	1,227'	-	X	-	-		**Total =**	**$42,000**
								Boat Launch	No adverse impact.	-
								Skid Dock - Low-Water	No adverse impact.	-
								Skid Dock - Main	No adverse impact.	-
								Dock A	Dock A can be shifted towards the lake along with Dock B, since Dock C is no longer used. This requires construction of (1) new set of stairs w/ handrails and relocation of dock anchors.	$20,000
								Dock B	Relocate along with Dock A. This requires construction of (1) new set of stairs w/ handrails and relocation of dock anchors.	$20,000
								Dock D	No adverse impact.	-
								Dock E	No adverse impact.	-
								Dock F	No adverse impact.	-
								Dock G	Relocate and attach to end of main dock. Relocate dock anchors.	$2,000
								Dock K	No adverse impact.	-
								Main Dock	No adverse impact.	-
Fort Spokane	*FS*	6/4/08	1,247'	X	-	-	X		**Total =**	**$59,500**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
								Courtesy Dock - Boat Launch	Add (2) - 6' x 20' dock sections. Add (1) additional pile.	$40,000
								Courtesy Dock - Picnic - #1	Add (1) - 6' x 20' dock section. (picnic dock near boat launch)	$15,000
								Courtesy Dock - Picnic - #2	Impacted. No space available to extend.	-
								Courtesy Dock - Picnic - #3	Impacted. No space available to extend.	-
								Courtesy Dock - Campground - #1	Impacted. Not advisable to extend, too steep.	-
								Courtesy Dock - Campground - #2	Impacted. Not advisable to extend, too steep.	-
								Courtesy Dock - Campground - #3	Impacted. Not advisable to extend, too steep.	-
								Government Dock	Impacted. Not advisable to extend, too steep.	-
								Swim Beach	No significant impact. Steep bank in swim area. Lower water elevations don't significantly decrease available swim area.	
								Swim Boom System - Wood	No significant impact. Steep bank in swim area. Lower water elevations don't significantly decrease available swim area. Add (3) "No Boat" buoys w/ anchors.	$4,500

Facility	Facility Code	Site Visit	Boat Launch	Swimming	Marina	Boat Campsite	Campground	Waterfront System	Expected Impact For Dry or Drought Year	Current Estimated Cost
									Total for All Facilities =	**$495,300**
Detillion	*DE*	-	-	-	-	X	-		**Total =**	**$24,000**
								Courtesy Dock - West	Add (1) - 4' x 20' dock section.	$12,000
								Courtesy Dock - East	Add (1) - 4' x 20' dock section.	$12,000
Porcupine Bay	*PB*	6/4/08	1,243'	X	X	-	X		**Total =**	**$43,100**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
								Courtesy Dock - Day Use	Add (2) - 6' x 10' dock sections.	$18,000
								Courtesy Dock - Boat Launch	Add (1) - 6' x 20' dock section.	$15,000
								Swim Beach	Add approximately 2,000 square feet plant prohibitory fabric to beach.	$1,500
								Swim Boom System - PVC - Inner	Add (2) PVC boom sections and move shore anchor to extend swim area towards campground.	$1,600
								Swim Boom System - Wood - Outer	Remove (1) wood log from boat beach boom and add to swim boom and move shore anchor 30 ft to extend swim area towards campground. Add (4) "No Boat" buoys w/ anchors.	$7,000
Hunters	*HU*	6/5/08	1,232'	X	-	-	X		**Total =**	**$55,100**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
								Courtesy Dock - Boat Launch - East	Add (1) - 6' x 20' dock section.	$15,000
								Courtesy Dock - Boat Launch - West	Add (1) - 6' x 20' dock section.	$15,000
								Courtesy Dock - Day Use Area	Add (1) - 6' x 20' dock section.	$15,000
								Courtesy Dock - Campground	No new impact. (already out of service by 1,278')	-
								Swim Beach	No adverse impact.	-
								Swim Boom System - Wood	Add (4) log boom sections and (1) anchor w/ buoy. Add (3) "No Boat" buoys w/ anchors.	$10,100
Gifford	*GC*	6/5/08	1,249'	-	-	-	X		**Total =**	**$35,000**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
								Courtesy Dock - Boat Launch - South	No new impact. (already out of service higher than 1,278')	-
								Courtesy Dock - Boat Launch - North	Add (1) - 6' x 20' dock section.	$15,000
								Courtesy Dock - Campground	Add (2) - 8' x 10' dock sections. (Enlarge berths between finger docks.)	$20,000

Facility	Facility Code	Site Visit	Boat Launch	Swimming	Marina	Boat Campsite	Campground	Waterfront System	Expected Impact For Dry or Drought Year	Current Estimated Cost
									Total for All Facilities =	**$495,300**
Cloverleaf	*CL*	6/5/08	-	X	-	-	X		**Total =**	**$8,200**
								Courtesy Dock	No new impact. (already out of service higher than 1,278')	-
								Swim Beach	No adverse impact.	-
								Swim Boom System - Wood	Add (5) - 30' logs and (1) anchor w/ buoy to log boom system at center of channel. Relocate shore anchor on south side 50' towards the lake. Add one "No Boat " buoy w/ anchor.	$8,200
Daisy	*DR*	6/5/08	1,265'	-	-	-	-		**Total =**	**$0**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
								Courtesy Dock	No new impact. (already out of service higher than 1,278')	-
Bradbury Beach	*BB*	6/5/08	1,251'	X	-	-	-		**Total =**	**$0**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
								Courtesy Dock	No new impact. (already out of service higher than 1,278')	-
								Swim Beach	No adverse impact.	-
								Swim Boom System - PVC - Inner	No significant impact. Lower water elevations don't significantly decrease available swim area or affect usability.	-
								Swim Boom System - Wood - Outer	No significant impact. Lower water elevations don't significantly decrease available swim area or affect usability.	-
French Rocks	*FR*	6/6/08	1,265'	-	-	-	-		**Total =**	**$12,000**
								Boat Launch	No adverse impact.	-
								Skid Dock	No adverse impact.	-
								Courtesy Dock	Add (1) - 4' x 20' dock section.	$12,000

Facility	Facility Code	Site Visit	Boat Launch	Swimming	Marina	Boat Campsite	Campground	Waterfront System	Expected Impact For Dry or Drought Year	Current Estimated Cost
									Total for All Facilities =	**$495,300**
Kettle Falls	*KF*	6/5/08	1,234'	X	-	-	X		**Total =**	**$6,000**
								Boat Launch	No adverse impact.	-
								Skid Dock - Boat Launch - South	No adverse impact.	-
								Skid Dock - Boat Launch - North	No adverse impact.	-
								Government Dock	Add (1) - 4' x 10' dock section.	$6,000
								Swim Beach	No new impact. (already out of service higher than 1,278')	-
								Swim Boom System - Wood	No new impact. (already out of service higher than 1,278')	-
								Fuel Station Dock System	No adverse impact.	-
								Boat Repair Dock	No adverse impact.	-
								Main Access Dock	No adverse impact.	-
Kamloops Island	*KI*	-	-	-	-	-	X		**Total =**	**$0**
								Courtesy Dock	No new impact (per NPS, no site visit).	-
Kettle River	*KR*	-	-	-	-	-	X		**Total =**	**$0**
								Courtesy Dock	No new impact (per NPS, no site visit).	-
Napoleon Bridge	*NB*	6/5/08	1,280'	-	-	-	-		**Total =**	**$0**
								Boat Launch	No new impact.	-
Marcus Island	*MI*	6/5/08	1,281'	X	-	-	X		**Total =**	**$0**
								Boat Launch	No new impact.	-
								Courtesy Dock	No new impact. (already out of service higher than 1,278')	-
								Swim Beach	No new impact.	-
								Swim Boom System - Wood	No new impact. Shallow bay. Safe to swim beyond boom because boats won't be using ramp in the area at low lake levels.	-
Summer Island	*SI*	-	-	-	-	X	-		**Total =**	**$0**
								Courtesy Dock	No new impact (per NPS, no site visit).	-
Evans	*EV*	6/5/08	1,280'	X	-	-	X		**Total =**	**$21,000**
								Boat Launch	No new impact.	-
								Courtesy Dock - Boat Launch	No new impact.	-
								Courtesy Dock - Campground	Add (1) - 6' x 20' dock section.	$15,000
								Swim Beach	No adverse impact.	-
								Swim Boom System - PVC - Inner	No adverse impact. PVC will lay on beach, outer boom becomes new swim area limits.	-
								Swim Boom System - Wood - Outer	Add (4) logs to boom, move (2) existing anchors and add (2) anchors.	$6,000

Facility	Facility Code	Site Visit	Boat Launch	Swimming	Marina	Boat Campsite	Campground	Waterfront System	Expected Impact For Dry or Drought Year	Current Estimated Cost
									Total for All Facilities =	**$495,300**
Snag Cove	*SN*	6/5/08	1,277'	-	-	-	X		**Total =**	**$12,000**
								Boat Launch	No significant impact. Lengthening not justified.	-
								Skid Dock	No adverse impact.	-
								Courtesy Dock	Add (1) - 4' x 20' dock section.	$12,000
North Gorge	*NG*	6/5/08	1,280'	-	-	-	X		**Total =**	**$0**
								Boat Launch	No new impact.	-
								Courtesy Dock - West	No new impact. (already out of service higher than 1,278')	-
								Courtesy Dock - Boat Launch	No new impact. (already out of service higher than 1,278')	-
China Bend	*CB*	6/5/08	1,280'	-	-	-	-		**Total =**	**$0**
								Boat Launch	No new impact.	-
								Courtesy Dock	No new impact.	-