Final

EVALUATION AND FINDINGS REPORT

on the

Application for Certification
Pursuant to Section 401 of the
Federal Clean Water Act

Submitted by:

Portland General Electric Company
and
The Confederated Tribes of the Warm Springs Reservation of Oregon

for the

RELICENSING OF THE PELTON ROUND BUTTE HYDROELECTRIC PROJECT
ON THE DESCHUTES RIVER, JEFFERSON COUNTY, OREGON
(FERC No. 2030)

Pursuant to
Oregon Administrative Rules Chapter 340, Division 48

Prepared by:

Oregon Department of Environmental Quality
811 S. W. 6th Ave.
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June 19, 2002

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1. INTRODUCTION

On December 16, 1999, Portland General Electric Company (PGE) and on December 17, 1999, the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS; Tribes), joint licensees for the Pelton Round Butte Hydroelectric Project (Project), filed competing applications with the Federal Energy Regulatory Agency (FERC) for a new license. On February 1, 2000, PGE and the Tribes reached final agreement on a settlement of their pending relicensing competition. On April 20, 2000, the Tribes and PGE requested FERC approval of the settlement, and on November 21, 2000, FERC approved that settlement. Subsequently, on June 29, 2001, the licensees filed a *joint* application for a new FERC license for the Project (FERC Project No. 2030).

The existing license for the Project was issued for a period ending December 31, 2001. Although the license term has expired, FERC has issued an annual license to the licensees under the terms and conditions of the prior license. Per federal regulation, the annual FERC license will automatically renew until such time as FERC takes action to issue a long-term license or otherwise orders disposition of the Project.

The Project is located on the Deschutes River near Madras, in Jefferson County, Oregon. Much of the Project straddles a CTWS and state boundary and impacts both tribal and state waterways. As required under the Federal Clean Water Act (CWA) and state and tribal law, the two applicants initially filed individually for § 401 water quality certifications from the Oregon Department of Environmental Quality (ODEQ; Department) and the Water Control Board of the Confederated Tribes of the Warm Springs Reservation of Oregon (WCB). Following FERC's approval of competition settlement, ODEQ and the WCB on November 2 and 3, 2000, respectively, denied *without prejudice* the individual applications for § 401-water quality certification.

On June 26, 2001, ODEQ received a new § 401 water quality certification application submitted jointly by the Tribes and PGE (Joint Applicants), dated June 2000. On July 5, 2001, the Department also received a copy of the June 2000 Final Joint Application Amendment (FJAA) being submitted by the Joint Applicants to FERC for a new joint license.

The record generated in the process of reviewing the § 401 application, all supplemental information submitted by the Joint Applicants, and all materials received as part of the public review process, are considered part of the record regarding § 401 application. This report documents ODEQ's evaluation of the § 401 application and its finding for conditional § 401 certification.

2. REQUIREMENTS FOR CERTIFICATION

Section 401 of the Federal Clean Water Act (33 USC §1341; Clean Water Act; CWA) establishes requirements for State certification of proposed projects or activities that may result in any discharge of pollutants to navigable waters. Before a Federal agency may issue a permit or license for any project that may result in any discharge of pollutants to navigable waters, the state must certify that the proposed project or activity will comply with applicable effluent limitations, water quality related effluent limitations, water quality standards and implementation plans, national standards of performance for new sources, and toxic and pretreatment effluent standards of Sections 301, 302, 303, 306, and 307 of the Clean Water Act and any state regulations adopted to implement these sections.

The state is further authorized to condition any granted certificate to assure compliance with appropriate water quality-related requirements of state law.

The federal Clean Water Act creates a unique system for protection of water quality. States have primary responsibility and authority for protecting water quality. ODEQ is the agency of the State of Oregon designated to carry out the certification functions prescribed by § 401 of the Clean Water Act for state waters. With respect to tribal waters, the U.S. Environmental Protection Agency (EPA) has primary § 401 responsibility and authority unless such authority has been delegated to the tribe. The CTWS applied for and received § 401 authority for its reservation waters, and the WCB is the entity within the CTWS with this regulatory authority.

ODEQ must act on an application for certification in a manner consistent with the following federal and state requirements:

** **Federal Requirements:** Sections 301, 302, 303, 306, and 307 of the Federal Clean Water Act. These sections prescribe effluent limitations, water quality related effluent limitations, water quality standards and implementation plans, national standards of performance for new sources, and toxic and pretreatment effluent standards.

** **State Requirements:** Oregon Administrative Rule (OAR) 340-041 and 340-048-0005 to 340-048-0040. These rules were adopted by the Environmental Quality Commission (EQC) to prescribe the state's water quality standards and procedures for receiving, evaluating, and taking final action upon a § 401-certification application. The rules include requirements for general information such as the location and characteristics of the project, as well as confirmation that the project complies with appropriate local land use plans and any other requirements of state law that have a direct or indirect relationship to water quality.

Oregon Revised Statute (ORS) 468B.040 This state statute prescribes procedural requirements and findings with which ODEQ must comply as it makes a decision on a § 401-certification application. This statute makes reference to the federal law requirements, state water quality rules, and requirements of state law regarding hydroelectric projects and other appropriate requirements of state law.

ORS 197.180(1) This statute requires state agency actions to be consistent with acknowledged land use plans and implementing regulations, or if a plan is not acknowledged, compatible with state land use goals. Findings must support the state agency action.

ORS 543A This statute establishes procedures for coordination among state agencies in the reauthorization of federally licensed hydroelectric projects, including state certification of water quality.

EQC rules identify the information that must be included in an application for § 401 certification [OAR 340-048-0020(2)]. The application together with information provided during the public input process is essential to support the following determinations to be made by ODEQ pursuant to § 401 of the Federal Clean Water Act and state law:

a. The determination of whether to issue or deny certification pursuant to the requirements of Sections 301, 302, 303, 306, and 307 of the Clean Water Act.

b. The determination of specific water quality-related requirements of state law which are appropriate to include as conditions in any granted certificate pursuant to § 401(d) of the Clean Water Act.

c. Development of findings as required by ORS 468B.040 and ORS 197.180(1).

After a completed application is filed with ODEQ, a public notice is prepared and circulated to solicit comments and input from interested citizens, groups, and agencies. Following the end of the public comment process, ODEQ must summarize comments received, evaluate the application and public comments, and notify the applicant of a decision on the application.

3. SUMMARY OF § 401 APPLICATION FILED WITH ODEQ

3.1 Documents Filed in Support of § 401 Application

The following documents were submitted by the Joint Applicants in support of their § 401 application and are part of the ODEQ record.

3.1.1 Documents Filed Prior to or with § 401 Application Filing

1. Portland General Electric Company and Confederated Tribes of the Warm Springs Reservation of Oregon Joint Application for Certification Pursuant to Section 401 of the Clean Water Act for Relicensing of the Pelton Round Butte Hydroelectric Project on the Deschutes River, Jefferson County, Oregon. June 2001. Received June 26, 2001

2. Application for a New License for the Pelton Round Butte Project (FERC Project No. 2030), including:

   - Final Joint Application Amendment (FJAA) for the Pelton Round Butte Hydroelectric Project (FERC Project Nos. 2030 and 11832), June 2001. Received June 29, 2001.

   - Portland General Electric Company Application for a New License for the Pelton Round Butte Project (FERC No. 2030), December 1999.

   - Confederated Tribes of the Warm Springs Reservation of Oregon Application for a New License for the Pelton Round Butte Project (FERC No. 11832), December 1999.

3. Limnology of Lake Billy Chinook and Lake Simtustus, Oregon. 1997. Report by R. Raymond, E. Eilers, K. Vache, and J. Sweet, E&S Environmental Chemistry, Inc., Corvallis, Oregon. Submitted to Portland General Electric Company.

4. Lower Deschutes River Studies: Water Quality and Biota, 1998. Report by R. Raymond and E. Eilers, E&S Environmental Chemistry, Inc., Corvallis, Oregon. Submitted to Portland General Electric Company.

5. Water Temperatures in Lower Deschutes River, Oregon, 1999. Report by C. Huntington, Clearwater BioStudies, Inc.; T. Hardin, Hardin-Davis, Inc.; and R. Raymond, E & S Consultants, Inc.

6. Water Quality Model Results in Support of PGE's 401 Certificate Application – Predicted Water Quality at Reregulating Dam and Lake Billy Chinook. Technical Memorandum by T. Khangaonkar, C. DeGasperi, S. Breithaupt, and Z. Yang. 1999. Foster Wheeler Environmental Corporation. Belleview, Wash. (§ 401 Certification Application Appendix 1).

7. Hydroacoustic Cross-Sections of Lake Billy Chinook Utilized in Calculating Kokanee Population Estimates. Prepared by C. Kern, S. Thiesfeld, and A. Dale. Oregon Department of Wildlife. (§ 401 Certification Application Appendix 2).

8. Local Land Use Compatibility Statement, Jefferson County Community Development Department. (§ 401 Certification Application Appendix 3).

9. Lower Deschutes River Macroinvertebrate and Periphyton Monitoring Report, Fall 1999 and Spring 2000 Sampling. 2001. B. Kvam, E. Connor, E. Greenberg, D. Reiser, and C. Eakin. R2 Resource Consultants. (§ 401 Certification Application Appendix 4).

10. Water Quality Model of Lake Simtustus. Z. Yang, T. Khangoankar, C. DeGasperi, and S. Breithaupt. 2001. Foster Wheeler Environmental Corporation. (§ 401 Certification Application Appendix 5).

11. Water Quality Model of the Lower Deschutes River. S. Breithaupt, T. Khangaonkar, Z. Yang, and C. DeGasperi. 2001. Foster Wheeler Environmental Corporation. (§ 401 Certification Application Appendix 6).

3.1.2 Documents Filed Following Initial § 401 Application Filing/Pre-Public Notice

1. Reregulation Discharge Data Correlation Analysis. Technical Memorandum by C. DeGasperi, Z. Yang, S. Breithaupt, and T. Khangaonkar. May 24, 2000. Foster Wheeler Environmental Corporation. Belleview, Wash.

2. Total Dissolved Gas Issues – Pelton Round Butte Hydroelectric Project. Memorandum delivered by the Joint Applicants to the Fisheries Technical Subcommittee on February 19, 2002.

3. Pelton Round Butte Project Water Quality Management and Monitoring Plan. Second Draft. February 2002. Confederated Tribes of Warm Springs Reservation of Oregon and Portland General Electric Company.

4. Selective Withdrawal Operation and Its Effect on Temperature and Water Quality During Drought Conditions. March 6, 2002. T. Khangaonkar. Foster Wheeler Environmental Corporation. Pelton Round Butte Annual Fisheries Workshop.

3.1.3 Documents Filed Following Public Notice

1. Draft Joint Applicants' response to Additional Information Request (AIR) regarding issue of the applicability of the ± 10% rule above 6,000 cfs. Email message from Julie Keil of Portland General Electric Company, June 2, 2002.

2. June 13, 2002 Email correspondence from Julie Keil of Portland General Electric Company indicating Joint Applicants' general support for ODFW's proposal for 200 cfs flow augmentation to the lower river during the fall under certain drought conditions. (See Section 9.12.7.5, minimum streamflows)

3.2 Notification of Complete Application

On July 30, 2001, ODEQ notified the Joint Applicants that it deemed the application for § 401 certification to be administratively complete for processing. On December 5, 2001, ODEQ

requested additional detail regarding the Joint Applicants proposed water quality management and monitoring. As indicated in Section 3.1.2, above, the Joint Applicants provided this additional information in support of their application.

3.3 Legal Name and Address of Project Owner (Applicant)

Portland General Electric Company
121 SW Salmon Street
Portland, OR 97204;

and

The Confederated Tribes of the Warm Springs Reservation of Oregon
P.O. Box C
Warm Springs, OR 97761

3.4 Legal Name and Address of Owner's Official Representatives

Julie Keil, Hydropower Relicensing
Portland General Electric Company
121 SW Salmon Street
Portland, OR 97204
(503) 464-8864

James Manion, General Manager
Warm Spring Power Enterprises
P.O. Box 960
Warm Springs, OR 97761
(541) 553-1046

3.5 Description of Project Location

The Project is located near river mile (RM) 100 on the Deschutes River in Jefferson County, Oregon. Round Butte Dam is located at T. 11 S., R. 12 E., Section 22. Pelton Dam is located at T. 10 S., R. 13 E., Section 18. The Reregulating Dam is located at T. 10 S., R. 12 E., Section 1. Detailed legal description of the Project location can be found in Exhibit G of PGE's FERC final license application.

3.6 Waters of the State Impacted by Project

Reservoirs behind Project dams impound the Deschutes River from RM 100 to approximately RM 120, the Crooked River from its mouth to approximately RM 7, and the Metolius River from its mouth to approximately RM 13. Most dramatic impact to the Deschutes River below the Project is experienced from RM 100 to approximately RM 85. Below RM 85, effects of the Project may be masked by ambient conditions and by inputs from tributaries and other point sources. The distance downstream that Project effects extend is dependent upon the constituent under consideration. Recent temperature studies have shown effects extending to the mouth of the Deschutes River (Huntington et al. 1999)

3.7 Adjacent Land Use and Ownership

The major property owners adjacent to the Project include the Confederated Tribes of the Warm Spring Reservation of Oregon, the U.S. Bureau of Land Management, the U.S. Forest Service, Crooked River National Grassland, the State of Oregon, and various private owners (§ 401 Certification Application Figure 2.6-1). There are approximately 15,445 acres of land within ¼ mile of the Project boundary. Adjacent land ownership is described in more detail in the following table.

Table 3.7-1. Land ownership and management within 1/4 mi. of the Project boundary.

Land Owner	**Acres**
United States Government	
Bureau of Land Management, Prineville District	4,320
Crooked River National Grassland (USFS)	2,184
Deschutes National Forest (USFS)	654
Confederated Tribes of the Warm Springs Reservation of Oregon	4,448
Private (excluding PGE)	2,024
State of Oregon	918
Jointly Owned Lands	897
Total	**15,445**

Adjacent land use within ¼ mile of the Project boundary is shown in § 401 Certification Application Figure 2.6-2. The vast majority of land use is depicted as undeveloped non-forest upland. Much smaller tracts of undeveloped forest land use occurs in the very upper arm of the Metolius branch of Lake Billy Chinook, while limited agriculture land use occurs in the upper Crooked branch.

4. DESCRIPTION OF PROJECT

The following description of the existing Project was prepared by ODEQ based on its understanding of the information presented in the application documents.

4.1 Project Overview

The Pelton Round Butte Project (Project) is an existing hydroelectric project Jefferson County, Oregon. The Project consists of the Round Butte, Pelton, and Reregulating developments located in sequence on the Deschutes River. The uppermost development, Round Butte, releases water directly into the Pelton Development and then into the Reregulating Development. The Project is operated as a modified run-of-river system in which the average daily discharge from the Reregulating Development is approximately equal to the average daily inflow to the Round Butte Development.

Both the Round Butte and Pelton developments are store-and-release facilities that are operated in a peaking mode. Water is passed daily through the turbines at the two developments during system peak electric power demand periods and then held (stored) during the relatively low-demand or off-peak periods. The Reregulating Development functions to redistribute the flows from the upstream developments and provide near-constant flows in the Deschutes River downstream of the Project.

4.1.1 Round Butte Development

Of the three developments, the 300-MW Round Butte Development is the largest in terms of both generation and reservoir storage capacity. The Round Butte Dam, located at RM 110.4, is a 440-foot-high rock-filled dam that creates a reservoir named Lake Billy Chinook. The crest of the dam is at 1,955 feet above mean sea level (MSL), measures 44 feet wide and is 1,382 feet long. Water currently exits the reservoir through an intake structure at a depth of about 280 feet below the normal high water surface elevation. On rare occasion, reservoir water is spilled over a concrete spillway located in the west abutment at elevation 1,915 feet (MSL). The spillway discharge is equipped with a 65-foot-long concrete flip bucket-type deflector to dissipate energy and prevent downstream erosion.

Lake Billy Chinook backs up into the Deschutes River, Crooked River and Metolius River canyons. The reservoir waters extend upstream from Round Butte Dam nine miles up the Deschutes River canyon, seven miles up the Crooked River canyon, and thirteen miles up the canyon of the Metolius River. The widest section of the reservoir measures about 3,000 feet wide, and the maximum depth in the forebay is about 420 feet. At the normal high water elevation of 1,945 feet (MSL), Lake Billy Chinook has a surface area of about 4,000 acres with an estimated total gross storage volume of 535,000 acre-feet. Under the current license drawdown allowance of 85 feet, the estimated maximum usable storage capacity is 274,000 acre-feet.

In a typical year, Lake Billy Chinook is drawn down about 10 feet during the period from November through February or March, and is refilled during April and May. Under the current Federal license, the reservoir must be kept at the highest level practicable from June 15 through September 15 of each year. The State license for the Round Butte Development requires that the reservoir be maintained at a stable pool elevation with a fluctuation not to exceed 1.0 foot during the same period. As a result of the Federal and State license requirements, the elevation of the reservoir

is generally kept within 1.0 foot of the normal maximum water surface elevation of 1,945 feet (MSL) from June 15 through September 15 of each year.

The Round Butte Powerhouse contains three vertical Francis-type turbines that were placed into operation in 1964. The Joint Applicants are planning to increase the efficiency and capacity of the Round Butte Development by replacement of turbine runners in two of the three generating units starting in 2002. These upgrades will include improvements of the water inlet path to the turbines and will improve turbine efficiency by about five percent.

The Round Butte Development also includes a 100-mile-long, 230-kV (kilovolt) transmission line extending from the Development's switchyard to PGE's bethel Substation, and a 10.5-mile-long, 12.5-kV transmission line to the Reregulating Development.

4.1.2 Pelton Development

The 110.4 MW Pelton Development is located downstream from the Round Butte Dam and upstream of the Reregulating Development. Pelton Dam, located at RM 110.4, is a 204-foot-high thin-arch variable radius reinforced concrete structure that impounds a reservoir named Lake Simtustus. The dam measures 636 feet along its crest at elevation 1,585 (MSL), with a base circle radius of 350 feet. An intake structure is incorporated into the upstream face of the arch dam and withdraws reservoir water from an elevation of 1,430 (MSL) which equates to a depth of 150 feet below maximum pool level. A spillway is located along the left bank with a crest at elevation 1,558 feet (MSL). The spillway channels have a curved lip at the end allowing spilled water to fall freely into the river.

The 7.9-mile-long Lake Simtustus backs from Pelton Dam up to the Round Butte Dam tailrace. Total shoreline length of the reservoir is about 18 miles. Because of the high steep river canyon, the reservoir is relatively narrow, varying in width from about 300 feet to nearly 1,000 feet. The normal maximum surface area of Lake Simtustus at elevation 1,580 feet (MSL) is approximately 540 acres. Maximum depth at the dam is about 165 feet. The estimated gross and usable storage capacities of the reservoir are 31,000 acre-feet and 3,700 acre-feet, respectively.

Over a 24-hour period, the discharge from Lake Billy Chinook into the Pelton Development reservoir, Lake Simtustus, is approximately the same as that passed from Lake Simtustus to the Reregulating Development. However, differences between the peak flow (corresponding to the peak operating point of the generating units) at the Round Butte Development can result in water level fluctuations in Lake Simtustus. The daily fluctuation in Lake Simtustus is generally less than 0.75 feet, but can exceed 3.5 feet as much as 25 percent of the time in a given year depending upon inflow and Project operation.

The Pelton Powerhouse contains three vertical Francis-type turbines that were in commercial operation by the spring of 1958. A 230-kV single-circuit transmission line about 7.9 miles long extends from the powerhouse to the Round Butte Switchyard.

4.1.3 Reregulating Development

Lowermost, and much smaller of the three developments, is the Reregulating Development. The Reregulating dam was constructed in 1957 along with the Pelton Dam as part of the original Pelton

Project. The reservoir behind the dam, aptly named the Reregulating Reservoir, is used to store the peaking flows from the upper developments and to release a near-constant flow into the Deschutes River downstream of the Project.

The Reregulating Dam is a rock-filled structure with a concrete gravity-type spillway, located at RM 100.1, about 2.5 miles downstream of Pelton Dam. The dam has a crest length of 1,067 feet, inclusive of a 250-foot concrete gravity section with a 163-foot spillway section. The maximum height of the dam is 88 feet at an elevation of 1,445 feet (MSL). The spillway has an ogee crest elevation of 1,402 feet (MSL). There are four spillway gates measuring 14 feet high and 20 feet wide. The average tailrace water elevation varies between approximately 1,392.4 feet (MSL) and 1,394.0 feet (MSL).

The Reregulating Reservoir measures about 2.5 miles long and essentially backs up to the tailrace of Pelton Dam. The reservoir has a shoreline of about 6 miles. At full pool, the maximum reservoir width is about 1,000 feet and maximum depth about 45 feet. At the maximum high water surface elevation of 1,435 feet (MSL), the surface area of the Reregulating Reservoir measures about 190 acres, with a gross storage capacity of 3,500 acre-feet. The estimated usable storage capacity of the reservoir is 3,270 acre-feet between elevation 1,435 feet and 1,408 feet (MSL). The estimated usable storage capacity between elevations 1,435 feet and 1,414 feet (MSL) (the proposed maximum drawdown limit for this reservoir under the new license) is about 2,850 acre-feet.

The Reregulating Reservoir storage is used to redistribute the upstream peaking flows from the upper developments in a manner that maintains the downstream river flows approximately equal to the daily average inflow to Lake Billy Chinook. Thus, the Reregulating Reservoir water level undergoes significant daily fluctuation in order to dampen the peaking operation of the upper two developments. Daily fluctuations in the Reregulating Reservoir are typically limited to 20 feet, and the maximum fluctuation is 27 feet.

The Reregulating Dam was originally constructed without a powerhouse. In 1982, CTWS constructed a powerhouse at the dam containing a single, bulb-type, Voest-Alpine turbine and an 18.9-MW Hitachi generator.

4.2 Fish Passage Facilities

Prior to the construction of the Project in the 1950s and 1960s, spring-run chinook salmon spawned primarily in the Metolius River system. Some spawning of spring-run chinook also occurred in lower Squaw Creek and the middle Deschutes River up to Steelhead Falls (Nehlsen 1995). Steelhead spawned Squaw Creek, the middle Deschutes below Steelhead Falls and in the Crooked River system. Although essentially eliminated from the system prior to Project construction, sockeye salmon historically spawned in Link Creek above Suttle Lake and used Suttle Lake as juvenile rearing habitat (Nehlsen 1995). Pacific lamprey were found in the mainstem of the Deschutes River, the Crooked River above the Project. Although the extent of fall chinook migration past the Project is not certain, a few were found above the Pelton site prior to Project construction (Nehlsen 1995). From one to several hundred maturing adult bull trout were annually passed upstream of the Project during the first few years of its operation (Ratliff et al. 1996).

Maintenance of anadromous fish runs was of paramount concern for state, tribal, and federal fisheries agencies when the Project dams were constructed. Upstream and downstream fish passage

facilities were constructed at all three Project dams. Upstream and downstream passage around the Reregulating and Pelton Dams was originally provided by a concrete fish ladder extending 2.84 miles from below the Reregulating Dam to the forebay upstream of the Pelton Dam. At the time of its construction in 1957, the Pelton Fish Ladder was the longest in the world with the second highest lift.

Because the canyon near Round Butte Dam was too steep for a fish ladder, and to accommodate an 85-foot drawdown within Lake Billy Chinook (as allowed for by the first FERC license), a tramway system was originally used to pass fish upstream over the high-head dam. Downstream passage facilities at Round Butte Dam includes a collection facility to attract and trap downstream migrants such that they could be hauled to the lower river via truck or shunted into a downstream-migrant pipe and discharged into the upper end of Lake Simtustus.

Shortly after the Round Butte Development was constructed in 1964, it became clear that the original fish passage facilities were not performing as designed. The Fish Commission of Oregon conducted evaluation of the passage facilities under the supervision of a multi-agency steering committee. In 1966, the committee concluded that fish passage was not successful and began discussion of hatchery alternatives to maintain anadromous fisheries resources (Ratliff and Schultz 1999). Subsequently, the fish passage facilities at Round Butte Dam were taken out of service in 1968, and the fish ladder was retired between 1968 and 1973.

4.3 Fish Hatchery Facilities

In 1972, PGE constructed a fish hatchery at the base of Round Butte Dam to mitigate for the loss of fish runs, as ordered by the former Oregon Fish and Game Commission. The hatchery provides for production of summer-run steelhead and spring-run chinook salmon. The mitigation target for steelhead (1,800 adults) has been met since the early stages of the hatchery program, and the mitigation target for adult and jack spring-run chinook (1,200; 600 females) has been met since 1985.

The Round Butte Fish Hatchery originally consisted of 10 rearing ponds, each 17 feet wide by 75 feet long by 5.5 feet deep, and two adult holding ponds, each 15 feet wide by 50 feet long by 5.5 feet deep. Later, twenty-eight 6-feet-diameter by 4-feet-high fiberglass rearing tanks were added to the hatchery. Hatchery operations were also extended by incorporation of the former Pelton Fish Ladder for use in rearing hatchery-produced fish. Oregon Department of Fish and Wildlife (ODFW) operates the hatchery facilities.

4.4 Recreational Facilities

The creation of Lake Billy Chinook behind Round Butte Dam inundated the Crooked River Canyon in the area of the then-existing Cove State Park. Parks Department of Oregon State Highway Commission managed the Cove State Park. Per agreement with the Parks Department, PGE paid for the construction of a replacement park, The Cove Palisades State Park, located between the Crooked River and Deschutes River Canyons. As part of the agreement, PGE also constructed new roads and bridges over the Crooked River and Deschutes River Arms of Lake Billy Chinook for access to the park. The Cove Palisades State Park Management Area covers approximately 2,690 acres and includes many developed campgrounds, boat ramps, swimming beaches, picnic areas, and hiking trails.

In conjunction with the development of the original Pelton Hydroelectric Project, PGE developed Pelton Park on the east shore of Lake Simtustus. This small, compact park is operated by PGE and includes campsites, picnic area, marina, boat rentals, boat launch, and a swimming beach.

Round Butte Overlook Park was built by PGE as part of the Round Butte Development. This park sits atop the east rim of Lake Billy Chinook, directly above the forebay and dam. This seasonal day-use facility provides for picnicking and a spectacular rim view of Round Butte Dam and Lake Billy Chinook.

In 1997, PGE constructed the Pelton Wildlife Overlook, a day-use site on the east rim above the Reregulating Reservoir. The site was built to provide public viewing of wildlife at the reservoir and an adjacent wildlife pond.

Recreational facilities on the Warm Springs Reservation include popular Chinook Island Day-Use Area located on the Metolius Arm of Lake Billy Chinook, and a primitive campground facility at Indian Park along the west shore of Lake Simtustus.

U.S. Forest Service (USFS) recreational facilities include semi-developed Monty and Perry South Campgrounds at the upper end of the Metolius Arm of Lake Billy Chinook and Street Creek Boat Launch located between the two campgrounds.

Two private recreational resources in the Project area include Lake Simtustus RV Park and Three Rivers Recreational Area. Lake Simtustus RV Park provides camping, boat rentals, boat launch, and a marina, located near Willow Creek on the east side of Lake Simtustus. Recreational facilities at Three Rivers Recreational Area includes include a private day-use beach, swimming area, marina, boat launch, houseboat/watercraft rental, and picnic area. Many of the recreational facilities at Three Rivers Recreational Area are for the exclusive use of a local private gated community or for members of the general public renting boats from the main operator.

4.5 Stream Flows

U.S. Geological Survey (USGS) stream gaging stations are located on the three major tributary streams just upstream of their entry into Lake Billy Chinook, and on the Deschutes River immediately below the Project (Madras Gage). The upstream gages have a combined drainage area of approximately 7,321 square miles, or about 94% of the Madras gage drainage area (7,820 square miles). Ungaged inflow to the Project is primarily composed of groundwater inflows into Lake Billy Chinook, and side-stream inflows to the three Project reservoirs. Based on the USGS gage data for the period of record (Hubbard et al. 1999), stream flows have averaged 4,553 cfs discharging from the Project at the Madras Gage, and 1,568 cfs, 1,491 cfs, and 915 cfs from the three tributary rivers entering the Project, the Crooked, Metolius, and Upper Deschutes, respectively (Table 4.5-1). The historical streamflows for the three tributary rivers on a monthly basis are summarized in Figure 4.5-1. The ungaged flow (i.e. the difference between the gaged flow at the Madras Gage and the combined gaged flow from three major river inputs) is about 13 percent of the total Project discharge and is derived from groundwater inputs, precipitation, ungaged streams (principally Willow Creek, Shitike Creek, and Campbell Creek).

Table 4.5-1. Drainage areas, average flows, and percent contribution of the gaged and ungaged flow inputs entering and leaving the Project.

River	Gage River Mile	Period of Record (years)	Drainage Area (sq. mi.)	Percent Area	Average Flow (cfs)	Percent Flow
Upper Deschutes	120.6	45	2,705	35	915	20
Crooked	6.7	37	4,300	55	1,568	34
Metolius	13.6	77	316	4	1,491	33
Ungaged Inputs	---	---	499	6	579[a]	13
Lower Deschutes	100.1	75	7,820	100	4,553	100

Based on data from USGS stream gages (Hubbard et al. 1999)
[a] Includes subsurface groundwater inputs to reservoirs

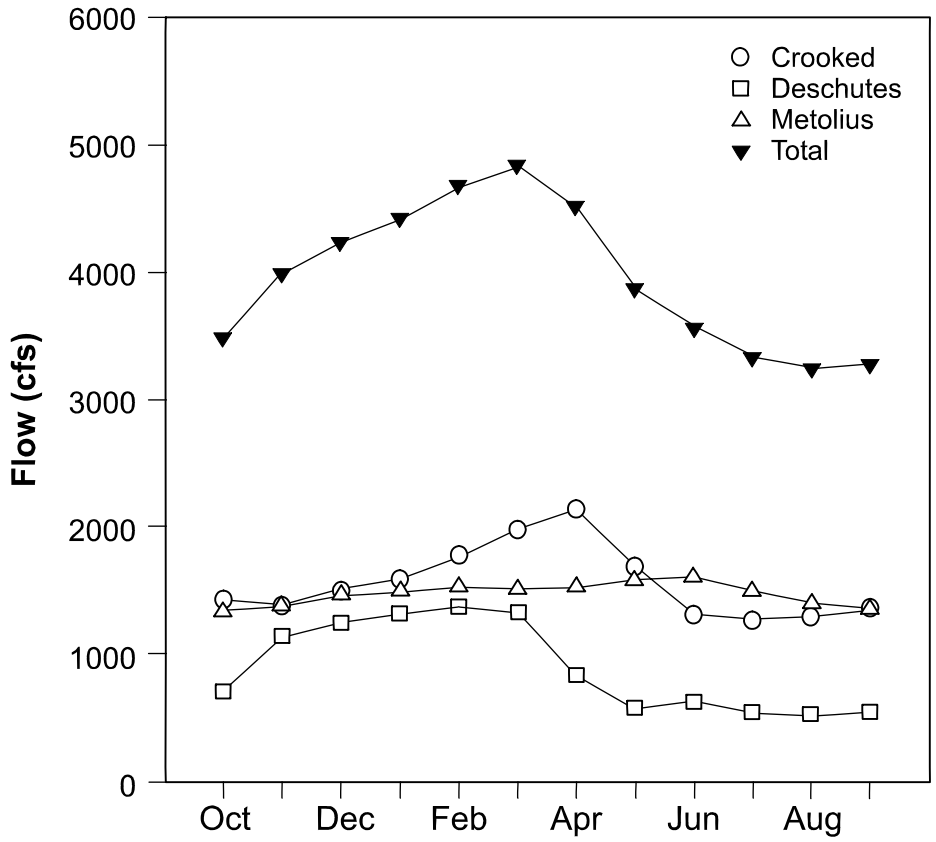

Figure 4.5-1. Historical mean monthly stream flows for tributary streams entering Lake Billy Chinook and for the Deschutes River below the Pelton Round Butte Project (Source: Moffatt et al. 1990).

A significant proportion of the flow of each of the three river inputs to Lake Billy Chinook comes from groundwater. These streams exhibit relatively steady flow and low seasonal and annual variability. This significant groundwater contribution is reflected in the steady flow and low seasonal and annual variability of the streams. The flow duration curves of Figure 4.5-2 illustrate the stability of the three tributary rivers.

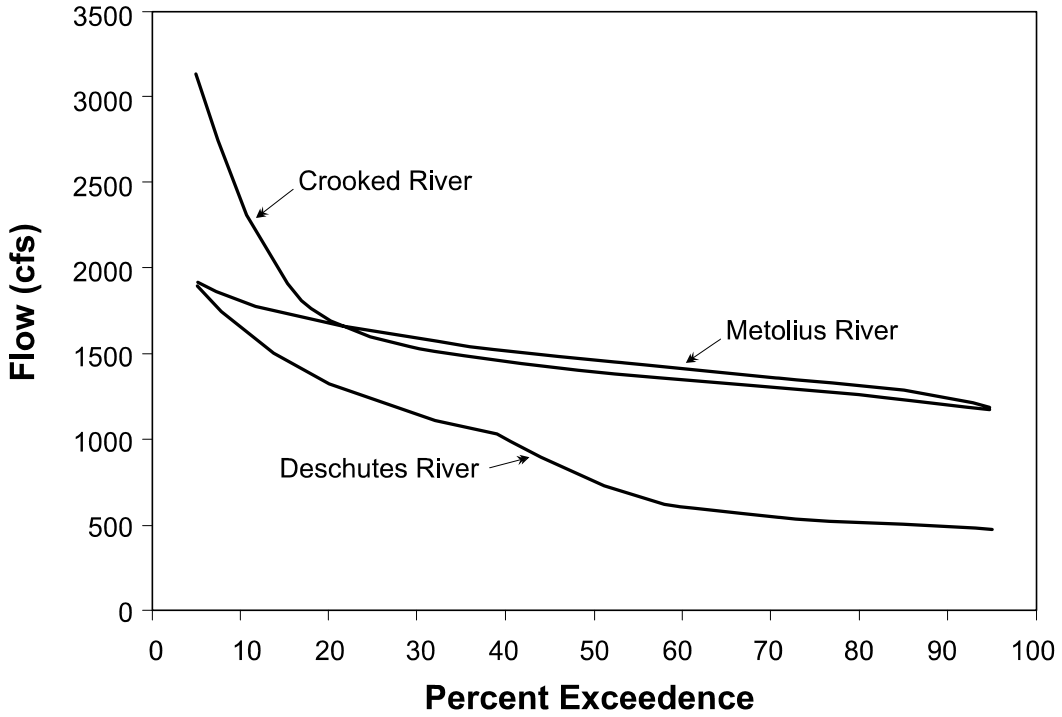

Figure 4.5-2. Annual flow duration curves for the Metolius River, Deschutes River, and Crooked River above Lake Billy Chinook (Source: Moffatt et al. 1990).

The Metolius River is the most regular of the three, as shown by the closer relationship between its high (10 percent exceedance) and low (90 percent exceedance) flows compared to the corresponding ratios for the other two tributary rivers (Table 4.5-2).

The hydrographs for the Crooked River and Metolius River are remarkably similar, with the exception of a small percentage of very high flows in the Crooked River. This reflects the difference in soils and climate in the two basins. In contrast to the heavily forested Metolius basin, the much larger Crooked River Basin is arid with shallow soils and sparse vegetation, and therefore is more responsive to episodes of heavy rainfall and snowmelt. The high proportion of low flows seen in the upper Deschutes River is a reflection of the heavy extractive use of that stream for irrigation.

Table 4.5-2. Ratio of low flow to high flow for tributary rivers to Lake Billy Chinook.

River	High Flow (10% exceedance)	Low Flow (90% exceedance)	Ratio (low:high flow)
Crooked	2,220 cfs	1,200 cfs	54.0%
Deschutes	1,580 cfs	489 cfs	30.9%
Metolius	1,790 cfs	1,220 cfs	68.2%

4.6 Groundwater

According to a recent groundwater study performed by the USGS (Gannett et al. 2001), most of the recharge to the regional aquifer in the upper Deschutes Basin comes from precipitation in the Cascade Range. The study estimates that the annual average recharge rate from precipitation is about 3,500 cfs. About one-half the groundwater flowing from the Cascade Range discharges to spring-fed streams along the margins of the range, including the upper Metolius River and its tributaries. The remaining groundwater flows through the subsurface, primarily through rocks of the Deschutes Formation, and eventually discharging to streams near the confluence of the Deschutes, Crooked and Metolius Rivers. Substantial groundwater discharge occurs along the lower two miles of Squaw Creek, the Deschutes River between Lower Bridge and Pelton Dam, the lower Crooked River between Osborne Canyon and the mouth, and in Lake Billy Chinook (Gannett et al. 2001). Groundwater discharge is primarily responsible for a greater than ten-fold increase in streamflow of the Deschutes River between Lower Bridge and Lake Billy Chinook (Caldwell 1998).

Discharge of groundwater into Lake Simtustus from the canyon walls immediately downstream of Round Butte Dam commenced following the construction of the Dam, suggesting that the presence of Lake Billy Chinook has influenced local groundwater conditions in the vicinity of the Project.

4.7 Existing Minimum Flow Releases and Ramping Rates

As previously mentioned, the Round Butte and Pelton developments are store-and-release facilities that operate in a modified run-of-river peaking mode. Releases are made from the two dams at times corresponding to the peak electric power demand periods (generally from about 7 a.m. to 10 p.m.) and are shut down during off-peak hours. The peaking flows from the upper two developments discharge to the Reregulating Development which is operated as a store-and-release facility that redistributes the peaking flows into steadier around-the-clock flows. Releases are made from the Reregulating Development to the lower Deschutes River to maintain a daily downstream flow approximately equal to the average inflow to Lake Billy Chinook.

In addition to the Madras Gage (USGS No. 14092500), the Project operates and maintains a parallel river flow gage at RM 100. This Project gage is use to automatically control the discharges from the Reregulating Dam to provide downstream flows of at least 3,000 cfs or inflow, whichever is less, from July 1 through February 28 and at least 3,500 cfs or inflow, whichever is less, from March 1 through June 30.

To calculate Project inflow, reservoir elevations are measured every six hours, and compared against reservoir storage tables to yield gross reservoir volume. The current storage volume is then compared against the previous value, and if the new total volume is within 600 second-foot-days, inflow is considered equal to outflow. This inflow/discharge monitoring continues until inflow increases and outflow can be restored to at least the required minimum flow releases. To ensure against dropping below these required minimum flows, actual discharges are normally maintained at 105 to 108 percent of the required minimum flow.

Figure 4.7-1 displays the annual flow duration curve for the Madras Gage for the period 1964 through 1997, the period after Lake Billy Chinook began filling. The minimum, mean and maximum flows measured during this period, are 2,770 cfs, 4,705 cfs, and 17,800 cfs, respectively. Monthly flow duration curves for the Madras Gage are shown in Figures 4.7-2 and 4.7-3. Summer discharge from the Project from April 1 though September 30 in a typical year averages between

4,300 and 4,430 cfs. A typical winter discharge during the period October 1 through March 31 averages between 5,000 and 5,140 cfs.

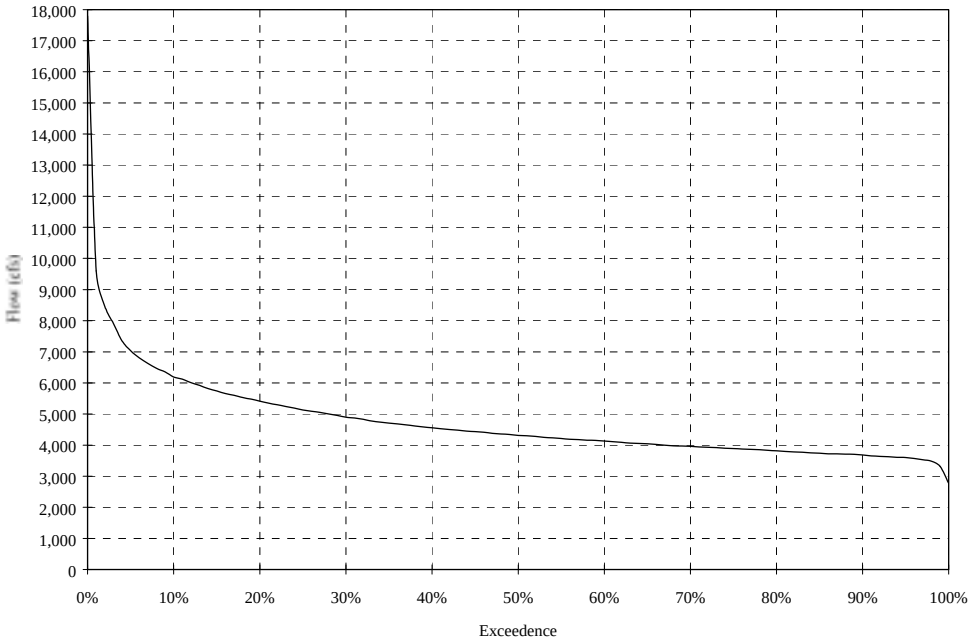

Figure 4.7-1. Flow duration curve, USGS Gage No. 14092500 — Deschutes River near Madras, Oregon, January 1, 1965–December 31, 1997.

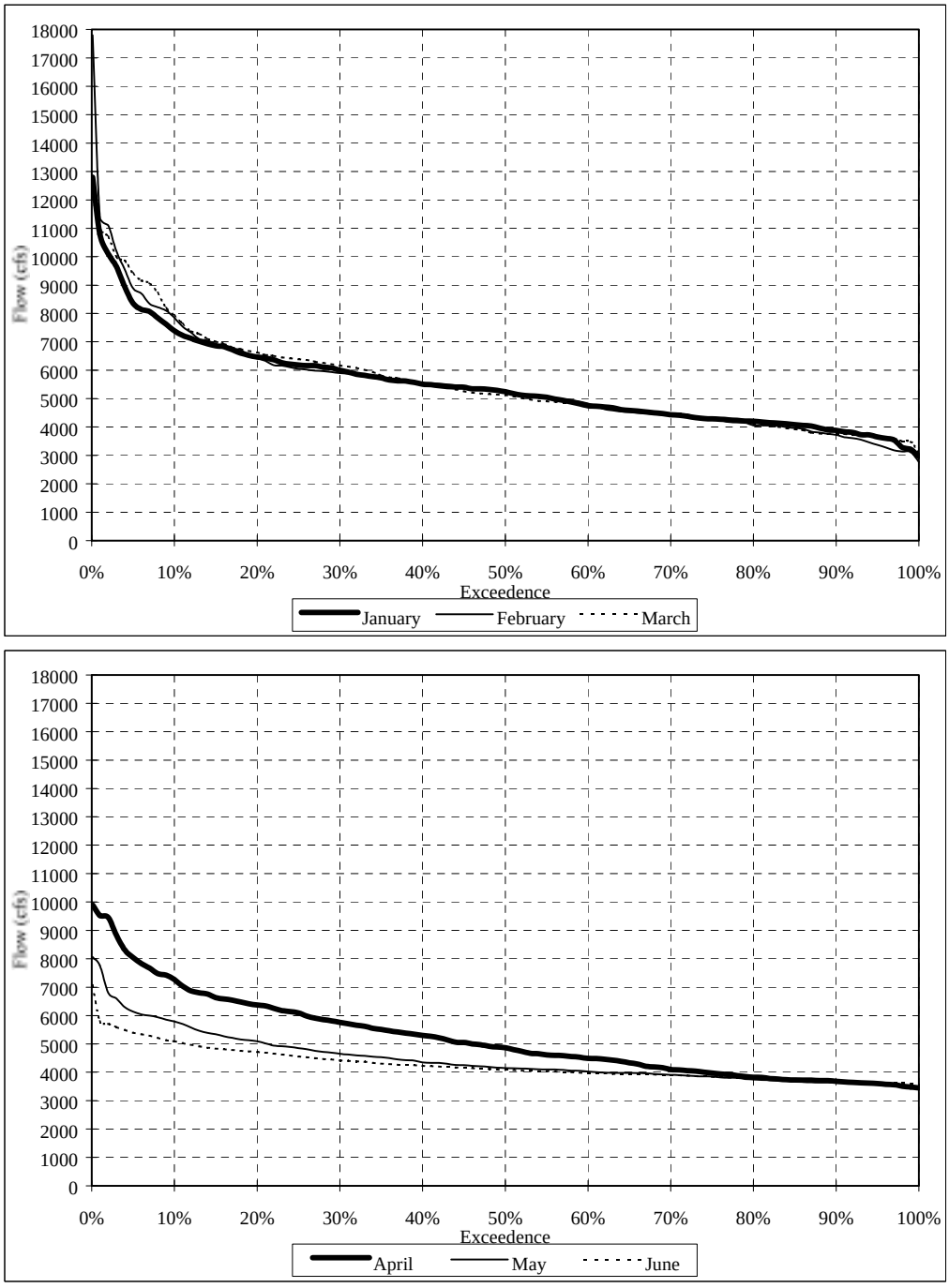

Figure 4.7-2. Monthly Flow Duration Curves, January–June, USGS Gage No. 14092500 — Deschutes River near Madras, Oregon.

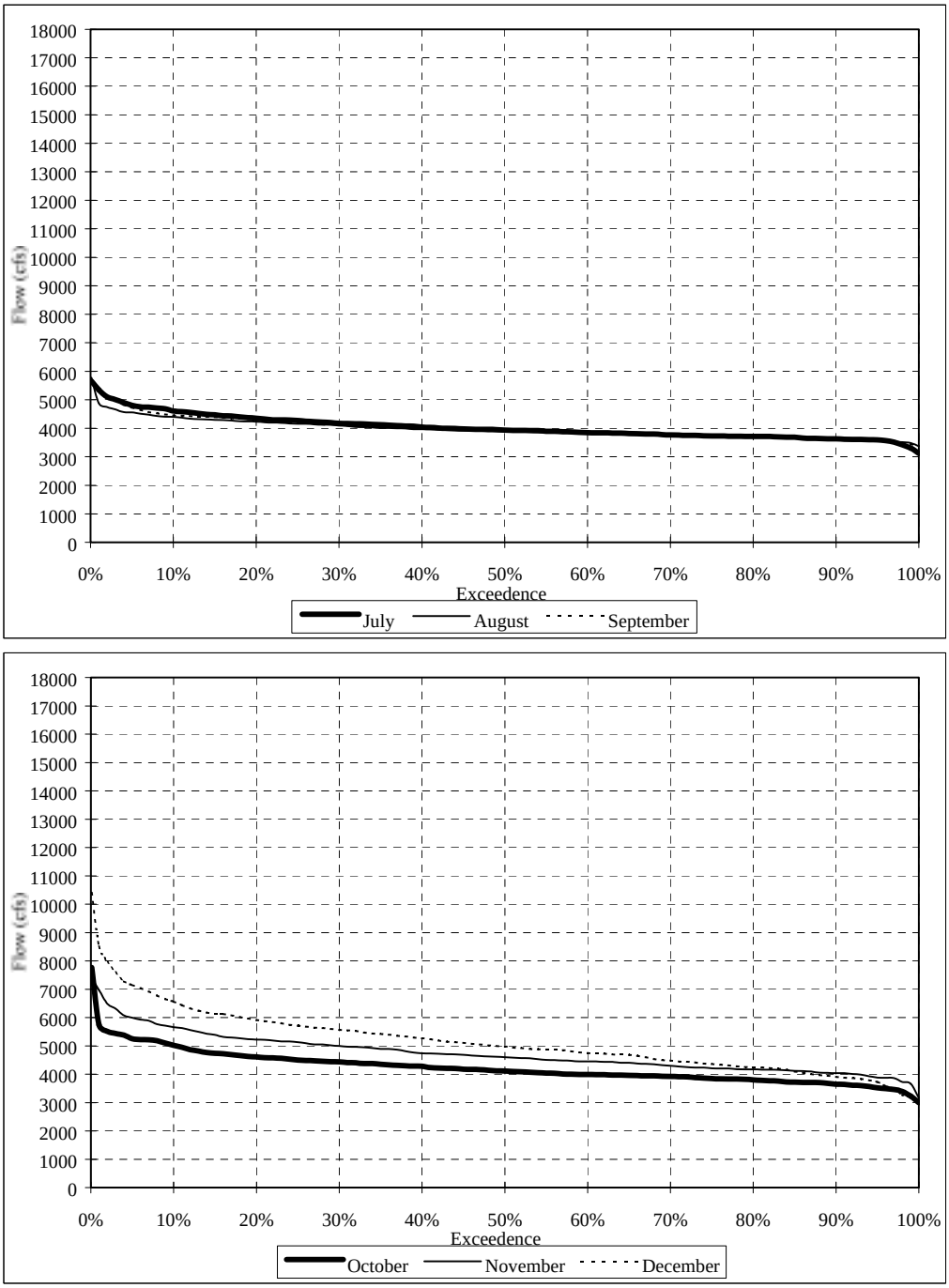

Figure 4.7-3. Monthly Flow Duration Curves, July–December, USGS Gage No. 14092500 — Deschutes River near Madras, Oregon.

Neither the current FERC nor State licenses for the Project require limits on rate of flow control change (ramping rates). However, the Project has observed operational limits for ramping rates that were developed over time in cooperation with various agencies. The current operating procedures limit ramping (as measured at the USGS gage) to 0.1 feet/hour and 0.4 feet/day, except during the period from May 15 through October 15 when the ramping rates are limited to 0.05 feet/hour and 0.2 feet/day. A stage change of 0.1 feet corresponds to approximately 260 cfs at the USGS gage.

5.0 PROPOSED PROTECTION, MITIGATION, AND ENHANCEMENT (PME) MEASURES

During the relicensing process, the Joint Applicants conducted numerous studies to identify and address a wide range of aquatic resource and water quality issues. Based upon the results of those studies, and in consultation with federal, state, and tribal agencies and non-governmental organizations (NGOs), the Joint Applicants identified several protection, mitigation, and enhancement (PME) measures to protect and enhance existing aquatic resources and water quality.

PMEs were developed based on the results of second-stage consultation, supplemental consultation on the Draft Joint Application Amendment (DJAA), and water quality studies completed after issuance of the draft DJAA license applications. This process involved using the results of technical and modeling studies conducted by the Joint Applicants to (1) estimate the effects of Project facilities and operations on water quality, and (2) identify potential opportunities for mitigation and enhancement. The following ongoing water quality effects and concerns were identified:

- Compliance of releases from Reregulating Dam with water quality standards, primarily temperature, dissolved oxygen, pH, and biological criteria standards.

- Ability of waters in Lakes Billy Chinook and Simtustus to meet water quality standards, primarily temperature, dissolved oxygen, pH, nuisance phytoplankton, and biological criteria standards.

The Joint Applicants have evaluated PME measures to provide reasonable assurance that the Project will be protective of designated beneficial uses and compliant with the antidegradation policy and water quality standards. The measures evaluated included selective water withdrawal at Lake Billy Chinook, which would be implemented as part of the Joint Applicants' proposed fish passage plan, but which also has important effects on temperature and dissolved oxygen. Other potential measures targeting dissolved oxygen include selective spill at the Reregulating Dam, as well as various air injection strategies. Although the Project's discharge is in compliance with the pH standard, the impact of selective water withdrawal on pH in the reservoirs and in the lower Deschutes River was also evaluated because modeling indicates that selective water withdrawal may adversely affect the Joint Applicants' ability to comply with the pH standard.

5.1 Overview of Proposed Protection, Mitigation and Enhancement Measures

Although construction and implementation of a selective water withdrawal structure is the principal PME measure intended to mitigate for Project impacts on water quality, several other PME measures are proposed for the support of designated beneficial uses. These PMEs, while described in detail elsewhere in the Final Joint Application Amendment, are summarized below. These PMEs are also discussed in the context of compliance with water quality standards in Section 9 of this evaluation report.

5.1.1 Selective Water Withdrawal

Because the ability to selectively withdraw generation water from the reservoir will improve water quality in the Project reservoirs and in the lower Deschutes River, the Joint Applicants intend to implement a program of selective water withdrawal to mitigate the Project's water quality and fish passage impacts.

The Interim Passage Phase of the Joint Applicants' fish passage plan, as currently envisioned, will begin with the final design and construction of a new selective water withdrawal facility to redirect currents in Lake Billy Chinook, attract and collect downstream migrants, and manage downstream water quality and water temperature. This facility would allow generation water to be pulled from the surface of the reservoir as well as from the existing deep intake, while excluding and collecting downstream migrants. This would enable the Project to modify the temperature and other water quality parameters of the water discharged from Lake Billy Chinook. Conceptual design development of selective water withdrawal and downstream migrant collection facilities is currently underway. The proposed withdrawal tower would have two sets of gates, one set at depth and the other set near the surface. To allow surface withdrawal with a 20-foot reservoir drawdown, the surface gates would be located below elevation 1,925 feet. All gate openings would be furnished with trashracks to prevent large debris from entering the tower. Changes between deep and shallow withdrawal could be completed while the Project is in operation, by modulating the position of the lower intake gates. This gate adjustment would vary the proportion of flow from top and bottom waters, to regulate downstream and reservoir water quality. The predicted impact on reservoir and lower Deschutes River water quality is discussed in much greater detail in Section 9 of this report.

5.2 Nonstructural Habitat Measures

In their final license application, the Tribes concluded that by reducing the concentrations of nutrients such as phosphorous and nitrogen entering the Project's reservoirs, it may be possible to bring these waterbodies closer to a mesotrophic state, thereby reducing the size and frequency of algal blooms and resulting turbidity. Similarly, improvements to instream flows and water temperatures in the Crooked River and Deschutes River above the Project could improve water temperatures in Lake Billy Chinook and, ultimately, in the lower Deschutes River. In 1982, the Tribes implemented streamside protection measures, including no-harvest buffers along classified streams, and observed a decline in water temperatures, even in drought years. Such measures can also be expected to result in an improvement in other water quality parameters.

The Joint Applicants will work with private and governmental entities in the Deschutes River Basin to implement cost-effective habitat enhancement and restoration measures to increase water quality flowing into the Project's reservoirs. These measures will include riparian enhancement and restoration. The Joint Applicants have included the amount of $1.475 million for these measures over the first 5 years of the new license. These measures will include the creation of riparian refugia, as well as improvements such as livestock exclusion, placement of large woody debris, planting of grass, shrubs, and trees, and the maintenance of wetlands. It is possible that improvement of livestock grazing or timber management practices can, in selected locations, also result in water quality improvements in the tributaries to the Project reservoirs. The proposed costs are summarized in Table 5.2-1.

Table 5.2-1. Proposed habitat measures and costs.

Proposed Mitigation Measure	Proposed Expenditure
Improved Riparian Corridor Management	$ 750,000
Community Habitat Education Activities	25,000
Establishment of Reserves and Refugia	700,000
Total	$1,475,000

5.2.1 Fish Passage Plan

The centerpiece of the fisheries PME package is the Joint Applicants' commitment to reintroduce anadromous fish runs above the Project. The Joint Applicants' proposed Fish Passage Plan, as detailed in Exhibit E, Section III of the FJAA, represents a multi-phase, multi-million dollar effort to restore spring-run chinook, steelhead, sockeye and Pacific lamprey runs to historic habitat above the Project and to enhance the already robust population of bull trout in the Metolius River and Lake Billy Chinook by reconnecting that population with other populations downstream of the Project.

A key component of the program is the use of adaptive management principles to direct the implementation of individual measures and associated monitoring and evaluation efforts that guide the adjustments that will be essential over the new license period. This commitment is exemplified by the extensive measures taken to ensure that the implementation of proposed fish passage PMEs will not inadvertently put important existing fishery resources at risk. The fish passage effort includes cooperative identification, protection, and enhancement of upstream habitat; state-of-the-art upstream and downstream fish collection and passage technology; measures to minimize the risk of disease, predation, and competition to the existing valuable resident fisheries; and continuing a long-term commitment to hatchery mitigation until such time as increased natural production to support both ecosystem and harvest objectives allows a reduction in hatchery production. Because it will likely take a number of generations of the target species to allow an informed evaluation of the success of this effort, the Joint Applicants believe that nothing less than a long-term commitment to this effort is necessary and appropriate.

The Joint Applicants' proposed fish passage program will be implemented under the guidance of the Fisheries Technical Subcommittee[1](FTS) pursuant to the principles of adaptive management. Key program elements include the completion of ongoing modeling of water quality and reservoir currents, continuing feasibility analysis and engineering studies of potential selective water withdrawal and downstream fish collection and passage systems, exploring possible prototype evaluation for selective water withdrawal, and completing the fish disease risk assessment program. The Joint Applicants are also developing a comprehensive monitoring and

[1] The Fisheries Technical Subcommitte or FTS consists of fisheries biologists and others with experience in aquatic ecosystems representing the following entities: PGE, CTWS, U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), ODFW, ODEQ, and a coalition of non-governmental organizations (NGOs).

adaptive management program to monitor physical, chemical, and biological parameters; rigorously evaluate progress towards achieving defined measures of success; and utilize gained knowledge to make necessary modifications to the program through time. In this manner, knowledge gained from each phase of the program will receive broad review from resource managers and the public and will lead to informed decisions to proceed to subsequent phases in an appropriate and timely fashion.

5.2.2 Round Butte Hatchery

Because of the presence of Lake Billy Chinook and its proven capacity to produce kokanee, it is believed that development of an anadromous sockeye salmon population larger than was historically present in the system is possible. However, because successful reintroduction may take many years to achieve, the Joint Applicants propose to continue to fund steelhead and chinook production at the Round Butte Hatchery.

The Joint Applicants propose to work with the ODFW, the Tribes and other members of the Technical Subcommittee to develop a continuing hatchery production and review program linked to the anadromous fish reintroduction effort. The long-term goal of coordinating the hatchery and reintroduction efforts is to continue to fully mitigate Project impacts and eventually eliminate hatchery production of anadromous fish. The Joint Applicants' commitment to this revised hatchery management plan includes:

- Maintain and continue funding smolt production at the Round Butte Hatchery.
- Maintain mitigation goals of an average return of 1,800 adult steelhead and 1,200 (600 females) adult and jack spring-run chinook back to the Project.
- Review the hatchery production program every five years, starting 10 years after fish returns from production upstream of the Project, to adjust hatchery smolt production to a level consistent with the combined returns of hatchery and naturally-produced anadromous fish from upstream of the Project.
- Maintain the post-smolt steelhead liberation program (approximately 25,000 per year) and the fingerling kokanee liberation program (more than 100,000 per year) for Lake Simtustus. The post-steelhead program will be reviewed every five years. The fingerling kokanee program may be decreased or eliminated, in consultation with the Technical Subcommittee, if creel surveys show continued low survival.

The proposed hatchery program is described in greater detail in Exhibit E, Section III.C.2 of the FJAA.

5.2.3 Adaptive Management

Because there is uncertainty surrounding the ultimate effectiveness of proposed water quality PMEs, the Joint Applicants propose to adopt an adaptive management and decision approach. Adaptive management is a formal, systematic, and rigorous approach to learning from the outcomes of management actions, accommodating change, and improving management. It involves synthesizing existing knowledge, exploring alternative actions, and making explicit

forecasts about their outcomes. Management actions and monitoring programs must be carefully designed to generate reliable feedback and clarify the reasons underlying outcomes. Actions and objectives are then adjusted based on this feedback and improved understanding. In addition, decisions, actions, and outcomes are carefully documented and communicated to others, so that knowledge gained through experience is passed on, rather than being lost when individuals move or leave the effort (Taylor 1996).

With respect to the proposed selective water withdrawal structure, details regarding facility design and operational plan are yet to be worked out and ultimately tested. It is highly likely that the operational plan and/or facility will need to be modified over time to achieve desired objectives. Thus, as a component of the adaptive management approach, an adaptive monitoring program will also be needed to assess water quality, to determine the success of adaptive management, and to provide input to future adaptive management decisions and actions. There are six main steps in adaptive management as it will be applied to the Pelton Round Butte fish passage and water quality program:

1. *Problem assessment* — explicitly recognizing that there are uncertainties regarding the outcome of management activities and identifying those uncertainties that are critical to success.

2. *Plan design* — deliberately designing the plan to increase understanding about the system and reveal the best way to reduce the level of uncertainty and meet explicitly stated objectives.

3. *Implementation* — carefully implementing the plan.

4. *Monitoring* — developing and implementing a monitoring program of key indicators of success against which progress can be measured.

5. *Evaluation* — analyzing data from the monitoring program and assessing results, considering the objectives and predictions.

6. *Adjustment* — incorporating results into future decisions and actions.

These steps are consistent with the implementation steps recommended by the EDT[2] process. The discussion of the adaptive management process is contained in Exhibit E, Section III.C.1 of the FJAA and Appendix II of the Fish Passage Plan, which is included as Attachment III-2 to the FJAA. A copy of the adaptive management discussion was also provided to ODEQ and the WCB on April 14, 2000.

[2] The Ecosystem Diagnosis and Treatment (EDT) assessment evaluated the ability of existing conditions of the aquatic environment to support identified goals and values based on the effects of certain environmental attributes on chinook salmon, the EDT's diagnostic species. The EDT process was used by CTWS prior to jointly applying to FERC for a new license for the Project. Members of the EDT Fisheries Technical Committee included CTWS, USFS, USFWS, NMFS, BLM,Bureau of Indian Affairs (BIA), ODFW, NGOs, and private individuals with extensive local knowledge of the river basin.

5.2.4 Flow and Operating Proposal

Reservoir storage within the Project allows daily peaking of Round Butte and Pelton dams while providing nearly constant discharge into the Deschutes River downstream. Although existing Project operations already closely mimic existing inflows, the Joint Applicants believe their proposed Operating Plan offers significant enhancement of flow monitoring, flow control, downstream river values, and seasonal operation of Lake Billy Chinook. The restrictions proposed are more stringent than those placed on historical Project operation and will lead to more uniform flows in the lower river.

The Joint Applicants believe that new operations-related compliance requirements associated with their proposed Operating Plan will be very near the limit of what can be accurately measured with modern equipment and controls, especially for lower river stage changes.

This operating proposal includes the following major operating enhancements over the existing license requirements:

- More accurate flow monitoring at the USGS Madras gage
- Hourly monitoring of Project inflows
- Higher minimum flow requirements below the Reregulating Development
- A run-of-river requirement that will hold lower river flows to within ±10% of inflow under most conditions
- More restrictive limits on river stage changes below the Reregulating Development
- Reduced seasonal drawdown of Lake Billy Chinook
- Reduced drawdown of the Reregulating Reservoir

In addition, the Joint Applicants are proposing to continue summer reservoir level restrictions on Lake Billy Chinook and seasonal restrictions on the fluctuation of Lake Simtustus. Taken together, the reservoir level restrictions for the Project reservoirs, the minimum flow requirements below the Reregulating Dam, the run-of-river flow requirement and the restrictions on lower river stage changes result in a highly controlled operation.

Specific elements of the Joint Applicants' operating proposal are described in the FJAA, Exhibit E, Section III.C.4.

5.2.5 Long-Term Water Quality Monitoring

In order to evaluate the effectiveness of mitigation projects and to determine if there are continuing impacts on water quality, it will be appropriate to implement a program to monitor water quality conditions in the Project area. This is particularly important, since many water quality problems are in fact related to conditions or activities in the watershed areas above the Project, and impacts apparently resulting from Project operations may in fact be caused upstream

of the Project. The information gathered in this program will also be used in the adaptive management of the fish passage program.

As discussed in detail in Section III.C.8 of the Fish Resources section of Exhibit E in the FJAA, the Joint Applicants, in conjunction with the Fisheries Technical Subcommittee, are developing a long-term monitoring plan for environmental factors relevant to resource management objectives in the Deschutes River Basin. Attachment III-6 to the Fish Resources section (Exhibit E, section III) of the FJAA lists the parameters, including those relevant to water quality, that are proposed to be monitored. This monitoring program will provide the data necessary to assess whether the Project attains and maintains compliance with the relevant water quality standards.

5.2.6 Large Wood

Although it appears that large wood was never a major component of the salmonid habitats in the lower Deschutes River, because transport events normally deposited it out of the wetted channel, all large wood removed from Lake Billy Chinook after large storm events will be moved to the lower Deschutes River for fish habitat enhancement.

5.2.7 Gravel Augmentation

Geomorphology studies of the Deschutes River indicate that after more than 40 years of impoundment, there are few obvious effects to channel and valley morphology that are traceable to the Project. Moreover, it appears that bedload movement occurs infrequently and at low rates in the Deschutes River downstream of the Project. However, the Project has impounded minor amounts of gravel from upstream sources and prevented that material from contributing to the lower river geomorphology. As a result, the Joint Applicants propose the following measures with regard to sediment transport and spawning gravel in the Deschutes River downstream of the Project:

- Verify the sediment transport model developed by Fassnacht (1998) by placing radio-tagged and/or colored rocks on selected bars in the Deschutes River below the Reregulating Dam. Determine at which flow levels these rocks are mobilized by checking their positions after each flow event greater than 10,000 cfs. Buried columns of colored rocks will be utilized to determine the depth of scour at different flow levels.
- Resurvey channel cross sections at five locations utilized by Fassnacht (1998). Resurvey these annually for 5 years to determine if there is any active channel change associated with years having high flow events. If no change is detected after 5 years, resurvey them every 5 years, or after events greater than 15,000 cfs.
- If monitoring sediment transport and channel change shows significant transport and/or change at flows lower than predicted by Fassnacht (1998), initiate a program to measure actual bedload transport at different flow levels at the Warm Springs bridge.
- If monitoring of channel change and measuring bedload shows significant transport at flow levels significantly below those predicted by the geomorphology study, revisit the

sites used by McClure (1998) for particle size measurements and redo these particle surveys.

- Initiate an experimental program to place spawning gravels at salmonid spawning locations between the Reregulating Dam and the mouth of Shitike Creek to gain knowledge regarding gravel augmentation. If particle size surveys show a significant loss of the small fraction, the Joint Applicants will consult with the Technical Subcommittee regarding the design of a spawning gravel augmentation program.

5.2.8 Riparian Planting

The Joint Applicants will implement a shoreline planting program to enhance on-site riparian habitat at all three Project reservoirs. The Joint Applicants will conduct additional tree and shrub plantings at all three Project reservoirs to enhance on-site riparian habitat. It is anticipated that most plantings will occur at Lake Billy Chinook. The Joint Applicants will first conduct a riparian planting feasibility assessment during the initial 2–3 years of the license to determine the potential for riparian restoration at the reservoirs. Results of the feasibility assessment will serve as the basis for the riparian planting program, which will be developed in consultation with the terrestrial resources working group (TRWG). Fifty percent of the potential planting sites will be planted within 3 years of completing the feasibility assessment; the remaining sites will be planted during the 5-year period that follows. Only native species propagated from seeds or cuttings collected locally will be used on federal lands. Species native to central Oregon, but propagated from non-local sources, may be planted on non-federal lands. A representative sample of the plantings will be monitored annually over the life of the license to assess plant survival and progress toward achieving riparian restoration objectives. In some cases, it may become necessary to conduct follow-up plantings if initial attempts fail to achieve the desired objective. Detailed measures for implementing the feasibility assessment, riparian planting program, and monitoring activity will be addressed in the riparian and wetland restoration strategy included in the terrestrial resources management plan (TRMP). Any tree and shrub plantings proposed for Tribal lands will require approval from the Tribes. This program can be expected to improve the quality of the littoral habitat, thereby enhancing the beneficial uses associated with the Biological Criteria standard, including salmonid fish rearing and resident fish and aquatic life.

6. ISSUANCE OF PUBLIC NOTICE/OPPORTUNITY TO COMMENT

Public Notice of the Joint Applicants' application and proposed § 401 certification documents was distributed March 13, 2002, by mailing to the Department's mailing list of known interested persons and agencies, adjacent property owners, and the FERC mailing list for the Project. Additionally, display ads were ran in The Bend Bulletin and Madras Pioneer Newspapers, advising of opportunities to provide written or oral comments on the § 401 certification documents. Written comments were accepted through 5 p.m. on May 13, 2002.

Public hearings on the Joint Applicants' application for § 401 certification were held April 16, 2002 at 2:00 p.m. and 7:00 p.m. at the Jefferson County Fairgrounds, Maccie Conroy Building, at 430 S.W. Fairgrounds Road, Madras, Oregon. The public hearings were preceded by opportunity for informal questions and answers from 1:00 p.m. to 2:00 p.m. and 6:00 p.m. to 7:00 p.m. Opportunity for provision of written and/or oral comments was provided at the hearings. In addition to ODEQ's hearings specific to the § 401 certification, opportunity to submit comment and/or oral testimony on a proposed unified state position, including proposed § 401 conditions, was also provided during state Hydroelectric Application Review Team (HART) hearings on the state's Second Unified State Position. The HART hearings were held April 15, 2002 at 2:00 p.m. and 5:00 p.m. at the same location.

7. SUMMARY OF PUBLIC COMMENT RECEIVED

No oral testimony was provided to ODEQ during either of the April 16, 2002 hearings. One oral testimony was provided during the afternoon HART hearing on April 15, 2002, but none of the comments pertained to the § 401 certification documents.

Three sets of written comments related to the § 401 certification documents were received by ODEQ, all on May 13, 2002. Comments were received from the Joint Applicants, Conservation Groups (joint letter from American Rivers, Trout Unlimited, Oregon Trout, and the Native Fish Society), and the U.S. Forest Service/Bureau of Land Management (also a joint comment letter). For convenience, these comments are summarized below, grouped by commenter. The full comment letters (as opposed to comment summaries) are available for review upon request to ODEQ. Identified in parentheses, following each comment summary, are the sections of this report where response to the comments can be found.

7.1 Joint Applicants (JA)

JA-1. The Joint Applicants recommend deletion of 401 certificate requirement to notify and consult the HART if Lake Billy Chinook is forecasted to not fill by June 15 of any year. The proposed consultation requirement would be inconsistent with specific obligations for the Joint Applicants to maintain defined water levels within the reservoir, and to maintain specified minimum flows in the Deschutes River below the Project. Such a consultation requirement would neither relieve the Joint Applicants of those obligations nor improve ability to meet them. The implication that this consultation process is needed to apportion water between minimum flows to the lower river and reservoir refill is misplaced. A reservoir refill allowance (outflow less inflow) of 150 cfs would equate to barely more than a 0.05 foot stage change in the lower river [at the Madras Gage], and would have no biological impact for the refill period. (9.12)

JA-2. The reservoir levels prescribed for Lake Billy Chinook contain an appropriate exception for defined "extraordinary circumstances." Inclusion of such an exemption for Lake Simtustus and the Reregulating Reservoir is also needed since it is essential to the safe operation of the Project. (9.12)

JA-3. The 401 certificate requirement to construct, operate and maintain a fish screen and/or bypass device as part of the fish passage structure or outlet structure(s) is inconsistent with the WCB 401 language on this subject and the ODEQ 401 requirement that the Joint Applicants construct fish passage facilities "as shall be set forth in the [FERC] license. Discussions to date within the FTS do not contemplate fish protection measures at the Pelton or Reregulating developments. The Joint Applicants recommend that condition related to fish entrainment (screening/bypass) be modified to be consistent with the ODEQ 401 requirement that references the future license condition. (9.12)

JA-4. The 401 certificate condition related to large wood is inconsistent with the WCB 401 certificate related to large wood. ODEQ and WCB should consult with one another to ensure that the final conditions are consistent. (9.12)

JA-5. The fifth step of the 401 certificate condition related to sediment transport and spawning gravel is inconsistent with that of the WCB's 401 certificate and should be changed. The study of historical data and the quality of spawning habitat proposed by the WCB is a logical precursor to the experimental placement of spawning gravel proposed by ODEQ. The Joint Applicants recommend that ODEQ replace its language with that of the WCB's related to this fifth step, and that the new paragraph would provide ODEQ sufficient authority to require a gravel placement program if necessary. (9.12)

JA-6. To avoid FERC requirements to develop duplicate plans, the 401 requirements related to implementing a shoreline erosion control plan and a riparian planting plan should be modified to reference the relevant components of the FJAA proposed recreational PMEs (shoreline erosion control) and the terrestrial resource management plan (riparian planting). (9.8)

JA-7. The 401 certificate provision reserving ODEQ right to modify the conditions of the certificate goes beyond that which has been preliminarily agreed upon between the Joint Applicants and ODEQ. The Joint Applicants note that FERC does not concede that § 401 permits such reservation of authority, and concur with this position. As noted in Section 3(f) of the draft Adaptive Management Agreement, the Joint Applicants do not waive any right to oppose any such actions by ODEQ or to seek administrative or judicial review of any such actions before state or federal administrative agencies or courts.(10)

JA-8. The compliance point for measuring ramping rates should not be the Madras Gage, but instead should be determined by flow set points for the Reregulating Powerhouse generating unit. Details of such a proposal are contained in Attachment B-2 of Exhibit B to the FJAA. (9.12)

7.2 Conservation Groups (CG)

CG-1. The 401 certification should include measures in addition to the Selective Water Withdrawal (SWW) structure. The Conservation Groups (CG) support the development and implementation of the SWW structure to address water quality impacts. However, the CG consider the proposed 401 certificate to be too reliant on the SWW, and that ODEQ should require other, non-structural water quality solutions, particularly habitat-related improvements, that have a high probability of success. (9.12)

CG-2. The proposed Section 401 conditions fail to adequately protect and restore the lower river. By requiring the licensees to provide target flows in the lower river, or "inflow", whichever is less, ODEQ fails to provide reasonable assurance that beneficial uses in the lower river – in particular, salmon and steelhead – will be protected for the term of the license or that instream water rights will be met. The "or inflow" provision should be removed to allow state minimum instream flows in the lower river to be met more often, and help offset increasing upper basin demand on limited water supplies. Second, the provision allowing the licensees to reduce lower river flows by an additional 150 cfs to ensure refill of Lake Billy Chinook by a date certain, further undermines the likelihood that the lower river will be protected, and, in conjunction with other conditions, will be detrimental to the public's interest in downstream instream water rights. Lastly, the 401 certificate fails to require a comprehensive habitat restoration plan for the lower river. Healthy habitat below the project is necessary to rebuild and protect anadromous fish runs, a specified beneficial use. ODEQ should revise the proposed 401 certificate to include a long-term habitat restoration and acquisition program. (9.12)

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW is precluded in instances of capital expenditure. Considering the considerable term of FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed. (9.2, 9.3, 9.4, 9.5, 9.6, 9.12, 9.14, 10)

CG-4. The restriction on using storage capacity to enhance water quality during droughts should be removed. While the CG's are generally supportive of the 401 certificate requirement of maintaining Project

outflows within 10% of inflow, ODEQ should not foreclose the potential use of the reservoirs for temporarily enhancing lower river water quality during emergency drought conditions. The certificate should contain an emergency exemption provision whereby outflows can temporarily exceed inflows by greater than 10% to obviate lower river drought emergency conditions affecting anadromous and resident fish populations. (9.12)

CG-5. Variances from several conditions must be consistent and well defined. Regarding several provisions – ramping rates, reservoir levels, run-of-river operations – the proposed 401 certificate identifies situations allowing for exemption from specified requirements. While some of the circumstances allowing variance appear designed to address similar situations (e.g. flood events, flow higher than 6,000 cfs), there is a lack of consistency. ODEQ should revise the provisions to ensure consistency to the extent appropriate, and more clearly define the triggering events throughout. (9.12)

7.2 U.S. Forest Service/U.S. Bureau of Land Management (FS/BLM)

FS/BLM-1. The method used to determine compliance with the ODEQ intergravel dissolved oxygen standard (IGDO) needs to assess the conditions in the redd throughout the incubation of the embryos and sac fry in the redd. The methodology used by PGE to measure IGDO results in measurement of conditions similar to ambient dissolved oxygen conditions because the redd has been recently cleaned during construction of the redd. The method needs to include sampling several months after the redd construction to assess true conditions experienced in the wild. (9.3)

FS/BLM-2. There is no ODEQ finding for macroinvertebrates even though there is good monitoring data available from PGE. There appears to be a tailwater affect directly below the Reregulation Dam. There appears to be some difference between shallow and deeper habitats during the fall that were not evident with the spring samplings. What is ODEQ's finding for macroinvertebrates? (9.12)

FS/BLM-3. The 401 certificate does not require a hard minimum flow be maintained to protect the State of Oregon instream water right, whereas ODFW recommends such in the Second Unified State Position. ODFW's request may require drafting of the Project reservoirs at times when Project inflow drops below the hard minimum flow. BLM is the federal manager of the Wild and Scenic River below the Project, and acknowledges the state's instream water right as the flow needed to protect the outstandingly remarkable values of the lower Deschutes River. Failure to protect these flows may be inconsistent with the Wild and Scenic River Plan. (9.12)

FS/BLM-4. The program to maintain instream wood recruitment to the lower Deschutes River needs to be coordinated with BLM, the federal managers for the Wild and Scenic River Plan. An environmental assessment would be needed prior to any instream project. (9.12)

FS/BLM-5. The 401 certificate requires that bedload movement monitoring be initiated at flows over 10,000 cfs, whereas ODFW's recommends a trigger flow of 7,000 cfs. The USFS and BLM are requesting that monitoring be initiated at flows greater than 6,500 cfs, since in most rivers the bed is moved at high flows that occur 10% of the time. For the Deschutes River, this 10% exceedance flow is less than 6,500 cfs. (9.12)

FS/BLM-6. The 401 certificate should not require gravel augmentation unless the bedload monitoring and sediment budget of the tributaries indicate a need based upon lack of supply and more frequent modeling than suggest by [Fassnacht's] modeling. (9.12)

FS/BLM-7. The 401 certificate requires that outflow can only vary by ± 10% of inflow when Project outflows are less than 6,000 cfs, whereas ODFW's recommendation uses a 7,000 cfs upper flow limit for this restriction. The USFS and BLM are requesting that FERC apply a ± 10% restriction for flows less than 7,000 to 8,000 cfs, after an assessment of flood risk is made. (9.12)

8. APPLICABLE WATER QUALITY REGULATIONS AND ODEQ EVALUATIONS

8.1 State and Tribal Waters to be Protected

CWA § 401 requires that an upstream state (or tribe) issuing a § 401 certificate for its waters also consider compliance with water quality standards of downstream states and tribes. Since the Project reservoirs straddle both state and tribal waters and impact state and tribal boundary waters along the Lower Deschutes River, a determination of compliance with either state or tribal standards alone may not theoretically protect the designated beneficial uses of the other. Thus, ODEQ must consider Project compliance with both Oregon and CTWS water quality standards. Similarly, the WCB must consider both tribal and state standards when issuing a § 401 certificate for the Project. For the most part, the Oregon and CTWS water quality standards are nearly identical in terms of numeric and narrative criteria, designated beneficial uses, and antidegradation policies. Where standards for a given parameter (such as temperature) are different, compliance must be evaluated in terms of the most stringent aspects of each of the two standards such that both the Tribes' and State's standards will be fully met. Thus, the WCB and ODEQ, along with EPA oversight, have actively worked to coordinate efforts to assure that any § 401 certificates potentially issued under the Tribal and State authorities are mutually protective of the boundary waters and contain compatible conditions.

8.2 General Application of Water Quality Standards

Oregon water quality regulations are contained in OAR Chapter 340, Divisions 41 through 53. Division 41 entitled "State-Wide Water Quality Management Plan: Beneficial Uses, Policies, Standards, and Treatment Criteria for Oregon" is the most significant with respect to § 401 certification of a proposed hydroelectric project. Similarly, Warm Springs Tribal Code Chapter 432, Ordinance No. 80 provides for CTWS "Water Quality Standards, Beneficial Uses, and Treatment Criteria". The requirements and standards set forth in Division 41 and Ordinance 80 were adopted to comply with the water quality protection provisions of state, tribal and federal law. The water quality standards in Division 41 are composed of three elements: beneficial uses, numeric and narrative criteria, and the antidegradation policy. The role of each of these is explained below.

8.3 Beneficial Uses

Oregon Law, Tribal Law and the Federal Clean Water Act are structured to require that water quality be protected and maintained so that existing and potential beneficial uses of public waters are not impaired or precluded by degraded water quality. The regulatory approach used is to: (1) identify beneficial uses that are recognized as significant with regard to water quality protection; (2) develop and adopt standards of quality for significant water quality parameters to define the quality that is necessary to protect the identified beneficial uses; (3) establish and enforce case-by-case discharge limitations for each source that is permitted to discharge treated wastes into public waters to assure that water quality standards are not violated and beneficial uses are not impaired; and (4) establish and implement "best management practices" for a variety of "land management" activities to minimize their contribution to water quality standards violations or impairment of beneficial uses.

Beneficial uses to be protected have been identified generally for each river basin in Oregon and specifically for significant stream reaches within some basins. The State's designated beneficial uses to be protected on the mainstems of the Deschutes, Crooked and Metolius Rivers of the

Deschutes Basin are listed in OAR 340-041-0562, and are shown in Table 8.3-1. These uses include public, private domestic, and industrial water supply; irrigation; livestock watering; anadromous fish passage; salmonid fish rearing; salmonid fish spawning; resident fish & aquatic life; wildlife & hunting; fishing; boating; water contact recreation; and aesthetic quality. Hydropower is also a designated use on the Deschutes River from the Project's Reregulating Dam up to the Bend Diversion Dam and the mainstem of the Crooked River.

Table 8.3-1. Oregon designated beneficial uses for the Deschutes Basin.

The Tribes have designated the same uses as the State for the shared (boundary) waters of the Deschutes and Metolius Rivers. In addition, the Tribes have additional designations for cultural and religious practices and for hydropower on the Metolius and its tributaries. The CTWS designated beneficial are listed in Ordinance 80, Table 1.

8.4 Numeric and Narrative Criteria

Generally, the assumption is made that if water quality standard numeric and narrative criteria fully protects the most sensitive beneficial use, then the criteria is fully protective of all the beneficial uses. Water quality standard criteria have been adopted for water quality parameters that are most significant or useful in regulating pollution. These criteria take the form of both numeric limits and narrative statements and have been established based on best available information at the time they were adopted. Development of water quality standards is a continuing process. As new information becomes available, standards for additional parameters may be added and existing numeric and narrative criteria may be revised to better reflect the intent of protection of the identified beneficial uses. Table 8.4-1 identifies applicable criteria used to identify protection of beneficial uses that have been designated within and downstream of the Project.

TABLE 8.4-1. Criteria supportive of Oregon designated beneficial uses.

Designated Uses	Applicable Numeric and Narrative Criteria
1. Public domestic water supply	Table 20 (OAR 340-041) human health, total dissolved solids, pH, narrative[1]
2. Private domestic water	Table 20 (OAR 340-041) human health, total dissolved solids, pH, narrative
3. Industrial water supply	Total dissolved solids, pH, narrative
4. Irrigation	pH, narrative
5. Livestock watering	Bacteria, pH, narrative
6. Anadromous fish passage	Table 20 (OAR 340-041) aquatic life toxicity, temperature, dissolved oxygen, pH, turbidity, total dissolved gas, narrative
7. Salmonid fish rearing	Table 20 (OAR 340-041) aquatic life toxicity, temperature, dissolved oxygen, pH, turbidity, total dissolved gas, narrative
8. Salmonid fish spawning	Table 20 (OAR 340-041) aquatic life toxicity, temperature, dissolved oxygen, , narrative criteria, toxics narrative criteria, turbidity, total dissolved gas criteria
9. Resident Fish and Aquatic Life	Table 20 (OAR 340-041) aquatic life toxicity, temperature, dissolved oxygen, pH, turbidity, total dissolved gas, narrative
10. Wildlife and Hunting	Bacteria, narrative
11. Fishing	Table 20 (OAR 340-041) aquatic life and human health toxicity, bacteria, narrative
12. Boating / Rafting	Table 20 (OAR 340-041) human health toxicity, bacteria, narrative
13. Water Contact Recreation	Table 20 (OAR 340-041) human health toxicity, bacteria, narrative
14. Aesthetic Quality	Nuisance phytoplankton, narrative
15. Hydro-Power	Narrative
16. Commercial Navigation & Transportation	Narrative
17. Cultural & Religious practices[2]	Table 3 (CTWS Ordinance 80, 432.100(2)(p)) human health toxicity, bacteria, narrative

[1] Where narrative criteria are identified in the table, it is intended to reference one to several of the non-numeric narrative standards or narrative components of the combination narrative/numerical standards of OAR 340-041.

[2] This is a CTWS designated use and corresponding applicable criteria, shown here for informational purposes. As identified earlier, this use, not designated by the state, must be provided protection along state/tribal boundary waters.

8.5 Antidegradation Policy

Oregon's antidegradation policy (OAR 340-041-0026) applies to all surface waters. In the case of bodies of water that meet water quality standards, it provides for the maintenance of existing water quality. Specifically, it states that the existing quality of high quality waters (i.e., waters meeting water quality standards) shall be maintained and protected unless the Environmental Quality Commission makes certain rigorous findings of need. For water quality-limited waters, water quality may in no circumstances be lowered; that is, these waters have a nondegradation status.

9. WATER QUALITY STANDARDS COMPLIANCE EVALUATION

9.1 Standards of Concern

The Pelton Round Butte Project likely affects not all water quality parameters for which standards are specified in Oregon Administrative Rule or CTWS Tribal Ordinance for the Deschutes Basin. Only those water quality standards that ODEQ considers may be significantly affected are explicitly evaluated in this certification application evaluation; nonetheless, the Joint Applicants are responsible to assure that the Project is operated in a manner that complies with all State and Tribal water quality standards.

9.1.1 Joint Applicants' Identification of Standards of Concern

The Joint Applicants have identified water quality standards for which they state there is no reason to suspect standards exceedance caused by the Project (Table 9.1.1-1). Table 9.1.1-2 lists those standards that the Joint Applicants consider are potentially affected, and deserving of more rigorous evaluation within this evaluation report.

Table 9.1.1-1. Water Quality Standards That Should Not Be Affected Per Joint Applicant

Standards Not Affected	Joint Applicants' Rationale
Bacteria	There is no reason to suspect that the Project affects bacteria, because there is no significant Project-related discharge of raw or treated sewage or animal waste into Project waters. The toilets at Pelton Park drain to onsite facilities. Domestic wastes at the dams are treated in on-site septic systems. Discharge of domestic wastes from houseboats is prohibited by state and federal law.
Bacterial Pollution	There are currently no known sources of bacterial pollution in the Project vicinity that would be subject to this standard.
Objectionable Liberation of Dissolved Gases	No physical or biological processes associated with the Project results in the objectionable liberation of dissolved gases.
Creation of Tastes or Odors [or Conditions Deleterious to Fish or Aquatic Life]*	The Project adds no nutrients to the water and withdrawal of water from deep in the reservoirs provides no opportunity for the introduction of objectionable tastes or odors.
Aesthetic Conditions	The Project produces no conditions that might be offensive to the human senses of sight, taste, smell, or touch.
Radioisotopes	No radioisotopes are being added to the water by the Project, and there are no known naturally occurring problems with radioisotopes.
Total Dissolved Solids (TDS)	Nothing is added to the water by the Project that would increase the total dissolved solids.
Toxic Substances	No toxic substances are added to the water by the Project, and there are no known naturally occurring problems with toxics.
Turbidity	No physical or biological process associated with the Project increases the turbidity of the water. Ramping rates, and the local geology, limit the production of turbidity through Project operations.

Bottom or Sludge Deposits	The Project adds no nutrients or organic matter to the water that would result in the production of bottom sludge or deposits. Recent investigations suggest that delta formation at the tributary mouths is minimal.
Discoloration, Scum, Oily Sleek, or Floating Solids	Nothing is added to the water by the Project to cause objectionable discoloration, scum, or oily sleek deposits.
Development of Fungi	No nutrients are added to the water as a result of the Project that will support the proliferation of fungi.

*****Bracketed words added by ODEQ to emphasize that this standard also addresses conditions that are considered deleterious to fish and other aquatic life.

Table 9.1.1-2. Water Quality Standards of Potential Concern Per Joint Applicant

Standards of Concern	Joint Applicants' Rationale
Biological Criteria	Discharges from the Reregulating Dam may adversely affect biological communities in the lower Deschutes River.
Dissolved Oxygen	The Deschutes River from the Reregulating Dam to the confluence with the White River is included by ODEQ on the 1998 303(d) list of water quality limited waterbodies. Dissolved oxygen in the tailrace below the Reregulating Dam does not always meet the relevant standard. Various points of Lake Billy Chinook and Lake Simtustus also may not meet the relevant standards.
Temperature	The Deschutes River from the Reregulating Dam to the mouth is included by ODEQ on the 1998 303(d) list of water quality limited waterbodies. Discharges from the Project may increase temperature in the lower river at various times of the year. As with dissolved oxygen, various parts of Lake Billy Chinook and Lake Simtustus may not meet the relevant standard.
Hydrogen Ion Activity (pH)	Lake Billy Chinook and Lake Simtustus, as well as the lower Deschutes River from the mouth to White River (at RM 46), are included by ODEQ on the 1998 303(d) list of water quality limited waterbodies. pH values in Lake Billy Chinook and Lake Simtustus exceed 8.5 during the summer. Discharges from the Project may affect pH in the lower Deschutes River.
Total Dissolved Gas	Spills over the spillways of the dam occur rarely in times of flood. The physical configuration of the spillways and tailraces of the dams do not allow for deep-plunging discharges, and prevent the possibility of gas supersaturation. High values of dissolved oxygen may approach the total dissolved gas standard.
Nuisance Phytoplankton Growth	Lake Billy Chinook and Lake Simtustus are included by ODEQ on the 1998 303(d) list of water quality limited waterbodies. Chlorophyll *a* concentrations greater than the guideline value specified in OAR 340-41-150 have been observed in Lake Billy Chinook and Lake Simtustus.
Antidegradation Policy	Because there are potential water quality impacts from the Project, an antidegradation analysis is necessary to assure that impacts are minimized.

9.1.2 ODEQ's Identification of Standards of Concern

The Department concurs with the Joint Applicants that the standards listed in Table 9.1.1-2 are standards of concern that deserve explicit evaluation. However, the Department also considers several of the standards listed in Table 9.1.1-1 as deserving of some greater level of evaluation, too. These are: Creation of Tastes or Odors, or Conditions Deleterious to Fish or Aquatic Life; Aesthetic Conditions; Total Dissolved Solids; Toxic Substances; Discoloration, Scum, Oily Sleek or Floating Solids; and Turbidity. The Table 9.1.1-2 and additional standards of concern identified here are evaluated in greater detail in the following sections of this report.

9.1.3 Standards Evaluation Format

In the following sections, the Joint Applicants' Project is reviewed against each of the standards of concern identified above based upon Oregon Administrative Record Chapter 340, Division 41, and CTWS Tribal Code Chapter 432, Ordinance No. 80. In instances where the Tribes' standards differ substantively from those adopted by the State, the Tribal ordinance language is provided in addition to State administrative rule. The standards evaluation is generally presented in the following format:

1. The applicable State standard is identified. In some instances, for efficiency and practicality, two or more standards may be grouped together for evaluation.

2. The applicable Tribal standard is identified.

3. The ODEQ interpretation or application of the standard is discussed.

4. The Joint Applicants' description of present conditions and any unique influencing factors relative to the specific standard(s) is discussed.

5. The Joint Applicants' claims regarding the Project's water quality impacts on the standard are summarized.

6. The relevant public testimony received regarding the Project's impacts on the standard is cited or summarized.

7. ODEQ's evaluation of the Project impact relevant to the specific standard is presented. This evaluation includes, where applicable, evaluation of the specific standard within the reservoirs as well as the lower Deschutes River. The Joint Applicants' proposed operations at the Project are evaluated in terms of the water quality standard as currently approved by the Environmental Quality Commission (for state standards) and CTWS Tribal Council (for tribal standards). Minimal evaluation of impact to the Reregulating Reservoir is offered, but may be inferred considering the quality of water discharging from Lake Simtustus and from the Reregulating Reservoir, as discussed in the section below.

8. The ODEQ finding is stated.

9.1.4 Standards Evaluation for the Reregulating Reservoir

Extensive water quality measurements were made at the inlet and outlet of the Regulating Reservoir is support of a 1994-1996 limnological study (Raymond et al. 1997). No samples were collected in the Reregulating Reservoir, itself. The lack of adequate boat access and the extreme fluctuation in elevation of the pool made sampling within the reservoir difficult and dangerous. Under normal summer operations with an average daily flow of 4,410 cfs through the project, the residence time of the Reregulating Pool is less than 10 hours. Under this typical summer flow, the pool exchanges completely 2.5 times per day. During higher winter flow conditions, the residence time is even less. Under these conditions, little change would be expected in the water quality as it passed through this relatively small reservoir. The stations

above and below the pool should adequately represent the water quality in the Reregulating Reservoir. The data presented in Table 9.1.4-1 confirm the similarity of the two sites.

Table 9.1.4-1. Water quality data from the inlet (station 3) and outlet (station 2) of the Reregulating Pool (mean ± standard deviation).

Considering the remarkable similarity in quality between the inlet and outlet of this relatively small reservoir, the limited retention time, and considering the lack of boat access and safety issues associated with sampling in this reservoir, ODEQ did not request any additional sampling be conducted from the reservoir pool. With respect to evaluating compliance with water quality standards for this reservoir, ODEQ is reasonably assured that the quality entering and departing the reservoir provides a reasonable estimate of the quality within the reservoir. As there is no provision for fish passage into or out of this reservoir, and public access is restricted (for safety concerns and security concerns associated with fish rearing operations), the need for a more detailed evaluation of beneficial use support (via sampling) is not needed. Thus, in the following sections, discussions relating to background conditions, Joint Applicants' position, and ODEQ evaluation, will be directed primarily at the two much-larger reservoirs and the lower river below the Reregulating Dam (below the Project).

9.2 Temperature – OAR 340-041-0565(2)(b), 340-041-0026(3)(a)(D), and 340-041-0120(11); and CTWS Ordinance 80, 432.100(2)(b)

9.2.1 Applicable State Standards

The applicable State standards for temperature are as follows:

340-41-565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes River Basin:

(b) Temperature: The changes adopted by the Commission on January 11, 1996, become effective July 1, 1996. Until that time, the requirements of this rule that were in effect on January 10, 1996, apply. The method for measuring the numeric temperature criteria specified in this rule is defined in OAR 340-041-0006(54):

(A) To accomplish the goals identified in OAR 340-041-0120(11), unless specifically allowed under a Department-approved surface water temperature management plan as required under OAR 340-041-0026(3)(a)(D), no measurable surface water temperature increase resulting from anthropogenic activities is allowed:

(i) In a basin for which salmonid fish rearing is a designated beneficial use, and in which surface water temperatures exceed 64.0°F (17.8°C);

(ii) In the Columbia River or its associated sloughs and channels from the mouth to river mile 309 when surface water temperatures exceed 68.0°F (20.0°C);

(iii) In waters and periods of the year determined by the Department to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a basin which exceeds 55.0°F (12.8°C);

(iv) In waters determined by the Department to support or to be necessary to maintain the viability of native Oregon bull trout, when surface water temperatures exceed 50.0°F (10.0°C);

(v) In waters determined by the Department to be ecologically significant cold-water refugia;

(vi) In stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological integrity of the Threatened and Endangered population;

(vii) In Oregon waters when the dissolved oxygen (DO) levels are within 0.5 mg/L or 10 percent saturation of the water column or intergravel DO criterion for a given stream reach or subbasin;

(viii) (viii) In natural lakes.

(B) An exceedance of the numeric criteria identified in subparagraphs (A)(i) through (iv) of this subsection will not be deemed a temperature standard violation if it occurs when the air temperature during the warmest seven-day period of the year exceeds the 90th percentile of the seven-day average daily maximum air temperature calculated in a yearly series over the historic record. However, during such periods, the anthropogenic sources must still continue to comply with their surface water temperature management plans developed under OAR 340-041-0026(3)(a)(D);

(C) Any source may petition the Commission for an exception to subparagraphs (A)(i) through (viii) of this subsection for discharge above the identified criteria if:

(i) The source provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or

(ii) A source is implementing all reasonable management practices or measures; its activity will not significantly affect the beneficial uses; and the environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource.

340-041-0026(3)(a)(D) [I]n any waterbody identified by the Department as exceeding the relevant numeric temperature criteria... and designated as water quality limited under Section

303(d) of the Clean Water Act, the following requirements shall apply to appropriate watersheds or stream segments...:

(i) Anthropogenic sources are required to develop and implement a surface water temperature management plan which describes the best management practices, measures, and/or control technologies which will be used to reverse the warming trend of the basin, watershed, or stream segment identified as water quality limited for temperature;

(ii) Sources shall continue to maintain and improve, if necessary, the surface water temperature management plan in order to maintain the cooling trend until the numeric criterion is achieved or until the Department, in consultation with the Designated Management Agencies (DMAs), has determined that all feasible steps have been taken to meet the criterion and that the designated beneficial uses are not being adversely impacted. In this latter situation, the temperature achieved after all feasible steps have been taken will be the temperature criterion for the surface waters covered by the applicable management plan. The determination that all feasible steps have been taken will be based on, but not limited to, a site-specific balance of the following criteria: protection of beneficial uses; appropriateness to local conditions; use of best treatment technologies or management practices or measures; and cost of compliance;

(iii) Once the numeric criterion is achieved or the Department has determined that all feasible steps have been taken, sources shall continue to implement the practices or measures described in the surface water temperature management plan in order to continually achieve the temperature criterion;

(iv) For point sources, the surface water temperature management plan will be part of their National Pollutant Discharge Elimination System Permit (NPDES);

(v) For nonpoint sources, the surface water temperature management plan will be developed by designated management agencies (DMAs) which will identify the appropriate BMPs or measures;

(vi) A source (including but not limited to permitted point sources, individual landowners and land managers) in compliance with the Department or DMA (as appropriate) approved surface water temperature management plan shall not be deemed to be causing or contributing to a violation of the numeric criterion if the surface water temperature exceeds the criterion;

(vii) In waters the Department determines to be critical for bull trout recovery, the goal of a bull trout surface water temperature management plan is to specifically protect those habitat ranges necessary to maintain the viability of existing stocks by restoring stream and riparian conditions or allowing them to revert to conditions attaining the coolest surface water temperatures possible under natural background conditions;

340-041-0120(11) EQC policy on surface water temperature (as regulated in the basin standards found in ..., OAR-340-041-0565, ...:

(a) It is the policy of the Environmental Quality Commission (EQC) to protect aquatic ecosystems from adverse surface water warming caused by anthropogenic activities. The intent of the EQC is to minimize the risk to cold-water aquatic ecosystems from anthropogenic warming of surface waters, to encourage the restoration of critical aquatic habitat, to reverse surface water warming trends, to cool the waters of the State, and to control extremes in temperature fluctuations due to anthropogenic activities:

(A) The first element of this policy is to encourage the proactive development and implementation of best management practices or other measures and available temperature control technologies for nonpoint and point source activities to prevent thermal pollution of surface waters;

(B) The second element of this policy is to require the development and implementation of surface water temperature management plans for those basins exceeding the numeric temperature criteria identified in the basin standards. The surface water temperature management plans will identify the best management practices (BMPs) or measures and approaches to be taken by nonpoint sources, and technologies to be implemented by point sources to limit or eliminate adverse anthropogenic warming of surface waters.

(b) Surface water temperatures in general are warming throughout the State. These water temperatures are influenced by natural physical factors including, but not limited to solar radiation, streamside shade, ambient air temperatures, heated water discharges, cold-water discharges, channel morphology, and stream flow. Surface water temperatures may also be affected by anthropogenic activities that discharge heated water, widen streams, or reduce stream shading, flows, and depth. These anthropogenic activities, as well as others, increase water temperatures. Anthropogenic activities may also result in the discharge of cold water that decreases water temperatures and affects biological cycles of aquatic species;

(c) The temperature criteria in the basin standards establish numeric and narrative criteria to protect designated beneficial uses and to initiate actions to control anthropogenic sources that adversely increase or decrease stream temperatures. Natural surface water temperatures at times exceed the numeric criteria due to naturally high ambient air temperatures, naturally heated discharges, naturally low stream flows or other natural conditions. These exceedances are not water quality standards violations when the natural conditions themselves cause water temperatures to exceed the numeric criteria. In these situations, the natural surface water temperatures become the numeric criteria. In surface waters where both natural and anthropogenic factors cause exceedance of the numeric criteria, each anthropogenic source will be responsible for controlling, through implementation of a management plan, only that portion of the temperature increase caused by that anthropogenic source;

(d) The purpose of the numeric criteria in the basin standards is to protect designated beneficial uses; this includes specific life cycle stages during the time periods they are present in a surface water of the state. Surface water temperature measurements taken to determine compliance with the identified criteria will be taken using a sampling protocol appropriate to indicate impact to the beneficial use. The EQC, in establishing these

criteria, recognizes that new information is constantly being developed on water temperatures and how water temperatures affect different beneficial uses. Therefore, continued reevaluation of temperature information is needed to refine and revise numeric criteria in the basin standards over time. The EQC also recognizes that the development and implementation of control technologies and best management practices or measures to reduce anthropogenic warming is evolving and the achievement of the numeric criteria will be an iterative process;

(e) Surface water temperature management plans will be required according to OAR 340-041-0026(3)(a)(D) when the relevant numeric temperature criteria are exceeded and the waterbody is designated as water-quality limited under Section 303(d) of the Clean Water Act. The plans will identify those steps, measures, technologies, and/or practices to be implemented by those sources determined by the Department to be contributing to the problem. The plan may be for an entire basin, a single watershed, a segment of a stream, single or multiple nonpoint source categories, single or multiple point sources or any combination of these, as deemed appropriate by the Department, to address the identified temperature problem:

(A) In the case of state and private forest lands, the practices identified in rules adopted pursuant to the State Forest Practices Act (FPA) will constitute the surface water temperature management plan for the activities covered by the act. Consequently, in those basins, watersheds or stream segments exceeding the relevant temperature criterion, and for those activities covered by the Forest Practices Act, the forestry component of the temperature management plan will be the practices required under the FPA. If the mandated practices need to be improved in specific basins, watersheds or stream segments to fully protect identified beneficial uses, the Departments of Forestry and Environmental Quality will follow the process described in ORS 527.765 to establish, implement, and improve practices in order to reduce thermal loads to achieve and maintain the surface water temperature criteria. Federal forest management agencies are required by the federal Clean Water Act to meet or exceed the substantive requirements of the state forestry nonpoint source program. The Department currently has Memoranda of Understanding with the U.S. Forest Service and Bureau of Land Management to implement this aspect of the Clean Water Act. These memoranda will be used to identify the temperature management plan requirements for federal forest lands;

(B) The temperature management plan for agricultural nonpoint sources shall be developed and implemented in the manner described in section (10) of this rule;

(C) The Department will be responsible for determining the appropriate surface water temperature management plan for individual and general NPDES permitted sources. The requirement for a surface water temperature management plan and the content of the plan will be appropriate to the contribution the permitted source makes to the temperature problem, the technologies and practices available to reduce thermal loads, and the potential for trading or mitigating thermal loads;

(D) In urban areas, the Department will work with appropriate state, county, municipal and special district agencies to develop surface water temperature management plans that reduce thermal loads in basins, watersheds, or stream segments associated with the temperature violations so that the surface water temperature criteria are achieved.

(f) The EQC encourages the release of stored water from reservoirs to cool surface water in order to achieve the identified numeric criteria in the basin standards as long as there is no significant adverse impact to downstream designated beneficial uses from the cooler water temperatures. If the Department determines that a significant adverse impact is resulting from the cold-water release, the Department shall, at its discretion, require the development of a management plan to address the adverse impact created by the cold-water release;

(g) Maintaining low stream temperatures to the maximum extent practicable in basins where surface water temperatures are below the specific criteria identified in this rule shall be accomplished by implementing technology based permits, best management practices or other measures. Any measurable increase in surface water temperature resulting from anthropogenic activities in these basins shall be in accordance with the antidegradation policy contained in OAR 340-041-0026.

OAR 340-41-0006 defines several terms used in the Temperature Standards:

(54) "Numeric Temperature Criteria" are measured as the seven-day moving average of the daily maximum temperatures. If there is insufficient data to establish a seven-day average of maximum temperatures, the numeric criteria shall be applied as an instantaneous maximum. The measurements shall be made using a sampling protocol appropriate to indicate impact to the beneficial uses;

(55) "Measurable Temperature Increase" means an increase in stream temperature of more than 0.25°F;

(56) "Anthropogenic", when used to describe "sources" or "warming", means that which results from human activity;

(57) "Ecologically Significant Cold-Water Refuge" exists when all or a portion of a waterbody supports stenotypic cold-water species (flora or fauna) not otherwise widely supported within the subbasin, and either:

(a) Maintains cold-water temperatures throughout the year relative to other segments in the subbasin, providing summertime cold-water holding or rearing habitat that is limited in supply, or;

(b) Supplies cold water to a receiving stream or downstream reach that supports cold-water biota.

9.2.2 Applicable Tribal Standards

The applicable Tribal standards for temperature are as follows:

CTWS Ordinance 80, 432.100(2)(d) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in waters of the Basin:

(A) No measurable surface water temperature increase resulting from anthropogenic activities is allowed unless a management plan has been reviewed and approved by the Tribe. The Tribes may allow a variance to the standards on a site-specific basis in accordance with Section 432.120, and after full satisfaction of the Tribe's continued integrated planning process. Variance standards will be set using the best data available and reviewed every three years as part of the triennial review process. This plan must show how the thermal load is (or will be) minimized and how the activity does not (or will not) interfere with attainment of numeric criteria within the watershed in question. This standard applies to the following:

(i) In a water body for which salmonid fish rearing (Table 4) is a designated beneficial use, and in which surface water temperatures exceed 64.0°F (17.8C); or

(ii) In waters and periods of the year determined by the Tribe (listed in Table 4, and Figure 1) to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a reach which exceeds 55.0°F (12.8C); or

(iii) In waters determined by the Tribe to support or to be necessary to maintain the viability of native Oregon bull trout (listed in Table 4, and Figure 1) when surface water temperatures exceed 50.0°F (10.0C); or

(iv) In waters determined by the Tribe to be ecologically significant cold-water refugia (Table 4); or

(v) In stream segments containing federally listed Threatened and Endangered species; or

(vi) In Reservation waters when the dissolved oxygen (DO) levels are within 0.5 mg/L or 10 percent saturation of the water column or intergravel DO criterion for a given stream reach or subbasin; or

(vii) In natural lakes.

(B) An exceedance of the numeric criteria identified in subparagraphs (A)(i) through (iii) of this subsection will not be deemed a temperature standard violation if it occurs when the air temperature during the warmest seven-day period of the year exceeds the 90^{th} percentile of the seven-day average daily maximum air temperature calculated in a yearly series over the historic record (local weather stations on the Reservation and in neighboring communities will be used to calculate air temperatures). All thermal sources must continue to meet permit or management plan requirements.

(C) Any source may petition the Tribe for a variance to subparagraphs (A)(i) through (vi) of this subsection (in accordance with Section 432.120) for discharge above the identified criteria if:

(i) The source provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or

(ii) A source is implementing all reasonable management practices or measures; its activity will not significantly affect the beneficial uses; and the environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource.

9.2.3 Application of the Temperature Standard

Water temperature has a profound effect on organisms that live or reproduce in the water. This is particularly true of Oregon's native "cold-water" fish such as salmon, bull trout, steelhead and some amphibians (frogs and salamanders). When water temperature becomes too high, salmon and trout (salmonids) suffer a variety of ill effects. With increasing temperature, salmonids experience sub-lethal effects of impaired feeding, decreased growth rates, reduced resistance to disease and parasites, increased sensitivity to toxics, intolerance with migration, reduced ability to compete with more temperature-resistant species, and increased vulnerability to predation. If temperatures are high enough for sustained periods, mortality occurs. As temperatures increase above the optimal range, spawning and egg development becomes rapidly impaired, thus limiting reproduction. In addition, elevated temperatures may also adversely affect other important water quality parameters (such as dissolved oxygen). Based on the available information, the temperature standard criteria were established with the primary intent of protecting the resident salmonid populations. It was recognized that natural temperatures may exceed the desirable upper limit criteria established in the standard for protection. However, the determination made in the adoption of the standard was that when temperatures are above the standard, discharges of waste or activities that cause a measurable increase should not be allowed.

While there may be competing beneficial uses in a river or stream, federal law requires ODEQ to protect the most sensitive of these beneficial uses. The temperature standard is designed to protect cold water fish such as salmon and trout. The temperature "standard" is a very flexible and important set of criteria. There is no one number that dictates how the temperature issue will be applied on every single stream, river, or season. The goal of the criterion is to protect fish and aquatic life. The standard is established at 64.0ºF (17.8ºC) unless there is cold-water fish spawning or bull trout habitat. These special habitat areas have standards of 55.0ºF (12.8ºC) and 50.0ºF (10.0ºC), respectively.

The appropriate temperature criterion needs to be matched with the location within a waterbody wherever and whenever sensitive beneficial uses occur or would be expected to occur under natural conditions. With respect to natural lakes and reservoirs that stratify, it may not be possible to meet temperature criteria at all depths and locations. With respect to § 401 certifications for hydroelectric reservoirs that stratify, ODEQ requires the following:

1) Demonstration that significant portions of the reservoirs will provide adequate water quality, compliant with all applicable criteria, supportive of the beneficial uses when and where they occur;
2) Implementation of management measures to the highest extent practicable to meet standards criteria in as large of a portion of the reservoirs as possible;
3) If applicable criteria cannot be met in the entire reservoir, the § 401 applicant must provide information describing why; and,
4) Temperature and/or other water quality management plans are required as deemed appropriate to accommodate an adaptive management approach to address the water quality issues and maximize suitable habitat.

The more sensitive beneficial uses within the Project reservoirs and the lower Deschutes River down to about Maupin are bull trout. These waters are known to have spawning, rearing, or resident adult bull trout and are to be protected based upon application of the 50°F criterion. Salmonid spawning and rearing criteria of 55°F and 64F, respectively, applies to protect these most sensitive beneficial uses in the lowermost Deschutes River below approximately Maupin. The timing of applicability of the 55°F and 64°F criterion in the lowermost river is dependent upon the periodicity of salmonid life stages.

9.2.4 Joint Applicants' Description of Present Conditions

Temperature was measured during 1994 through 1996 in each tributary once monthly during the daytime, and also approximately every half-hour by automated monitoring devices. The monthly data show distinct differences between the tributary rivers (Figure 9.2-1). The Metolius River is notably cooler than the others, the Deschutes is intermediate, and the Crooked River is the warmest. The annual cycle of temperature is more marked in the Deschutes River than in the other tributaries. Both the Metolius and Crooked Rivers are strongly influenced by springs, which tend to moderate annual temperature cycles. The Crooked River is also notable for the relatively narrow range of temperatures it exhibits. This can be attributed to warm springs entering the river upstream from the reservoir, which keep the Crooked River warmer during the winter.

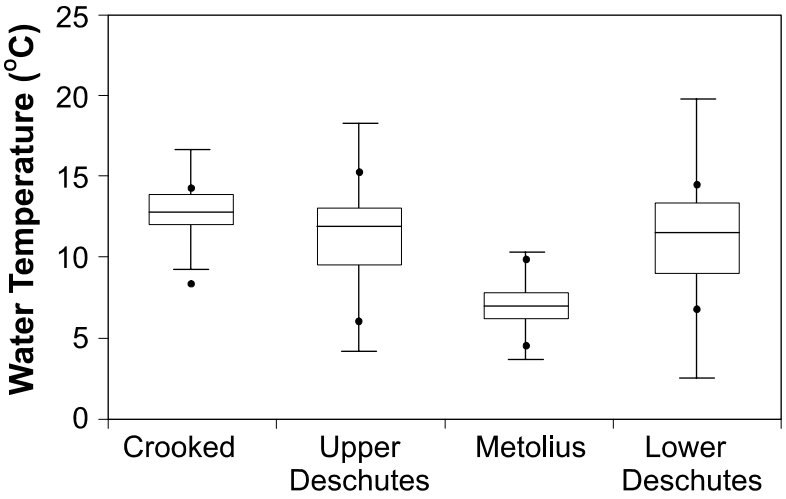

Figure 9.2.4-1 Box plot showing the distribution of temperature values measured in the Crooked River (Site 11), the upper Deschutes River (Site 14), the Metolius River (Site 17), and the lower Deschutes River at the Highway 26 bridge (Site 1) during June 1994 through October 1996.

Water temperatures were measured at 30-minute intervals in the three tributaries in 1994 and 1996. The 7-day running mean maximum and mean minimum temperatures have been calculated from these data. The running 7-day mean daily high and low temperatures are shown in Figure 9.2-2 for the three tributary rivers for the period November 1994 through September 1996. The plots emphasize the relatively narrow range of daily temperature fluctuation in the Crooked River compared to the relatively large changes in daily temperature in the Metolius River. The running 7-day mean daily high temperature in the Metolius River above Lake Billy Chinook is greater than 10°C for much of the summer, from mid-June through August. Temperatures in the Crooked River and the Deschutes River are greater than 12.8°C for the same period.

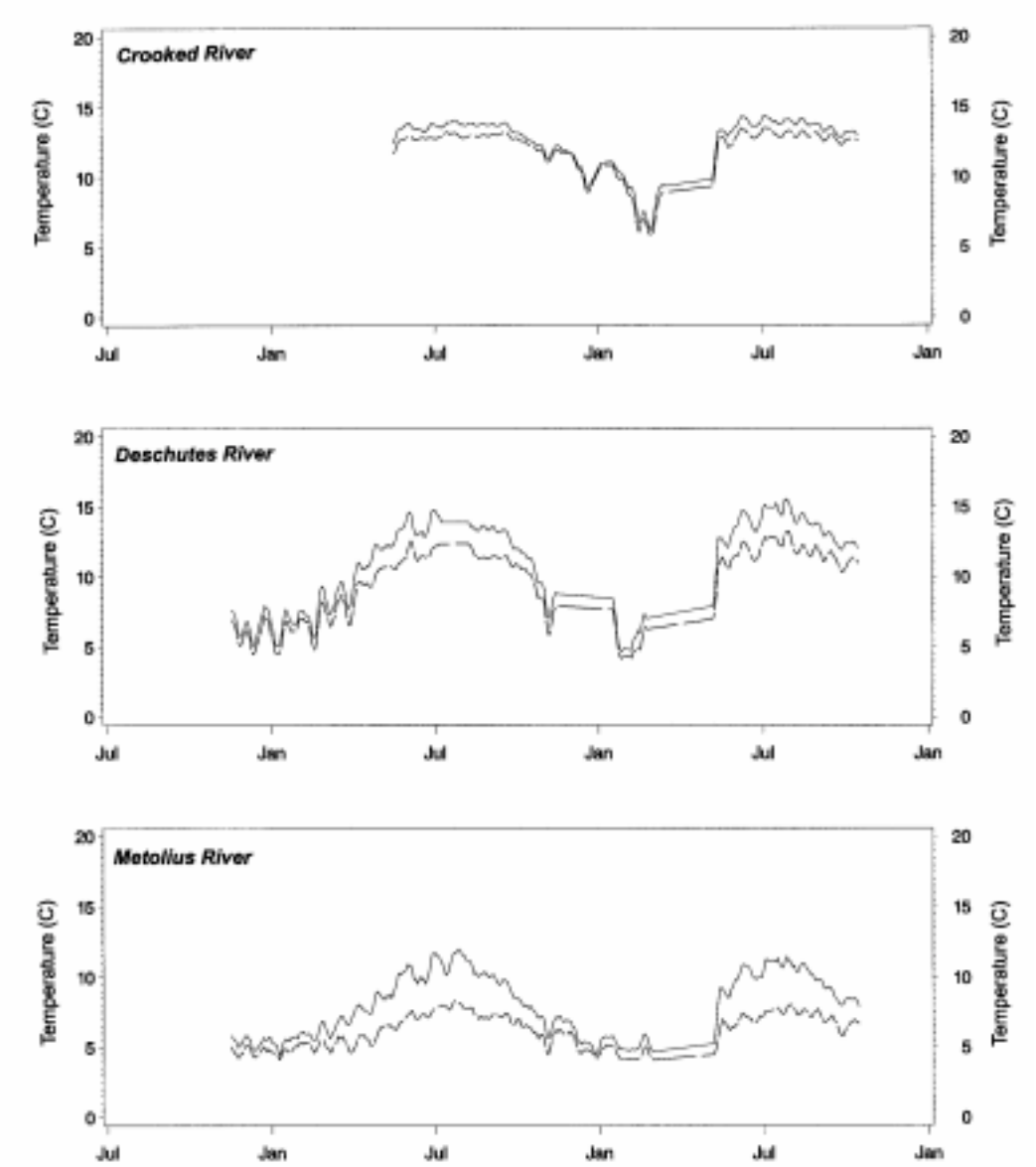

Figure 9.2.4-2. Daily high (upper curve) and low (lower curve) temperature in the tributary rivers entering Lake Billy Chinook (plotted as 7-day running mean).

Historical data collected by the U.S. Geological Survey show that the temperature in the Metolius River just above Lake Billy Chinook exceeded 10°C for 2 to 3 months every summer for the period 1954 through 1974 (Figure 9.2-3).

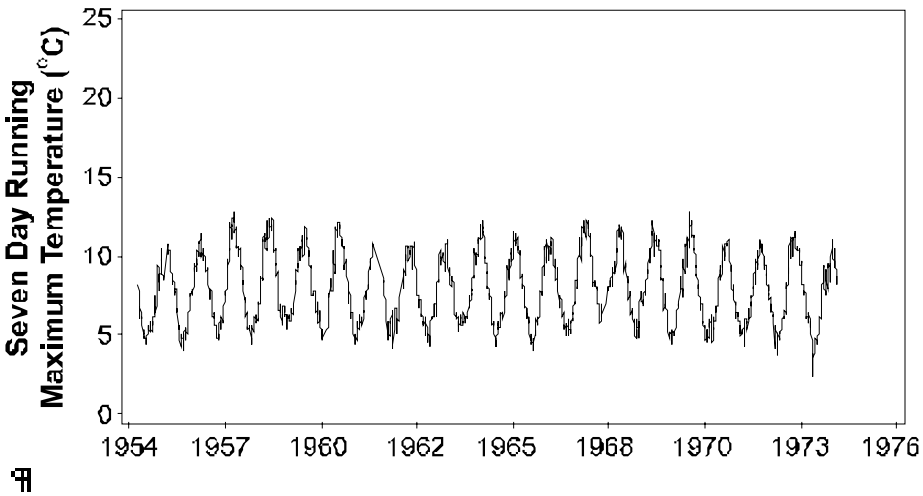

Figure 9.2.4-3. Water temperature measured in the Metolius River near Grandview, above Lake Billy Chinook, 1954–1974 (Source: USGS 1998).

Lake Billy Chinook stratifies in the summer, developing a thermocline at approximately 10 m depth. This isolates the surface waters from those at depth and influences the flow and mixing of waters in the reservoir. Stratification lasts from May until October. Between October and May, however, although the vertical temperature gradient is greatly reduced, the reservoir typically does not become vertically isothermal (Figure 9.2-4). This, combined with evidence from measurements of other constituents, suggests that Lake Billy Chinook does not mix completely in all years (Raymond et al. 1997). Lake Simtustus is thermally stratified in the summer from approximately mid-May until mid-September, with a thermocline developing at approximately 4 m. Stratification breaks down in September, and the reservoir is vertically isothermal by late October. The reservoir continues to cool until March or April.

Temperatures in Lake Billy Chinook and Lake Simtustus exceed 10°C at all depths from June through October for the years studied. The warming that occurs in the hypolimnion is the result of inflow of warm water from the tributary streams, because there is no mechanism to warm the hypolimnetic water by contact with the atmosphere when the reservoirs are stratified. This is to be expected, in light of the observed inflow temperatures shown in Figures 9.2-2 and 9.2-3.

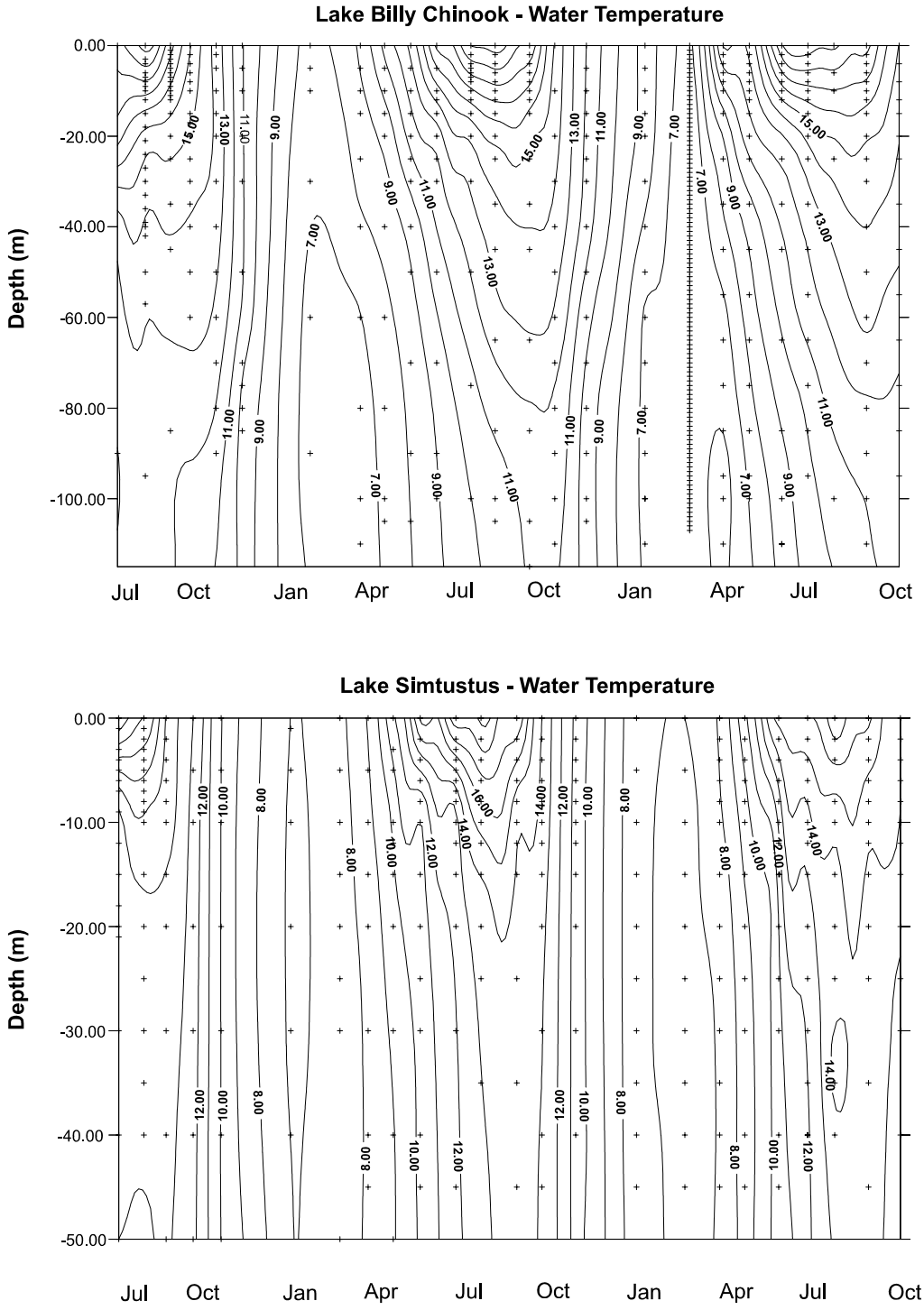

Figure 9.2.4-4 Seasonal temperature profiles (°C) for Lake Billy Chinook and Lake Simtustus during July 1994 through October 1996.

The range of temperature measured below the Project is somewhat smaller than that in the Deschutes River above the Project, with a maximum monthly value of 14.8°C and a minimum monthly value of 6.9°C. The median temperature of 11.1°C is also somewhat lower than in the Deschutes River above the Project (Figure 9.2-1). The effect of mixing with the Metolius River

and Crooked River can be seen in the broadening of the interquartile distance in temperatures measured below the Project.

Based on mass balance calculations adjusted for estimated warming during travel in the absence of the reservoirs, the annual range of temperatures measured below the Reregulating Dam is similar to what would exist at that point in the Deschutes River in the absence of the reservoirs (Raymond et al. 1998). Detailed computer analysis (Huntington et al. 1999) confirms that the annual maximum and minimum temperatures have changed little as a result of the Project.

Detailed temperature modeling of the Deschutes River (Huntington et al. 1999) shows, however, that for the years for which there are sufficient data, the temperatures measured in the Deschutes River below the Reregulating Dam during the summer are equal to or lower than what would have been expected in the absence of the dams. Temperatures in the late summer and fall are slightly warmer than temperatures that would have been expected in the absence of the Project. Computer simulations, based on detailed temperature data collected in 1997 and 1998, suggest that weekly mean temperatures immediately below the Reregulating Dam have been shifted in time so that they are warmer by approximately 0.7°C (range: 0.2 to 1.5°C warmer) from early August to mid-December and cooler by an average of about 1.7°C (range: 0.2 to 3.5°C cooler) during the remainder of the annual cycle as a result of the Project (Huntington et al. 1999).

Seven-day mean maximum temperatures measured at 21 stations in the Deschutes River below the Project increased with increasing distance down river, and ranged from 14.3°C (ending on September 6) immediately below the Reregulating Dam (RM 100) to 20.9°C (ending on August 7) at Colorado Rapids (RM 4). The temperature standard applied for the protection of salmonids (17.8°C) was exceeded at all sites below White River (RM 46) but at no sites above that point. Results of computer simulation of temperatures using the model SNTEMP suggest that the effects of the Project reduced the annual mean maximum weekly temperature throughout the length of the river. The effect at Colorado Rapid (RM 4) was to delay the maximum temperature by about 2 weeks and reduce the magnitude by approximately 0.3°C (Huntington et al. 1999).

The BETTER temperature model accurately predicts the existing temperature stratification and circulation in Lake Billy Chinook. Reservoir temperature and water quality is driven by the inflow of three tributaries: the Crooked, Deschutes, and Metolius rivers. Superimposed on this pattern is the effect of summer heating that further warms the surface of the reservoir. Downstream water temperature is a function of river discharge, air temperature, and the temperature of the discharge from Round Butte Dam. Figures 1 through 12 of Khangaonkar et al. (1999) show modeled temperatures corresponding to the existing conditions (for 1995) in Lake Billy Chinook (Khangaonkar et al. 1999 [§ 401 Application Appendix 1]).

9.2.5 Joint Applicants' Position

Applicable temperature standards for bull trout and salmonid spawning are exceeded during the summer in the Deschutes River below the Project, in Lake Billy Chinook and Lake Simtustus, and in the Crooked, Deschutes, and Metolius rivers above the Project. The exceedances in the three tributaries to Lake Billy Chinook are the result of processes that occur outside the boundaries of the Project and are a reflection of the natural condition of the rivers. Detailed field data and computer modeling suggest that the Project has had a net cooling effect on the lower Deschutes River during the summer and has delayed and reduced slightly the maximum summer

temperature in the river. As noted, however, the Project has also had a slight warming effect later in the year.

The threshold question is whether the Project contributes measurable warming to any potential exceedances. As noted above, computer simulations do show a measurable increase below the Project (Huntington et al. 1999). Similarly, modeling results from the BETTER model also indicate that the Project does contribute more than 0.25ºF to temperatures in the river, as shown by Figure 9.2-5, which compares existing and pre-Project conditions below the Reregulating Dam. Accordingly, since the discharges at the Reregulating Dam reflect conditions in Lake Billy Chinook, it is appropriate to evaluate the potential impact of these temperatures on the beneficial uses in Lake Billy Chinook.

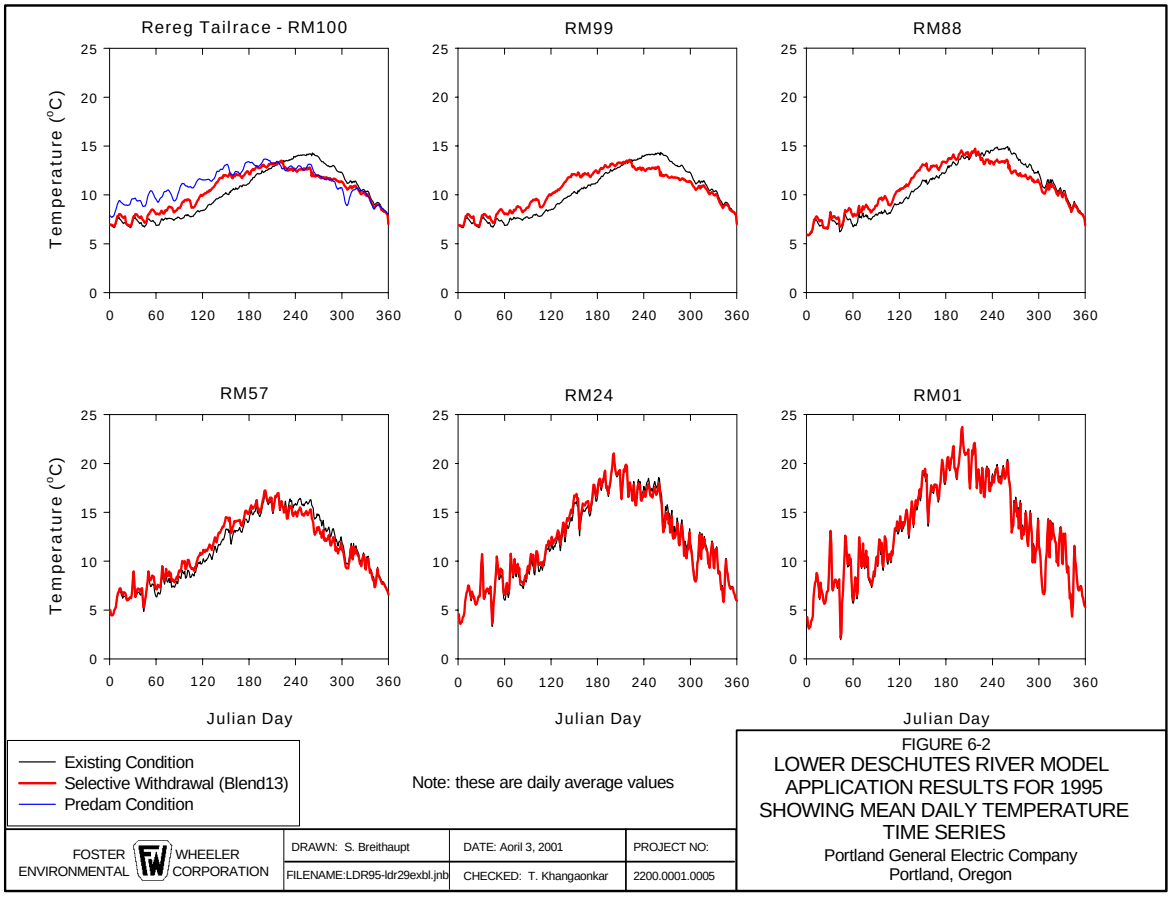

Figure 9.2.5-1. Lower Deschutes River model application results for 1995, showing mean daily temperature time series.

For purposes of analyzing the Project's compliance with the water quality temperature standard in Lake Billy Chinook, temperature data are presented in a manner that permits direct spatial and temporal comparison of the relevant standard with the location wherever sensitive beneficial uses occur or would be expected to occur. The two beneficial uses that are most relevant are bull trout and salmonid rearing. Thus, for purposes of this analysis, the bull trout criterion of 50ºF

(10°C) would apply year-round within Lake Billy Chinook and Lake Simtustus at the depths in which bull trout occur or would be expected to occur and in the lower river at the Reregulating Dam. The salmonid 64ºF (17.8°C) criterion would apply at other depths within Lake Billy Chinook, Lake Simtustus, and the Reregulating Reservoir.

9.2.5.1 Kokanee

Kokanee is a pelagic species that rears most of its life in a standing water body and then moves up a tributary to spawn. The Lake Billy Chinook kokanee population apparently originated from the wild kokanee population in Suttle Lake upstream. The reservoir was filled in 1964, and by 1968, kokanee made up 67 percent of the angling harvest, even though they were not stocked in the reservoir until 1970 (Stuart et al. 1996). Kokanee are the most abundant fish species in Lake Billy Chinook and are found throughout the reservoir during most of the year. During the warm summer, when the reservoir is thermally stratified, kokanee spend nearly all their time at or below the thermocline in the cooler water.

A major study of life history, harvest, and limiting factors of kokanee in Lake Billy Chinook began in 1996 (Chilcote 1996). Results of the study to date have shown that more than 90 percent of this population spawns in the Metolius River system. The rest spawn in the Crooked and Deschutes rivers upstream of the reservoir. Maturing adults begin staging in early August at the head of the Metolius River Arm. Movement up the river begins about the first of September, and peak spawning activity occurs in early October (Thiesfeld et al. 1999). Fry emerge from January through May and move immediately to Lake Billy Chinook. Peak movement in 1998 occurred during early April. Young-of-the-year kokanee are concentrated in the Metolius River Arm during spring and summer but disperse throughout the reservoir in the fall. An estimated 2.5 million fry migrated down the Metolius River to Lake Billy Chinook from mid-March through May in 1998 (Thiesfeld et al. 1999). The fishery for kokanee in Lake Billy Chinook is very popular, with between 95,000 and 150,000 angler hours expended annually. Because of the abundance of kokanee, and the relatively small impact of angling on this population, there is a bonus bag limit of 25 kokanee per angler daily.

Hydroacoustic data show that kokanee are widespread in Lake Billy Chinook, generally at depths below 50 ft (§ 401 Application Appendix 2). During summer, they appear to orient below the thermocline during most of the day. Abundant zooplankton allows the harvest of kokanee at levels per surface acre higher than most other lakes (Kern et al. 1999).

9.2.5.2 Bull Trout

The bull trout population in Lake Billy Chinook is actually an extension of the bull trout population in the Metolius River Basin because this is where the critical cold-water spawning and initial juvenile rearing habitat is located. Bull trout are a migratory species. In major river systems, they move down to lower river areas when about 2 to 3 years old to forage and after several years return upstream to their natal habitat to spawn. Such migratory behavior is termed “fluvial.” When bull trout migrate to a standing water body instead of a large river, this life-history type is termed “adfluvial.”

Prior to the construction of the Project, a fluvial bull trout population occurred in the Metolius and Deschutes rivers (Buchanan et al. 1997). With the construction of Round Butte Dam in 1964 and

the termination of fish passage in 1968, juvenile bull trout moving out of the Metolius River entered Lake Billy Chinook instead of the Deschutes River. Thus, the fluvial population was converted to an adfluvial population with the formation of the reservoir. Bull trout in this system have been studied since 1985 (Ratliff and Fies 1989; Ratliff 1992; Ratliff et al. 1996; Riehle et al. 1997).

Adfluvial juvenile bull trout appear to enter Lake Billy Chinook mostly during spring and summer at ages 1 through 3. Juvenile and subadult bull trout can be found in the highest densities in the upper Metolius River Arm. However, some bull trout move quickly into the downstream areas of the reservoir, while others move through the reservoir and up the Crooked and Deschutes rivers as far as they have access.

Bull trout are a coldwater-adapted char and can be found throughout Lake Billy Chinook near the surface and along the rocky shoreline, through the winter and early spring. They appear to employ several strategies to avoid the warmer surface waters of Lake Billy Chinook during summer. Radio-tagging studies have shown that, although they will not spawn until September, maturing adult bull trout enter the lower Metolius River during spring and early summer (Thiesfeld et al. 1996). Thus, they spend the summer in the cool waters of the Metolius River prior to entering their respective cold spawning tributaries in August or September to spawn. Other tagging studies show that many immature bull trout also spend the warm summer months in the lower Metolius River (Ratliff et al. 1996) or in the Deschutes and Crooked rivers upstream of Lake Billy Chinook (Ratliff 1992). Immature bull trout have also been captured in crayfish traps below a depth of 200 ft (60 m) during late summer (Scott Lewis, OSU, personal communication); these fish are apparently residing in the coldest water remaining in Lake Billy Chinook at that time of year. Although the upper portion of Lake Billy Chinook is much warmer than the 50°F (10°C) standard set by ODEQ for bull trout waters, this population appears to have ample cool-water habitat to utilize during the warmer periods of the year.

Large bull trout were caught only occasionally until the late 1980s. They were managed as part of the general trout group, and most were harvested at a relatively small size. Starting in 1988, a series of more protective regulations (Ratliff et al. 1996) and a public education effort (Ratliff et al. 1997) increased the awareness of the potential of Lake Billy Chinook to produce large bull trout. These measures led to increasing numbers of large bull trout in the reservoir. Since 1993, many trophy-sized bull trout over 10 pounds have been caught annually at Lake Billy Chinook. To address the proposed federal listing of bull trout as a Threatened species, a 24-in. minimum size regulation was adopted in 1997. Because of the overwhelming evidence that this population is abundant and robust, the U.S. Fish and Wildlife Service continues to allow the consumptive fishery in Lake Billy Chinook under the management of the Oregon Department of Fish and Wildlife (ODFW) and Tribes.

The ongoing kokanee and sockeye salmon research provides additional data on the locations of bull trout within Lake Billy Chinook. In particular, screw traps fished in the Metolius River just upstream of Lake Billy Chinook in the early winter captured large numbers of juvenile bull trout, which were attracted to the kokanee fry in the trap. On the other hand, otter trawls throughout Lake Billy Chinook captured no bull trout, which indicated that they were present at depths greater than those sampled by the otter trawls (down to approximately 100 ft; Kern et al. 1999). This is confirmed by the capture of bull trout in crayfish traps fished below a depth of 200 ft during late summer.

9.2.5.3 Temperature Data

Figures 1 through 12 of Appendix 1 of the § 401 Application (Khangaonkar et al. 1999) show current temperature conditions in Lake Billy Chinook as predicted by the BETTER model. These figures show that although surface waters warm through the summer months and the area of temperature meeting the temperature criteria decreases and lies deeper, a substantial volume of the reservoir remains below the relevant criterion. In particular, Figures 7 through 9 show that the 64ºF (17.8ºC) salmonid criterion is met at depths below approximately 50 ft during the summer months. Temperatures meeting the 50ºF (10°C) bull trout standard exist at greater depths in the Metolius and Deschutes river arms of Lake Billy Chinook.

These data are consistent with the locations where kokanee and bull trout are found or expected to be found. As a result, it can be concluded that temperature conditions in Lake Billy Chinook are not having an adverse impact on the relevant beneficial uses. There is ample water meeting the temperature criterion for kokanee, and bull trout, when present, are in the deepest and coldest waters.

Figure 5-25 of Yang et al. (2001; § 401 Application Appendix 5) shows current temperature conditions in Lake Simtustus as modeled using output of the BETTER model in Lake Billy Chinook. This figure shows that although, as in Lake Billy Chinook, surface waters warm during the summer months, a substantial volume of the reservoir meets the 17.8ºC criterion. The effect of Blend 13 on temperature in Lake Simtustus can be seen clearly in the comparison of longitudinal temperature distributions between the existing condition and Blend 13. As shown in Figure 5-25 of Appendix 5, the temperature in the entire reservoir under Blend 13 is much cooler than under existing conditions.

Juvenile bull trout are not found in Lake Simtustus, and are not found in Lake Billy Chinook during the summer. Subadult bull trout, however, are found throughout Lake Billy Chinook during the summer. Chinook salmon, steelhead, and rainbow trout spawn successfully in the Deschutes River below the Project.

It appears that the exceedance of temperature standards are the result of conditions outside the influence of the Project, that Project operations may be having a net benefit (i.e., cooling summertime temperatures) throughout the lower river, and that the most restrictive beneficial uses, bull trout and salmonid spawning, are not impaired. To the extent that temperatures in the lower Deschutes River are not being increased by the presence of the Project, even though the lower river exceeds the temperature standard that has been applied, the water quality standard is being met. In addition, to the extent that the tributaries of Lake Billy Chinook exceed the relevant temperature standard, conditions in the deeper portions of Lake Billy Chinook may not represent violations of the Naturally Occurring Conditions standard as it applies to temperature.

As noted above, the Project causes a slight warming of the lower river at the Reregulating Dam from August to mid-October. This is shown in Figure 6-2 of Breithaupt et al. (2001; § 401 Application Appendix 6).

For the period in late summer and fall when the lower river exceeds the applied temperature standard and computer simulations suggest the Project has a slight warming effect, the standard is not being met. The Joint Applicants are proposing measures to mitigate for this slight warming.

9.2.5.4 Joint Applicants' Conclusion

After implementation of selective water withdrawal, modeling indicates that discharges from the Reregulating Dam will meet the relevant temperature criterion. Selective water withdrawal will shift temperature conditions back toward pre-Project conditions. These improved conditions will persist over much of the lower river. Conditions in the reservoirs will improve, and conditions will meet the relevant temperature criteria where the associated beneficial uses occur or are expected to occur. As a result, the Joint Applicants believe that there will be a reasonable assurance that proposed Project operations, coupled with the Joint Applicants' proposals for mitigation, will not contribute "measurably" to temperature criteria exceedance.

9.2.6 Summary of Public Testimony

Conservation Groups:

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW is precluded in instances of capital expenditure. Considering the considerable term of FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed.

9.2.7 ODEQ Evaluation

The Joint Applicants have conducted extensive data collection and water quality modeling to evaluate existing conditions and to quantify Project-related water quality impacts. Predictive modeling has also been employed to evaluate potential remedies for identified Project-related water quality impacts, leading up to the Joint Applicants' proposal to construct and implement a selective water withdrawal (SWW) facility in the forebay of Lake Billy Chinook.

As identified in Section 9.2.5.3, the applicable 50F-bull trout criterion is exceeded at times within the Project reservoirs and at the point of discharge to the lower river. These exceedances are a function of the temperatures of the tributary and groundwater inputs, the processes that take place within the reservoirs, including thermal stratification, and how water is discharged from the Project. Although the Joint Applicants do not have control over or responsibility for the quality of water received from the upper basin, the existence and operation of the Project influences how and to what extent the quality of that water is modified within the reservoirs before being passed to the lower Deschutes River. The impoundment of water behind the dams provides an environment for seasonal thermal stratification, resulting in water quality that varies with depth. Waters discharged from the Project to the lower Deschutes River is cooler in the spring and early summer and warmer from late summer until late fall than would be the case if the Project did not exist. The Project-related warming of waters during the late summer and early fall contributes to non-attainment of the 50°F bull trout temperature criterion. The lower Deschutes River is on Oregon's CWA 303(d) list of temperature-impaired waterbodies.

The single-depth, deep-water withdrawal facility within Lake Billy Chinook limits any potential operational capability to selectively and strategically remove waters of variable quality from different depths within the reservoir when it is stratified. It appears, based upon modeling that modification of the deep water withdrawal facility in Lake Billy Chinook to allow managed SWW would provide the potential to significantly improve the quality of waters impounded by all three dams and discharged to the lower river. At least 16 different flow-blending scenarios have been modeled to identify seasonal blending that will significantly improve water quality and also provide for improved surface currents within Lake Billy Chinook. With respect to the latter, it is hypothesized that improved surface current velocities and patterns toward the Round Butte Dam forebay would likely allow for improved collection efficiency of downstream fish migrants, considered a very important element of the Joint Applicants' fish passage plan.

The Joint Applicants have proposed to construct a SWW facility alongside and connecting to the existing deep-water intake structure in the Round Butte Dam forebay. According to the Joint Applicants, the SWW facility would consist of a tower with two sets of gates, one set at depth and the other set near the surface. The facility would also be equipped to exclude and collect downstream fish migrants. To allow surface withdrawal with a 20-foot reservoir drawdown, the surface gates would be located below elevation 1,925 feet. All gate openings would be furnished with trashracks to prevent large debris from entering the tower. A trashrack rake system would likely be required for the cleaning of the surface trashracks, as these racks would be more prone to debris accumulation than the deep racks. Changes between deep and shallow withdrawal would be completed while the Project is in operation, by modulating the position of the lower intake gates. This gate adjustment would vary the proportion of flow from top and bottom waters, to regulate downstream water temperatures and quality. Overall, it is expected that the operation and maintenance of SWW facility would be relatively simple. It is expected that the SWW facility would be constructed without the need to draft down the reservoir.

Modeling results indicate that if the SWW facility is operated to blend within a bracketed range between the above-referenced Blend 13 and Blend 16, a blend evaluated since submittal of the initial § 401 application, that the Project would not "measurably" warm waters discharging from the Project at any time of the year. In other words, waters discharged to the lower river from the Reregulating Dam are predicted to be less than 0.25°F warmer than the flow-weighted average temperature of waters entering the Project from the three tributary rivers and groundwater. This would, in effect, result in a temperature regime more like that which it is thought that the Deschutes River fish and aquatic organisms evolved in. Additionally, such limitation of Project-related warming to the lower river would be considered compliant with the temperature standard in that the Project, by regulatory definition, would not cause measurable warming to the lower Deschutes River. This limitation to less than 0.25°F warming, would be satisfied not only when Project inflows are 50°F or greater, as required by OAR 340-041-565(2)(b)(A)(iv), but at all times, thus assuredly meeting administrative rule requirements for waters containing federally listed Threatened or Endangered species (bull trout and steelhead are federally listed as threatened). For reference, the rule, as cited in Section 9.2.1 under OAR 340-041-565(2)(b)(A)(vi), states: "To accomplish the goals identified in OAR 340-041-0120(11), unless specifically allowed under a Department-approved surface water temperature management plan as required under OAR 340-041-0026(3)(a)(D), *no measurable surface water temperature increase* resulting from anthropogenic activities is allowed in stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological

integrity of the Threatened and Endangered population.

Within Lake Billy Chinook, modeling predicts that the withdrawal of warmer surface waters, primarily from the Deschutes and Crooked Rivers, during winter and spring will allow the accumulation of colder and denser Metolius River water that tends to fill the bottom of the reservoir. This would lead to a colder mean reservoir temperature as summer approaches, thereby significantly improving habitat for temperature-sensitive bull trout and other salmonids. Modeling also indicates that cold water habitat for salmonids in Lake Simtustus and the Reregulating Reservoir would be significantly increased, too. While the 50°F bull trout criterion will not be met at all depths within the reservoirs, as is the current condition, significantly greater volumes (depths) of water will meet the criterion with SWW.

In addition to evaluating potential temperature impacts of such blending, the Joint Applicants have also examined this blending in terms of how it would impact Lake Billy Chinook surface currents and other important water quality parameters including dissolved oxygen, pH, and phytoplankton such that water quality modifications could be optimized. The evaluations have included analysis for median flow conditions as well as worst-case drought flow and water quality conditions entering the Project. Potential blending impacts to dissolved oxygen, pH and phytoplankton are discussed in Sections 9.3, 9.4, and 9.5 of this report, respectively. This same range of blending is also expected to improve surface currents to help guide outmigrating smolts to a forebay collection facility. The percentage of surface to bottom withdrawal for Blends 13 and 16 are described in Table 9.2.7-1.

Table 9.2.7-1. Range of surface and bottom withdrawal (%) from Lake Billy Chinook to achieve water quality compliance and provide guidance currents for outmigrating smolts.

	Surface Withdrawal (%)		**Deep Withdrawal (%)**	
Month	Blend 13	Blend 16	Blend 13	Blend 16
Jan	100	100	0	0
Feb	100	100	0	0
Mar	100	100	0	0
Apr	100	100	0	0
May	100	100	0	0
Jun	80	100	20	0
01 Jul - 18 Jul	70	85	30	15
19 Jul - 31 Jul	60	85	40	15
01 Aug - 13 Aug	60	70	40	30
14 Aug - 28 Aug	50	70	50	30
29 Aug - 17 Sep	42	60	58	40
18 Sep – 30 Sep	15	60	85	40
01 Oct - 12 Oct	15	50	85	50
13 Oct - 31 Oct	0	25	100	75
November	0	50	100	50
December	0	100	100	0

Because there is uncertainty surrounding the ultimate design, operational plan, and effectiveness

of the proposed SWW facility and other water quality PMEs, the Joint Applicants have proposed to adopt an adaptive management and decision approach to address water quality issues.

Adaptive management is a formal, systematic, and rigorous approach to learning from the outcomes of management actions, accommodating change, and improving management. It involves synthesizing existing knowledge, exploring alternative actions, and making explicit forecasts about their outcomes. Actions and objectives are then adjusted based on this feedback and improved understanding. In addition, decisions, actions, and outcomes are carefully documented and communicated to others, so that knowledge gained through experience is passed on, rather than being lost when individuals move or leave the effort (Taylor 1996).

The Joint Applicants' adaptive management proposal for water quality, inclusive of a proposed Temperature Management Plan (TMP) is contained in a document entitled *Water Quality Management and Monitoring Plan* (WQMMP), Fourth Draft Proposal, March 2002, attached as Exhibit A to both this evaluation and the § 401 certification. Chapter 3 of the proposed WQMMP contains the adaptive management provisions specific to temperature, while Chapter 7 includes adaptive monitoring provisions related to temperature and other water quality parameters.

The WQMMP, inclusive of the TMP, was available for review during the public comment period. Within ninety days of issuance of the § 401 certification, the Joint Applicants will need to revise the WQMMP to further refine and clarify necessary management and monitoring measures, and then resubmit the document for ODEQ approval. It is not expected that the final revised WQMMP will include a substantial change in the management and monitoring plans upon which ODEQ's determination of reasonable assurance is based.

In general, the TMP calls for blending within a bracketed range bounded by Blends 13 and 16 to comply with the temperature standard within and downstream of the Project. Provisions are included in the TMP to adapt this flow blending regime as determined appropriate based upon monitoring feedback, past results, new information (i.e. additional modeling runs) and expected impacts to other water quality parameters inclusive of surface currents. The plan also calls for periodic reporting of SWW gate adjustments and monitoring results to ODEQ and the WCB, as well as presentation of results to other interested parties at an annual spring workshop. ODEQ expects that implementation of SWW in accordance with the TMP would limit Project-related warming of the lower river to less than 0.25°F (defined by rule as non-measurable), and would maximize the useable cold-water habitat within the reservoirs. Further, the Joint Applicant, in implementing such SWW, maximizing cold-water habitat under a revised and ODEQ-approved TMP, will satisfy each of the temperature compliance requirements for stratified reservoirs identified in Section 9.2.3.

In addition to the adaptive management and monitoring described in the WQMMP to address Project-related temperature impacts, the Project operations must comply with future Total Maximum Daily Loads (TMDLs). The target date for completing TMDLs for CWA 303(d) listings on the lower Deschutes, including temperature listings, is 2006. The Joint Applicants will be expected to comply with the TMDL including any related necessary modification of the revised and ODEQ-approved WQMMP. To provide further assurance that adaptive management and TMDL requirements will be reliable and enforceable in the context of a new FERC license, ODEQ and the Joint Applicants propose to enter a § 401 Implementation Agreement, attached as Exhibit B to this report, concurrent with issuance of a § 401 certification. The agreement will serve two

purposes: (1) addressing ODEQ's role and the Joint Applicants' commitments regarding adaptive management measures required by § 401 certification conditions, and (2) providing ODEQ and the public further reasonable assurance that the Project as proposed to be relicensed will comply with water quality standards and future TMDLs.

With respect to public comment #CG-3, the WQMMP does, indeed, specify a restriction regarding ODEQ's ability to require modifications to the SWW structure. Based upon the information presented to ODEQ in support of § 401 certification, and considering the proposed blending regime, ODEQ is reasonably assured that upon construction of the SWW structure and implementation of the proposed flow regime, that additional structural modification will not be necessary. However, as provided for by 33 USC 1341 and OAR 340-48, ODEQ may reconsider the proposed § 401 certification and add, delete, or modify certification conditions as necessary to address changes in knowledge, Project conditions, or water quality standards or to address any failure of certification conditions to protect water quality and beneficial uses. ODEQ includes such a provision in the § 401 certification and the § 401 Implementation Agreement to be signed by the Joint Applicants and ODEQ.

9.2.8 ODEQ Finding

ODEQ is reasonably assured that operation of the Project will comply with the temperature standard provided that the Joint Applicants meet the following conditions:

Water Quality Management and Monitoring Plan

Within 90 days of issuance of the §401 certification, the Joint Applicants, in consultation with ODEQ, shall revise the Water Quality Management and Monitoring Plan attached to these certification conditions as Exhibit A and submit the revised plan to ODEQ for approval. The plan as approved by ODEQ is hereafter referred to in these certification conditions as the "WQMMP". Upon ODEQ approval, the WQMMP becomes a part of the §401 certification for the Project for purposes of any federal license or permit thereafter issued.

Selective Water Withdrawal Facility Construction and Operation

By no later than five years from the date of receiving a new FERC license for the Project, the Joint Applicants shall construct, test, and commence operation of the Selective Water Withdrawal (SWW) facility described in the Joint Applicants' §401 application.

Temperature

1. The SWW facility shall be operated in accordance with the Temperature Management Plan (TMP) contained in the WQMMP. The TMP shall identify those measures that the Joint Applicants will undertake to reduce the Project's contribution to exceedances of water quality standard criteria for temperature.

2. Upon issuance of a new FERC license for the Project, the Joint Applicants shall implement the Water Quality Monitoring Plan (WQMP) contained in the WQMMP. The WQMP shall specify the temperature monitoring reasonably needed to determine (a) whether the temperature criteria continue to be exceeded in waters affected by the Project, (b) the

success of the TMP in reducing the Project's contribution to any continued exceedances of the criteria, and (c) any additional measures that may be needed to reduce the Project's contribution to exceedances of the criteria.

3. Upon the U.S. Environmental Protection Agency's final approval or adoption of a TMDL for temperature in the portion of the Deschutes River affected by the Project, ODEQ may reevaluate the Joint Applicants' TMP in light of information acquired since the certification of the Project. If additional temperature reduction measures are feasible and necessary to meet a Load Allocation (LA) for the Project under the TMDL (either as a component of the initial TMDL or any subsequent modification of the TMDL), ODEQ may require submittal of a revised TMP that ensures attainment of the LA, subject to the limits set forth in Chapter 1.0 of the attached Exhibit A and incorporated into the WQMMP. If the TMDL does not include a specific LA for the Project, references to the "LA for the Project" shall refer to the LA that encompasses Project-related thermal contributions to waters affected by the Project.

4. At the end of the period determined by ODEQ to be necessary to implement the TMDL for temperature in waters affected by the Project, ODEQ may:

   (a) Determine whether the LA for the Project has been achieved.

   (b) If the LA for the Project has been achieved, the Joint Applicants shall continue to implement the TMP unless, at the Joint Applicants' request, ODEQ approves a modification or termination of the TMP.

   (c) If the LA for the Project has not been achieved, ODEQ may reevaluate the TMP to determine whether additional measures to reduce the Project's contribution to exceedances of the temperature criteria are necessary and feasible. If additional measures are necessary and feasible, ODEQ may require submittal of a revised TMP that ensures attainment of the LA, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. Any modification of the TMP that would require the Project to reduce water temperatures beyond what would be required by the LA for the Project shall be effective only upon modification of the LA to reflect the reduced load allocation.

   (d) If (i) additional measures to reduce the Project's contribution to exceedances of the temperature criteria are necessary to achieve the LA but the measures are not feasible, and (ii) the water quality standard has not been achieved for waters affected by the Project, ODEQ shall verify whether all feasible measures have been undertaken within the Deschutes River Basin to achieve the LA for waters affected by the Project. If all feasible measures have not been undertaken, ODEQ, in conjunction with designated management agencies, shall take steps to ensure that all feasible measures are undertaken. If all feasible measures have been undertaken, ODEQ shall determine whether designated beneficial uses of waters affected by the Project are adversely affected by the failure to achieve the LA. If the designated beneficial uses are not adversely affected by the failure to achieve the LA, the Joint Applicants shall continue to implement the TMP unless, at the Joint Applicants' request, ODEQ approves modification or termination of

the TMP. If the designated beneficial uses are adversely affected by the failure to achieve the LA, ODEQ may modify the TMP to require additional temperature measures, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. Any modification of the TMP that would require the Project to reduce water temperatures beyond what would be required by the LA for the Project shall be effective only upon modification of the LA to reflect the reduced load allocation.

5. Any Project-related instream temperature increase of 0.25°F. or less above the relevant criterion shall not be deemed to contribute to an exceedance of the temperature criterion or to a violation of the temperature water quality standard.

6. ODEQ may make or require reasonable modifications to the WQMP that it considers to be reasonable and feasible if:

   (a) The WQMP proves inadequate to provide the data needed to make the determinations described in certification condition 2, above; or,

   (b) Modifications to the TMP require or indicate a need for modification to the WQMP.

7. With the approval of ODEQ, the Joint Applicants may cease implementing the TMP and WQMP or may implement a modified TMP and WQMP. ODEQ may approve termination or modification if ODEQ determines that it will not impair the achievement of any LA for the Project for temperature and will not contribute to the exceedance of the relevant temperature criterion in waters affected by the Project.

8. The Joint Applicants shall implement modifications requested by ODEQ under these certification conditions and the WQMMP.

9.3 Dissolved Oxygen (DO) – OAR 340-041-0565(2)(a) and CTWS Ordinance 80, 432.100(2)(a)

9.3.1 Applicable State Standard

The applicable State standard for dissolved oxygen is as follows:

340-041-0565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(a) Dissolved oxygen (DO): The changes adopted by the Commission on January 11, 1996, become effective July 1, 1996. Until that time, the requirements of this rule that were in effect on January 10, 1996, apply:

   (A) For waterbodies identified by the Department as providing salmonid spawning, during the periods from spawning until fry emergence from the gravels, the following criteria apply:

(i) The dissolved oxygen shall not be less than 11.0 mg/L. However, if the minimum intergravel dissolved oxygen (IGDO), measured as a spatial median, is 8.0 mg/L or greater, then the DO criterion is 9.0 mg/L;

(ii) Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/L or 9.0 mg/L criteria, dissolved oxygen levels shall not be less than 95 percent of saturation.

(B) For waterbodies identified by the Department as providing salmonid spawning during the period from spawning until fry emergence from the gravels, the spatial median intergravel dissolved oxygen concentration shall not fall below 6.0 mg/L;

(C) A spatial median of 8.0 mg/L intergravel dissolved oxygen level shall be used to identify areas where the recognized beneficial use of salmonid spawning, egg incubation and fry emergence from the egg and from the gravels may be impaired and therefore require action by the Department. Upon determination that the spatial median intergravel dissolved oxygen concentration is below 8.0 mg/L, the Department may, in accordance with priorities established by the Department for evaluating water quality impaired waterbodies, determine whether to list the waterbody as water quality limited under the Section 303(d) of the Clean Water Act, initiate pollution control strategies as warranted, and where needed cooperate with appropriate designated management agencies to evaluate and implement necessary best management practices for nonpoint source pollution control;

(D) For waterbodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen shall not be less than 8.0 mg/L as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/L, dissolved oxygen shall not be less than 90 percent of saturation. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen shall not fall below 8.0 mg/L as a 30-day mean minimum, 6.5 mg/L as a seven-day minimum mean, and shall not fall below 6.0 mg/L as an absolute minimum (Table 21);

(E) For waterbodies identified by the Department as providing cool-water aquatic life, the dissolved oxygen shall not be less than 6.5 mg/L as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen shall not fall below 6.5 mg/L as a 30-day mean minimum, 5.0 mg/L as a seven-day minimum mean, and shall not fall below 4.0 mg/L as an absolute minimum (Table 21);

(F) For waterbodies identified by the Department as providing warm-water aquatic life, the dissolved oxygen shall not be less than 5.5 mg/L as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen shall not fall below 5.5 mg/L as a 30-day mean minimum, and shall not fall below 4.0 mg/L as an absolute minimum (Table 21).

OAR 340-41-0006 defines several terms used in the Dissolved Oxygen standards:

(44) "Intergravel Dissolved Oxygen" (IGDO) – The concentration of oxygen measured in the stream gravel pore water. For the purposes of compliance with criteria, the dissolved oxygen concentration should be measured within a redd or artificial redd, down-gradient of the egg pocket. Measurements should be taken within a limited time period; for example, prior to emergence of fry during the month of March.

(45) "Spatial Median" – The value which falls in the middle of a data set of multiple IGDO measurements taken within a spawning area. Half the samples should be greater than, and half the samples should be less than the spatial median.

(46) "Daily Mean" (dissolved oxygen) – The numeric average of an adequate number of data to describe the variation in dissolved oxygen concentration throughout a day, including daily maximums and minimums. For the purpose of calculating the mean dissolved oxygen concentration.

(47) "Monthly (30-day) Mean Minimum" (dissolved oxygen) – The minimum of the 30 consecutive day floating averages of the calculated daily mean dissolved oxygen concentration.

(48) "Weekly (seven-day) Mean Minimum" (dissolved oxygen) – The minimum of the seven consecutive day floating average of the calculated daily ***mean*** dissolved oxygen concentration.

(49) "Weekly (seven-day) Minimum Mean" (dissolved oxygen) – The minimum of the seven consecutive day floating average of the daily ***minimum*** concentration. For purposes of application of the criteria, this value will be used as the reference for diurnal minimums.

(50) "Minimum" (dissolved oxygen) – The minimum recorded concentration including seasonal and diurnal minimums.

(51) "Cold-Water Aquatic Life" – The aquatic communities that are physiologically restricted to cold water, composed of one or more species sensitive to reduced oxygen levels. Including but not limited to *Salmonidae* and cold-water invertebrates.

(52) "Cool-Water Aquatic Life" – The aquatic communities that are physiologically restricted to cool water, composed of one or more species having dissolved oxygen requirements believed similar to the cold-water communities. Including but not limited to *Cottidae*, *Osmeridae*, *Acipenseridae*, and sensitive *Centrarchidae* such as the small-mouth bass.

(53) "Warm-Water Aquatic Life" – The aquatic communities that are adapted to warm-water conditions and do not contain either cold- or cool-water species.

9.3.2 Applicable Tribal Standard

The applicable Tribal standard for dissolved oxygen is as follows:

CTWS Ordinance 80, 432.110(2)(a) No wastes shall be discharged and no activities shall conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes River:

(A) For waterbodies identified by the Tribe as providing salmonid spawning, during the periods from spawning until fry emergence from the gravels, the following criteria apply:

(i) The seven-day mean minimum dissolved oxygen shall not be less than 11.0 mg/L. However, if the minimum intergravel dissolved oxygen, measured as a spatial is 8.0 mg/L or greater, then the dissolved oxygen criterion is 9.0 mg/L.

(ii) Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/L or 9.0 mg/L criteria, dissolved oxygen levels shall not be less than 95 percent of saturation.

(iii) Periods of native salmonid spawning, egg incubation, and fry emergence for the gravel are flow and temperature dependent and tend to vary with elevation. If necessary, site specific dates for these periods may established by the Tribe after full satisfaction of the public participation of the Tribes continued and integrated planning process.

9.3.3 Application of the Dissolved Oxygen Standard

One of the principal parameters used to determine water quality is dissolved oxygen (DO). Maintaining adequate concentrations of DO is vitally important for supporting fish, invertebrates, and other aquatic life. Some aquatic species such as the salmonids are very sensitive to reduced concentrations of DO. Sensitivity also varies between various life stages (egg, larvae, and adults), and between different life processes (feeding, growth, and reproduction).

DO levels within gravels (intergravel DO, or IGDO) directly influence the survival of salmonid embryos. Many of the salmonids spawn in gravel redds. The critical DO levels for the developing embryos occur in the intergravels surrounding the eggs at these redds. High water column DO levels are not necessarily indicative of adequate IGDO levels, and vary depending on several interrelated factors including water column concentrations, the percentage of fine sediment in the gravel pores, sediment oxygen demand, and oxygen demand of the eggs.

The appropriate DO criterion needs to be matched with the location within a waterbody wherever and whenever sensitive beneficial uses occur or would be expected to occur under natural conditions. The Project reservoir environments support cold-water aquatic life, thus the applicable DO criterion is 8.0 mg/L, in accordance with OAR 340-041-0565(2)(a)(D). With respect to natural lakes and reservoirs that stratify, it may not be possible to meet DO criteria at all depths and locations. With respect to § 401 certifications for hydroelectric reservoirs that stratify, ODEQ requires the following:

1) Demonstration that significant portions of the reservoirs will provide adequate water quality, compliant with all applicable criteria, supportive of the beneficial uses when and where they occur;

2) Implementation of management measures to the highest extent practicable to meet standards criteria in as large of a portion of the reservoirs as possible;

3) If applicable criteria cannot be met in the entire reservoir, the § 401 applicant must provide information describing why; and,

4) Temperature and/or other water quality management plans are required as deemed appropriate to accommodate an adaptive management approach to address the water quality issues and maximize suitable habitat.

The waters downstream of the Project in the lower Deschutes River support salmonid spawning, with various species of salmonid spawning or egg incubation occurring practically year-round. Hence, the applicable DO criterion for the river below the Project is 11.0 mg/L or 95 percent saturation. However, if the IGDO in the lower river, measured as a spatial median, is 8.0 mg/L or greater, then the DO criterion for the water column is 9.0 mg/L or 95 percent saturation (OAR 340-041-0565(2)(a)(A).

9.3.4 Joint Applicants' Description of Present Conditions

Dissolved oxygen values for the three tributary streams above the Project are summarized in Figure 9.3-1. The annual ranges of DO values in the three tributaries, measured during the daytime, are similar. The Metolius River has somewhat higher DO values (median value = 11.8 mg/L) than the Deschutes River (median = 11.2 mg/L) and Crooked River (median = 10.7 mg/L). Daytime DO values measured between 1994 and 1996 in the Metolius and Deschutes Rivers were greater than 11.0 mg/L with only a few exceptions. Dissolved oxygen in the Crooked River was usually close to 11.0 mg/L.

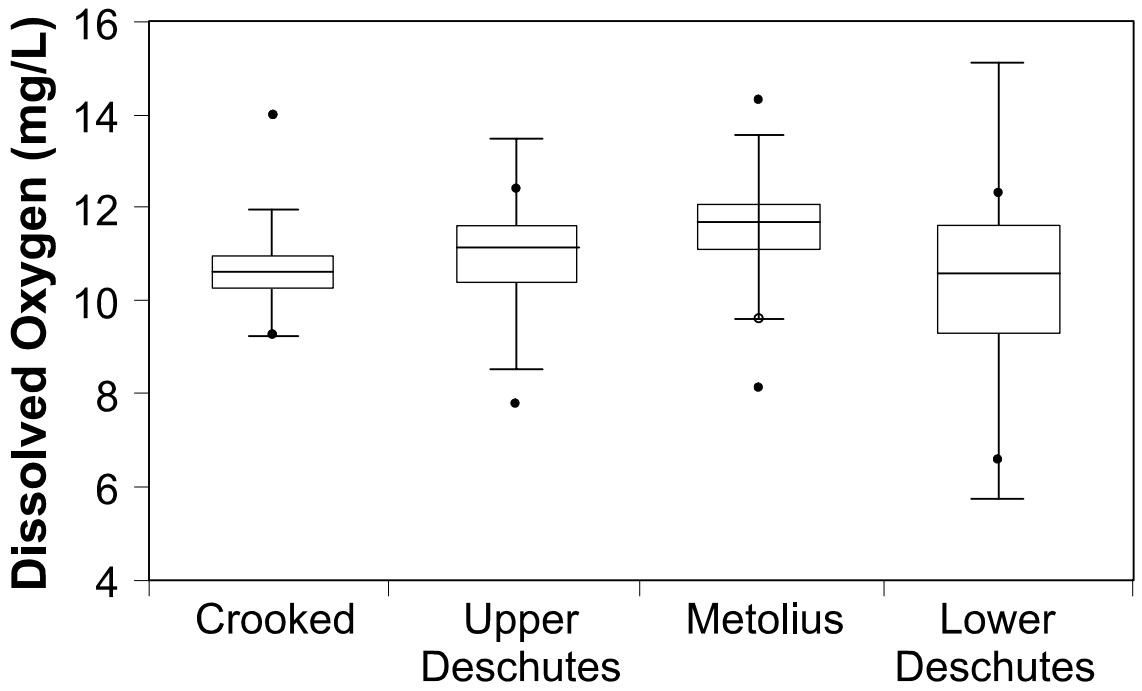

Figure 9.3.4-1. Box plot showing the distribution of dissolved oxygen values measured in the Crooked River (Site 11), the upper Deschutes River (Site 14), the Metolius River (Site 17), and in the lower Deschutes River below the Project (Site 1) during June 1994 through October 1996.

Lake Billy Chinook is well oxygenated during the winter throughout its depth, although DO concentration varies slightly with depth, even when the reservoir appears to be well mixed. In the reservoir, DO falls below the 8.0 mg/L standard in the deeper water during the summer. Figure 9.3-2 shows the seasonal pattern for the forebay of Lake Billy Chinook. Figure 9.3-3 shows the distribution with depth of DO values in Lake Billy Chinook. During the summer, Lake Billy Chinook experiences partial DO depletion in the hypolimnion. Dissolved oxygen values of less than 4.0 mg/L occur near the bottom at the deepest stations.

Near the surface, DO values stay at or above 10 mg/L throughout the year, with the highest concentrations of DO typically occurring in late March and October. Figures 37 through 40 of Khangaonkar et al. (1999) (§ 401 Application Appendix 1) show DO concentrations corresponding to the existing conditions in Lake Billy Chinook for the summer months of June, July, August, and September.

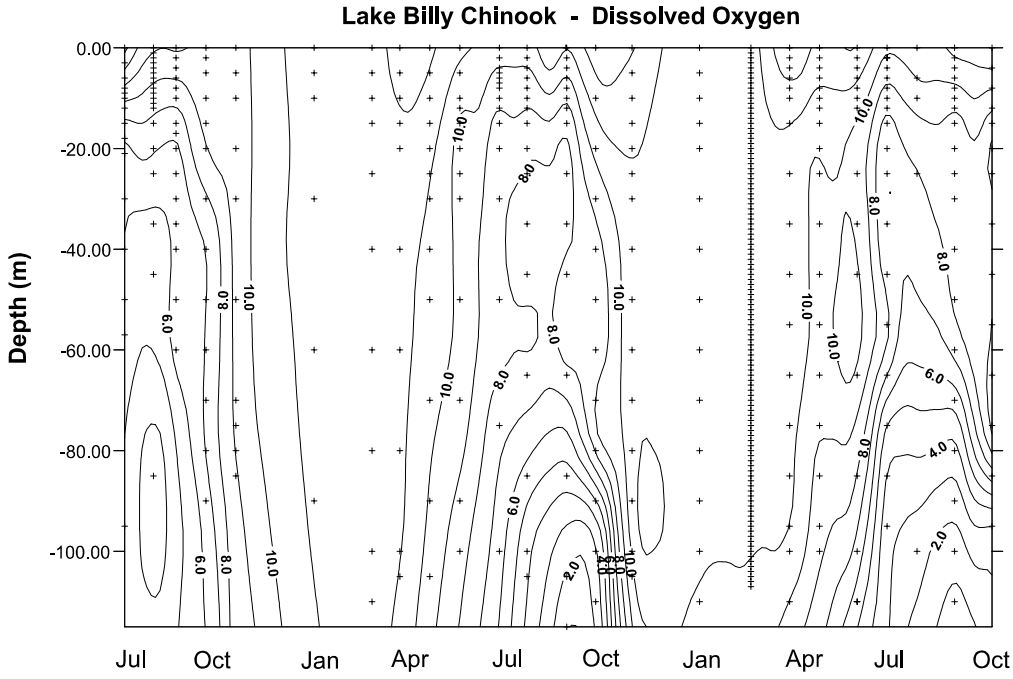

Figure 9.3.4-2 Seasonal profiles of dissolved oxygen (mg/L) in Lake Billy Chinook during July 1994 through October 1996.

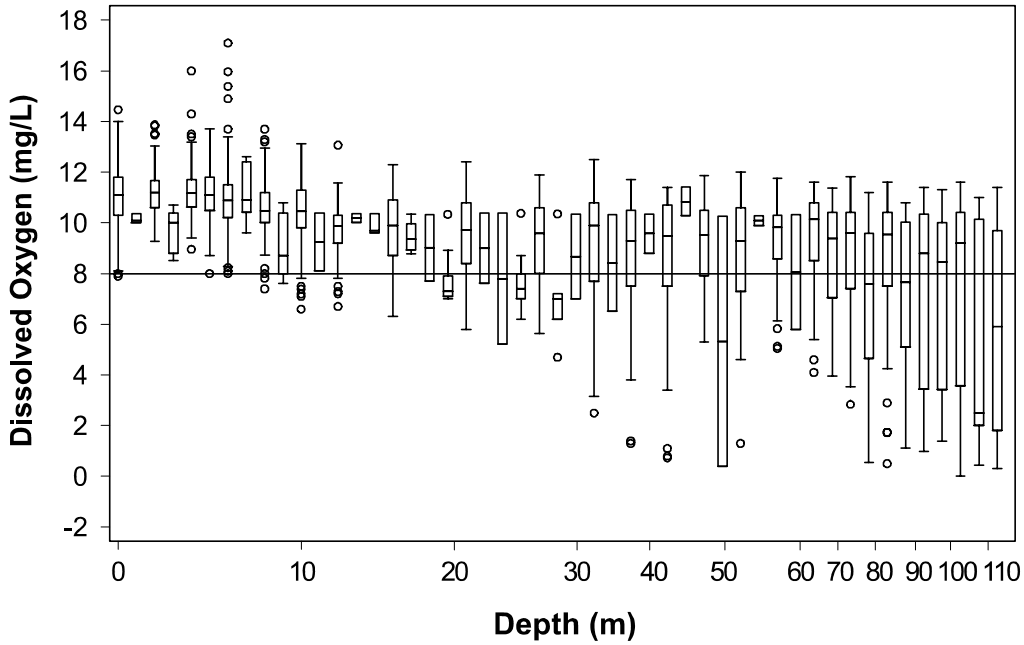

Figure 9.3.4-3 Box plot showing the distribution of dissolved oxygen values with depth measured at all sites during the Pelton Round Butte limnology study, 1994–1996.

In general, DO remains above 8 mg/L at depths less than 15 m. At depths between 15 m and 75 m, the majority of DO measurements were greater than 8 mg/L. Below 75 m, 50 percent or more of DO measurements were less than 8 mg/L. Water at depths greater than 75 m is below the powerhouse intake. Water in reservoirs below the intake tends to remain in the reservoir and form a stagnant layer near the bottom (Thornton et al. 1990). During the period of summertime

stratification, this water can become depleted in oxygen. Although the concentration of DO in this stagnant layer in Lake Billy Chinook decreases during the summer, DO is not depleted entirely, so that low redox conditions of the sediment-water interface do not occur. In fact, the BETTER model shows that DO concentrations meet or exceed the water quality standard of 8 mg/L throughout much of Lake Billy Chinook for the entire summer (Figures 37 through 40, Khangaonkar 1999; § 401 Application Appendix 1).

Lake Simtustus shows seasonal vertical stratification in DO concentration similar to Lake Billy Chinook but does not exhibit significant depletion of oxygen in the hypolimnion during the summer. During the winter, the reservoir has a uniform DO concentration throughout its depth. In May, as stratification sets in, the epilimnion begins to display elevated DO concentration. Dissolved oxygen reaches a peak in the epilimnion in June, well above saturation levels. The hypolimnion remains well oxygenated throughout the year (Figure 9.3-4).

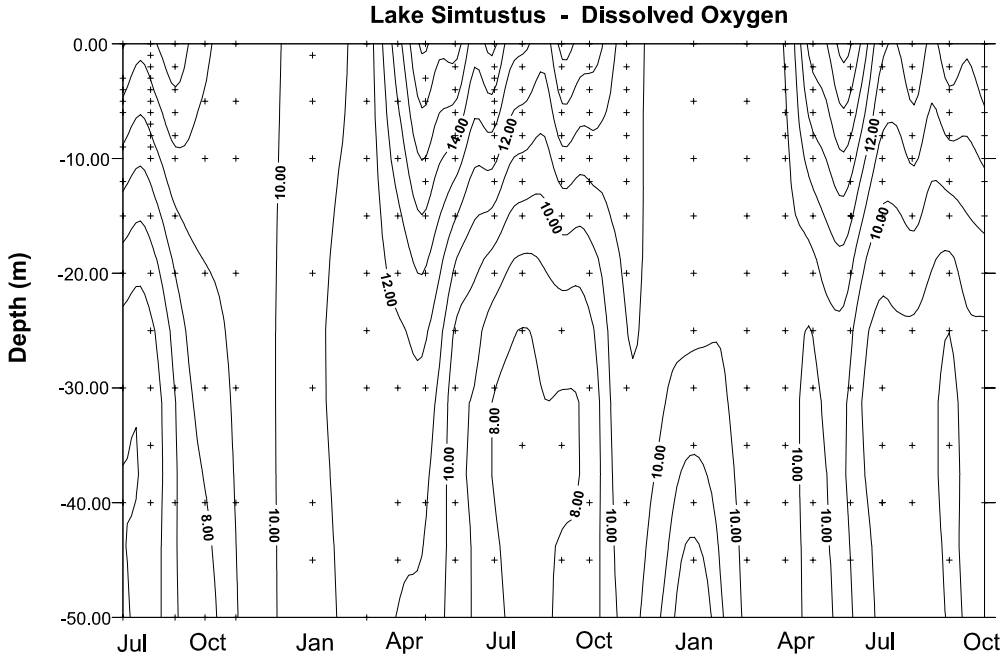

Figure 9.3.4-4 Seasonal profiles of dissolved oxygen (mg/L) in Lake Simtustus during July 1994 through October 1996.

The prolific algal growth in the epilimnion of Lake Billy Chinook and Lake Simtustus would lead to the expectation of even greater oxygen depletion in the hypolimnion than actually occurs. Such extreme oxygen depletion does not occur in Lake Billy Chinook because well-oxygenated water from the Metolius and Deschutes Rivers tends to flow at depth to replace water removed through the power intake. A similar situation occurs in Lake Simtustus where relatively well-oxygenated water from mid-depths in Lake Billy chinook flows through the hypolimnion. The short residence time (4 to 5 days) in the hypolimnion in Lake Simtustus during the summer reduces the opportunity for oxygen depletion.

In a highly productive system, DO can be depleted from surface waters at night as the result of biological respiration. Diurnal measurements made between 2 hours before sunrise and 2 hours after sunset in July 1995 and August 1997 are shown in Figure 9.3-5. In the epilimnion, where the diurnal effects of photosynthetic activity are most dramatic, DO ranged between approximately 8

and 12 mg/L in July 1995 in Lake Billy Chinook. In August 1997, measurements made in Lake Simtustus ranged between approximately 8 mg/L and 17 mg/L. In Lake Billy Chinook the range was approximately 8 to 12 mg/L in the epilimnion, with somewhat lower values in the hypolimnion.

During the 1994-1996 limnology study, DO was measured in the Deschutes River at the Highway 26 bridge. Of 24 monthly daytime samples, 11 were below 11 mg/L. However, conditions of temperature, altitude, and pressure sometimes precluded reaching 11 mg/L concentration. Of the 24 monthly measurements, eight were below 95 percent saturation (Figure 9.3-6).

Dissolved oxygen below the Project displays a greater range than in the tributaries above the Project, with a median value intermediate between the Metolius and Deschutes Rivers (Figure 9.3-1). During the course of the 1994 through 1996 study, one monthly value of DO less than 8.0 mg/L was recorded below the Project. Most values were between 9 and 13 mg/L.

The relatively low DO concentration measured immediately below the Project is caused by drawing water from deep in Lake Billy Chinook and Lake Simtustus for power generation. In the natural annual cycle, oxygen becomes depleted during the summer in the hypolimnion of Lake Billy Chinook at the level of the power intake. This water continues through Lake Simtustus in the hypolimnion and is withdrawn through the power intake and discharged to the Reregulating Reservoir. Residence time in the Reregulating Reservoir is too short to provide for complete reaeration before discharge through the Reregulating Dam powerhouse to the lower Deschutes River.

Water leaving the Reregulating Reservoir was undersaturated in DO, but was rapidly reoxygenated by both physical and biological activity in the river, based on measurements taken during the 1997 lower river survey (Raymond et al. 1998). DO was measured continuously for several days in May and July just above Sherars Falls (RM 44). Dissolved oxygen saturation ranged between 88 percent and 102 percent, reflecting the effects of photosynthetic activity and respiration in the lower river.

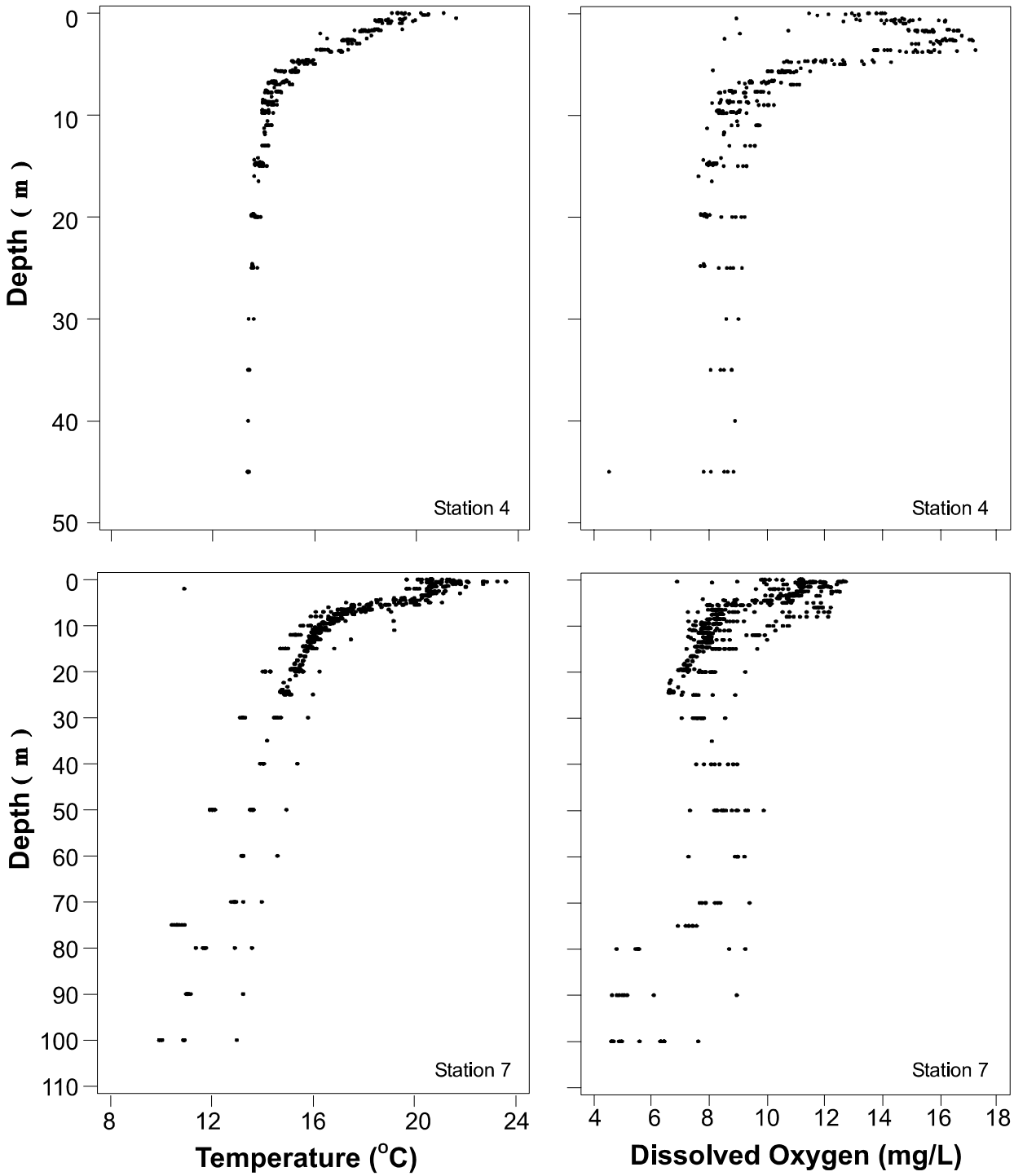

Figure 9.3.4-5 Diurnal distribution of dissolved oxygen and temperature measured in Lake Billy Chinook (Site 7) and Lake Simtustus (Site 4) for all measurements taken between 2 hours before sunrise and 2 hours after sunset in July 1995 and August 1997.

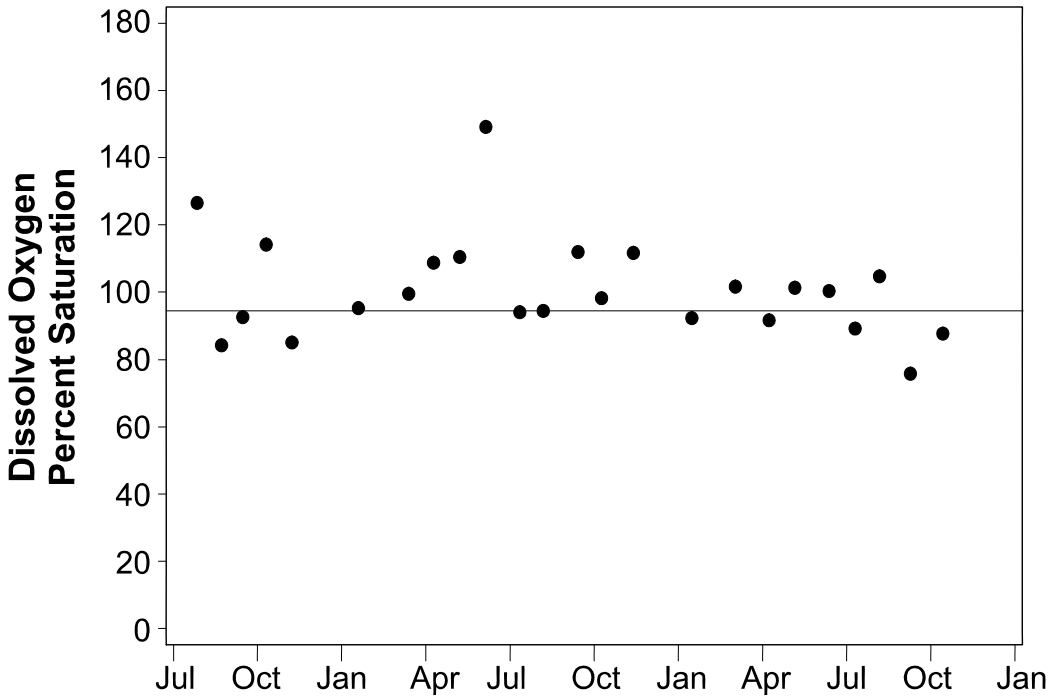

Figure 9.3.4-6 Daytime dissolved oxygen concentration values (percent saturation) measured monthly at the Highway 26 bridge during the Pelton Round Butte limnology study, 1994–1996. The horizontal line marks 95 percent.

Additional diurnal measurements of DO made in 1998 and 1999 suggest that the oxygen deficiency immediately below the Reregulating Dam is rapidly replenished (Lewis and Raymond 2000).

9.3.5 Joint Applicants' Position

Waters of the State and Reservation affected by the Project do not consistently meet State standards for DO. Releasing water for power generation from the hypolimnion of Lake Billy Chinook may contribute to low DO in the Deschutes River directly below the Reregulating Dam. Lower amounts of DO in the deeper water of the reservoirs are the result of stratification and the high productivity in the epilimnion during the summer. Diurnal fluctuations in DO do not result in excessive depletion of DO at night.

The Joint Applicants believe that as originally designed, without generation at the Reregulating Development, the Project discharges to the lower river were likely reaerated. However, a result of the current Project configuration, the lower DO in the Deschutes River immediately below the Reregulating Dam appears to be the result of the operation of the Project. The Joint Applicants recognize this and are proposing mitigating measures outlined below.

Low DO in the hypolimnion of Lake Billy Chinook appears to be the result of stratification and high productivity in the surface waters. The instances of DO concentrations that do not meet the minimum applicable standard are confined to the depths of the reservoir below the powerhouse intake. There are places in the hypolimnion that meets the criteria necessary for the protection of beneficial uses (cold water aquatic life) at all times. Specifically, in Lake Billy Chinook, although the DO at some times and in some places does not meet the applied DO standard, there are at all

times, locations in the reservoir where the standard is met. The most sensitive species (bull trout and kokanee) appear not to be impaired — in fact, are thriving. The relevant standard appears to be met.

In the Deschutes River immediately below the Project, the DO standard is not always met because water released from the Project is undersaturated in DO. The Joint Applicants have investigated measures that could be taken to mitigate this condition.

For purposes of analyzing the Project's compliance with the water quality DO standard, DO data are presented in a manner that permits direct spatial and temporal comparison of the relevant standard with the location wherever sensitive beneficial uses occur or would be expected to occur. The two beneficial uses that are relevant are salmonid rearing in Lake Billy Chinook and salmonid-spawning in the lower river below the Reregulating Dam. Thus, for purposes of this analysis, the salmonid-rearing criterion of 8.0 mg/L would apply year-round within Lake Billy Chinook at the depths in which salmonids occur or would be expected to occur. The salmonid-spawning 11.0 mg/L criterion would apply in the lower river below the Reregulating Dam. If, however, seasonal IGDO level is at least 8.0 mg/L, the contemporary DO criterion in the lower river is 9.0 mg/L.

The occurrence of bull trout and kokanee is described in Section 9.2.5.2 in connection with the temperature standard.

Figures 37 through 40 of Appendix 1 of the § 401 Application (Khangaonkar et al. 1999) show current DO conditions in Lake Billy Chinook as predicted by the BETTER model. These figures show that DO levels in the surface waters regularly exceed the 8.0 mg/L criterion through the summer months. Dissolved oxygen levels exceed the minimum in substantial portions of the deeper waters of the Metolius and Deschutes arms throughout the critical summer months. In particular, Figures 37 through 40 show that the 8 mg/L is met to the bottom of the Metolius arm.

These data are consistent with the locations where kokanee and bull trout are found or expected to be found. As a result, it can be concluded that dissolved conditions in Lake Billy Chinook are not having an adverse impact on the relevant beneficial uses (Kern et al. 1999).

Figure 5-26 of Yang et al. (2001; § 401 Application Appendix 5) shows current DO conditions in Lake Simtustus as modeled using output of the BETTER model in Lake Billy Chinook. This figure shows that, as in Lake Billy Chinook, DO levels in surface waters regularly exceed the 8.0 mg/L criterion during the summer months. In addition, a substantial volume of the reservoir meets the 8.0 mg/L criterion. The effect of Blend 13 on DO levels in Lake Simtustus can be seen clearly in the comparison of longitudinal DO distributions between the existing conditions and Blend 13. As shown in Figure 5-26 of Appendix 5, the DO levels in the entire reservoir under Blend 13 are much higher than under existing conditions.

DO levels in the lower river are shown in Figure 6-6 of Breithaupt et al. (2001; § 401 Application Appendix 6), which illustrates the temporary depression in DO levels immediately below the Reregulating Dam. However, as shown in that figure, DO levels exceed the relevant standard by RM 88.

Strategies for improving DO in the lower river could include modification or use of existing turbine and water control equipment at the three powerhouses. In addition, an aeration system or oxygen

injection in the Project reservoirs or waterways might be options for DO improvements in the lower river system. As part of the 1999 DO study work, Project engineering staff identified potential physical options and tested Project equipment to estimate possible aeration performance and to further advance modification concepts.

The 1999 engineering tests determined that existing air admission systems at Round Butte and Pelton dams could not be operated to improve downstream DO levels. The tests established that any significant air entrainment from these turbines would require piping modifications and the addition of air compressors or blowers to the turbine systems. The Reregulating Dam turbine does not have an air admission system.

Dissolved oxygen improvement options that have been considered also include addition of air injection blowers and piping at one of the powerplants and an oxygen bubbler system in the Reregulating Reservoir. By comparison with selective spilling at the Reregulating Dam, these approaches do not appear feasible.

The possibility that selective spilling might resolve concerns about DO levels in the lower river was suggested between October 1995 and March 1996, when repairs were carried out on the turbine at the Reregulating powerhouse and flows were spilled over the dam. During that period, DO levels at the Highway 26 bridge were above the 95 percent saturation standard.

During September 1999, controlled spills were conducted at the Reregulating Dam to evaluate the effectiveness of this as a potential PME (Lewis and Raymond 2000). The results of the study showed that partial spill at the Reregulating Dam was an effective way to increase DO below the Project. Dissolved oxygen in the gravel did not differ significantly from that in the ambient water. Spill at the Reregulating Dam was adequate to raise ambient DO, and also IGDO, above 9.0 mg/L; sufficient to meet the relevant standard.

The Joint Applicants' proposal to construct a selective water withdrawal as part of its proposed fish passage plan will improve DO conditions in Lake Billy Chinook and downstream of the Project. This action should minimize the time that spill at the Reregulating Dam will be required.

9.3.5.1 Joint Applicants' Conclusion

After implementation of selective water withdrawal, modeling indicates that DO levels below the Project will improve and discharges from the Reregulating Dam will meet the relevant DO criterion. Dissolved oxygen levels will be higher than existing conditions throughout the summer, as a result of which intergravel DO levels will be greater than 8.0 mg/l, and ambient DO levels will exceed 9.0 mg/l. Although it would be possible to implement selective spills at the Reregulating Dam, it does not appear that this will be necessary. Conditions in the reservoirs will improve and will meet the relevant DO criterion where the associated beneficial uses occur or are expected to occur. As a result, the Joint Applicants believe that there will be a reasonable assurance that proposed Project operations, coupled with the Joint Applicants' proposals for mitigation, will not cause waters within or downstream of the Project to violate the DO standard. As discussed below, if it should prove necessary to implement selective spills at the Reregulating Dam, discharges will also comply with the dissolved gas standard.

9.3.6 Summary of Public Testimony

Conservation Groups:

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW are precluded in instances of capital expenditure. Considering the considerable term of FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed.

U.S. Forest Service/U.S. Bureau of Land Management

FS/BLM-1. The method used to determine compliance with the ODEQ intergravel dissolved oxygen standard (IGDO) needs to assess the conditions in the redd throughout the incubation of the embryos and sac fry in the redd. The methodology used by PGE to measure IGDO results in measurement of conditions similar to ambient dissolved oxygen conditions because the redd has been recently cleaned during construction of the redd. The method needs to include sampling several months after the redd construction to assess true conditions experienced in the wild.

9.3.7 ODEQ Evaluation

Based upon the extensive data collection effort, it appears that the applicable 8.0 mg/L DO criterion is met at all depths within Lake Billy Chinook and Lake Simtustus over most of the year. However, there are periods during the summer when the criterion is not met within the hypolimnions of these two reservoirs below approximately 15 to 20 meters in depth. The Metolius arm of Lake Billy Chinook may be an exception, however, with modeling indicating that the DO criterion is met from nearly top to bottom year-round in the middle and upper reaches. Stratification and high primary productivity (photosynthetic algal growth) results in high DO concentration within the epilmnions of the reservoirs, whereas dead algae filtering down from the epilimnions results in algal decay and oxygen uptake in the hypolimnions.

In the Deschutes River immediately below the Project, the DO standard is not always met because water released from the Project is undersaturated in DO. Dissolved oxygen concentrations leaving the Project are generally lower than that entering the Project from the three principal tributary inputs as shown by the box plot data of Figure 9.3.1. ODEQ concurs with the Joint Applicants that the lower DO concentrations in the Deschutes River immediately below the Reregulating Dam, which has led to its placement on the CWA 303(d) list, is likely the result of the operation of the Project.

To address Project-related impacts to DO, the Joint Applicants have proposed the construction and implementation of a SWW facility, as previously described in Section 9.2.7. The Joint Applicants have also proposed a Dissolved Oxygen Management Plan (DOMP) and associated monitoring which are described in Chapters 4 and 7, respectively, of the proposed WQMMP (Exhibit A).

The WQMMP, inclusive of the proposed DOMP, was available for review during the public comment period. Within ninety days of issuance of the § 401 certification, the Joint Applicants will need to revise the WQMMP to further refine and clarify necessary management and monitoring measures, and then resubmit the document for ODEQ approval. It is not expected

that the final revised WQMMP will include a substantial change in the management and monitoring plans upon which ODEQ's determination of reasonable assurance is based.

Like the proposal for temperature, modeling indicates that if the SWW facility is operated to blend within a range bracketed by Blends 13 and 16 (Table 9.2.7-1), as per the DOMP, that DO concentrations within the reservoirs and discharged to the lower Deschutes River would be dramatically improved. Since colder water can retain higher concentrations of DO, it follows that this same blending to achieve cooler temperatures would also result in higher dissolved oxygen concentrations.

The modeling (Khangaonkar 2001) indicates that the percentages of surface and bottom withdrawals listed in Table 9.2.7-1 would result in ambient DO concentrations discharged to the lower Deschutes River in excess of 11.0 mg/L during most of the year. During late August through November, when modeling indicates that DO concentrations would fall below 11.0 mg/L, the concentrations would still exceed 9.0 mg/L.

During September 1999, controlled spills were conducted at the Reregulating Dam to evaluate the effectiveness of spill as a potential PME to improve DO (Lewis and Raymond 2000). The results of the study showed that partial spill at the Reregulating Dam is an effective way to increase DO below the Project. Dissolved oxygen in the gravel did not differ significantly from that in the ambient water. Spill at the Reregulating Dam was adequate to raise ambient DO, and also IGDO, above 9.0 mg/L; sufficient to meet the alternate DO criterion provided for in OAR 340-041-0565(2)(A)(i).

It does appear that SWW, coupled with as-needed backup spilling at the Reregulating Dam, as called for under the DOMP, would assure compliance with the dissolved oxygen standard. However, pending collection and submittal of additional data regarding seasonal IGDO levels under implemented SWW, ODEQ will apply, the 11.0 mg/L (or 95% saturation) criterion. If post-SWW monitoring *assuredly* demonstrates well-oxygenated gravels, then ODEQ would approve targeting the alternative DO criterion of 9.0 mg/L for those seasons that the data supports. As an element of the DOMP, the Joint Applicants have proposed to collect two years of IGDO data, in addition to ongoing DO data collection, to better define the DO/IGDO relationship and concentrations in the lower river under conditions of SWW. ODEQ concurs with concerns raised by the USFW/BLM under public comment FS/BLM-1, above, and discussed in greater detail below. For this reason, ODEQ considers it appropriate that three years of DO/IGDO data collection be collected rather than two to potentially support a future proposal by the Joint Applicants to target the alternative 9.0 mg/L DO criterion. It will be vital that such additional monitoring be performed in a manner invoking confidence in the results.

Regarding public comment FS/BLM-1, ODEQ concurs that the protocol used by PGE to measure IGDO may not be representative of conditions expected within an actual redd at later stages of egg incubation. ODEQ is supportive of using an IGDO methodology that involves measurements within a constructed or artificial redd as opposed to an actual redd to limit disturbance to actual redds and spawning fish. PGE did construct and collect IGDO measurements within artificial redds in accordance with a protocol approved by ODEQ. While the ODEQ laboratory staff intend to evaluate how well the IGDO results from this protocol parallel conditions in real redds at the time of construction or at times corresponding to later embryo development, such an evaluation has not yet been completed. It seems reasonable to suspect that over time that siltation may limit exchange of

dissolved oxygen between the water column and intergravel environments, resulting in greater differences with time following construction of the redds. Future methodologies may employ the collection of one or more additional measurements during the months following construction of the redd. Additionally, respiration and other metabolic processes occurring within an actual redd relative to embryo development would be expected to exert an oxygen demand on the IGDO that may not be experienced in an artificial redd. It is quite possible that preferred protocols for collecting IGDO data will evolve over time, and more representative sampling techniques will be developed. It is also possible that empirical relationships may be developed relating data collected from artificial redds to actual redds. Considering the current state-of-the-art IGDO methodology and potential for its evolution, it is appropriate that future IGDO sampling efforts receive contemporary approval from ODEQ. The WQMMP should be revised with respect to IGDO monitoring to reflect that the methodology to be employed will be based upon contemporary approval by ODEQ, reflective of the current methodologies. Additionally, as stated above, the WQMMP should be revised to require three years of additional DO/IGDO collection to potentially support a future proposal by the Joint Applicants to target the alternative 9.0 mg/L DO criterion.

In addition to the adaptive management and monitoring described in the WQMMP to address Project-related dissolved oxygen impacts, the Project operations must comply with future TMDLs. The target date for completing TMDLs for CWA 303(d) listings on the lower Deschutes, including dissolved oxygen listings, is 2006. The Joint Applicants will be expected to comply with the TMDL including any related necessary modification of the revised and ODEQ-approved WQMMP. To provide further assurance that adaptive management and TMDL requirements will be reliable and enforceable in the context of a new FERC license, ODEQ and the Joint Applicants propose to enter a § 401 Implementation Agreement, attached as Exhibit B to this report, concurrent with issuance of a § 401 certification. The agreement will serve two purposes: (1) addressing ODEQ's role and the Joint Applicants' commitments regarding adaptive management measures required by § 401 certification conditions, and (2) providing ODEQ and the public further reasonable assurance that the Project as proposed to be relicensed will comply with water quality standards and future TMDLs.

With respect to public comment #CG-3, the WQMMP does, indeed, specify a restriction regarding ODEQ's ability to require modifications to the SWW structure. Based upon the information presented to ODEQ in support of 401 certification, and considering the proposed blending regime, ODEQ is reasonably assured that upon construction of the SWW structure and implementation of the proposed flow regime, that additional structural modification will not be necessary. However, as provided for by 33 USC 1341 and OAR 340-48, ODEQ may reconsider the proposed 401 certification and add, delete, or modify certification conditions as necessary to address changes in knowledge, Project conditions, or water quality standards or to address any failure of certification conditions to protect water quality and beneficial uses. ODEQ includes such a provision in the § 401 certification and the § 401 Implementation Agreement to be signed by the Joint Applicants and ODEQ.

9.3.8 ODEQ Finding

ODEQ is reasonably assured that operation of the Project will comply with the dissolved oxygen standard provided that the Joint Applicants meet the following conditions:

Water Quality Management and Monitoring Plan

Within 90 days of issuance of the §401 certification, the Joint Applicants, in consultation with ODEQ, shall revise the Water Quality Management and Monitoring Plan attached to these certification conditions as Exhibit A and submit the revised plan to ODEQ for approval. The plan as approved by ODEQ is hereafter referred to in these certification conditions as the "WQMMP". Upon ODEQ approval, the WQMMP becomes a part of the §401 certification for the Project for purposes of any federal license or permit thereafter issued.

Selective Water Withdrawal Facility Construction and Operation

By no later than five years from the date of receiving a new FERC license for the Project, the Joint Applicants shall construct, test, and commence operation of the Selective Water Withdrawal (SWW) facility described in the Joint Applicants' §401 application.

Dissolved Oxygen

1. The SWW facility shall be operated in accordance with the Dissolved Oxygen Management Plan (DOMP) contained in the WQMMP. The DOMP shall identify those measures that the Joint Applicants will undertake to reduce the Project's contribution to violations of water quality standard criteria for dissolved oxygen.

2. Upon issuance of a new FERC license for the Project, the Joint Applicants shall implement the Water Quality Monitoring Plan (WQMP) contained in the WQMMP. The WQMP shall specify the dissolved oxygen monitoring reasonably needed to determine (a) whether the dissolved oxygen criteria continue to be violated in waters affected by the Project, (b) the success of the DOMP in reducing the Project's contribution to any continued violations of the criteria, and (c) any additional measures that may be needed to reduce the Project's contribution to violations of the criteria.

3. Upon the U.S. Environmental Protection Agency's final approval or adoption of a TMDL for dissolved oxygen in the portion of the Deschutes River affected by the Project, ODEQ may reevaluate the DOMP in light of information acquired since the certification of the Project. If additional dissolved oxygen improvement measures are feasible and necessary to meet a Load Allocation (LA) for the Project under the TMDL (either as a component of the initial TMDL or any subsequent modification of the TMDL), ODEQ may require submittal of a revised DOMP that ensures attainment of the LA, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. If the TMDL does not include a specific LA for the Project, references to the "LA for the Project" shall refer to the LA that encompasses Project-related impacts on dissolved oxygen concentrations in waters affected by the Project.

4. At the end of the period determined by ODEQ to be necessary to implement the TMDL for dissolved oxygen in waters affected by the Project, ODEQ may:

    (a) Determine whether the LA for the Project has been achieved.

(b) If the LA for the Project has been achieved, the Joint Applicants shall continue to implement the DOMP unless, at the Joint Applicants' request, ODEQ approves a modification or termination of the DOMP.

(c) If the LA for the Project has not been achieved, ODEQ may reevaluate the DOMP to determine whether additional measures to reduce the Project's contribution to exceedances of the dissolved oxygen criteria are necessary and feasible. If additional measures are necessary and feasible, ODEQ may require submittal of a revised DOMP that ensures attainment of the LA, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. Any modification of the DOMP that would require the Project to increase dissolved oxygen concentrations beyond what would be required by the LA for the Project shall be effective only upon modification of the LA to reflect the reduced load allocation.

(d) If (i) additional measures to reduce the Project's contribution to violations of the dissolved oxygen criteria are necessary to achieve the LA but the measures are not feasible, and (ii) the water quality standard for dissolved oxygen has not been achieved for waters affected by the Project, ODEQ shall verify whether all feasible measures have been undertaken within the Deschutes River Basin to achieve the LA for waters affected by the Project. If all feasible measures have not been undertaken, ODEQ, in conjunction with designated management agencies, shall take steps to ensure that all feasible measures are undertaken. If all feasible measures have been undertaken, ODEQ shall determine whether designated beneficial uses of waters affected by the Project are adversely affected by the failure to achieve the LA. If the designated beneficial uses are not adversely affected by the failure to achieve the LA, the Joint Applicants shall continue to implement the DOMP unless, at the Joint Applicants' request, ODEQ approves modification or termination of the DOMP. If the designated beneficial uses are adversely affected by the failure to achieve the LA, ODEQ may modify the DOMP to require additional dissolved oxygen measures, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. Any modification of the DOMP that would require the Project to increase dissolved oxygen concentrations beyond what would be required by the LA for the Project shall be effective only upon modification of the LA to reflect the reduced load allocation.

5. ODEQ may make or require reasonable modifications to the WQMP that it considers to be reasonable and feasible if:

(a) The WQMP proves inadequate to provide the data needed to make the determinations described in certification condition 2, above; or,

(b) Modifications to the DOMP require or indicate a need for modification to the WQMP.

6. With the approval of ODEQ, the Joint Applicants may cease implementing the DOMP and WQMP or may implement a modified DOMP and WQMP. ODEQ may approve termination or modification if ODEQ determines that it will not impair the achievement

of any LA for the Project for dissolved oxygen and will not contribute to violation of dissolved oxygen criteria in waters affected by the Project.

7. The Joint Applicants shall implement modifications requested by ODEQ under these certification conditions and the WQMMP.

9.4 pH (Hydrogen Ion Concentration) -- OAR 340-041-0565(2)(d)

9.4.1 Applicable State Standard

The applicable State standard for pH is as follows:

340-041-0565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(d) pH (hydrogen ion concentration): pH values shall not fall outside the ranges identified in paragraphs (A), (B), and (C) of this subsection. The following exception applies: Waters impounded by dams existing on January 1, 1996, which have pHs that exceed the criteria shall not be considered in violation of the standard if the Department determines that the exceedance would not occur without the impoundment and that all practicable measures have been taken to bring the pH in the impounded waters into compliance with the criteria:

(A) Mainstem Columbia River (river miles 147 to 203): pH values shall not fall outside the range of 7.0 to 8.5;

(B) Other Hood River Basin streams (except Cascade lakes): pH values shall not fall outside the range of 6.5 to 8.5;

(C) Cascade lakes above 3,000 feet altitude: pH values shall not fall outside the range of 6.0 to 8.5.

9.4.2 Applicable Tribal Standard

The applicable Tribal standard for pH is as follows:

CTWS Ordinance 80, 432.100(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes River:

(d) pH (Hydrogen Ion Concentration): pH values shall not fall outside the range of 6.5-8.5 with the following exception:

Waters impounded by dams existing prior to adoption of these water quality standards, which exceed the pH criterion shall not trigger a violation of the standard provided the following conditions are met:

(A) The exceedance of the pH criterion occurs as a result of the impoundment, in response to primary productivity supported by nutrients that arise from sources not associated with the impoundment; and

(B) All practicable measures have been taken to minimize the factors related to the impoundment that lead to primary productivity.

(C) In cases where this exemption could be applied, the Tribe will work closely with all involved entities to help develop either a TMDL for the watershed, develop site specific criteria for the waterbody or develop a use attainability analysis to modify the use for portions of the reservoir.

9.4.3 Application of pH Standard

pH values relate to the balance of acid and alkaline substances in the water. The theoretical range is from 1 (very acid) to 14 (very alkaline). Most streams in Oregon have pH values falling somewhere between 6.5 and 8.5. There may be seasonal fluctuations in the pH number due to substances entering the water from land or bio-chemical activity in the water. Since the fish and other aquatic life in any particular stream have evolved under rather specific pH conditions, it is important to set a pH standard that reflects natural conditions and will prevent any intolerable acid/alkalinity imbalances. Deschutes Basin pH standard has been set at a tolerable range of 6.5 to 8.5 to coincide with the locally natural range.

9.4.4 Joint Applicants' Description of Present Conditions

The Metolius River has the lowest overall pH of the tributary streams. The Deschutes River and the Crooked River have similar overall pH, but the pH in the Deschutes River is more variable than in the Crooked River. During the 1994 through 1996 limnology study, pH exceeded 8.5 in the Deschutes River and Crooked River above the Project on several occasions. Values of pH in the Metolius River exceeded 8.0 (Figure 9.4-1).

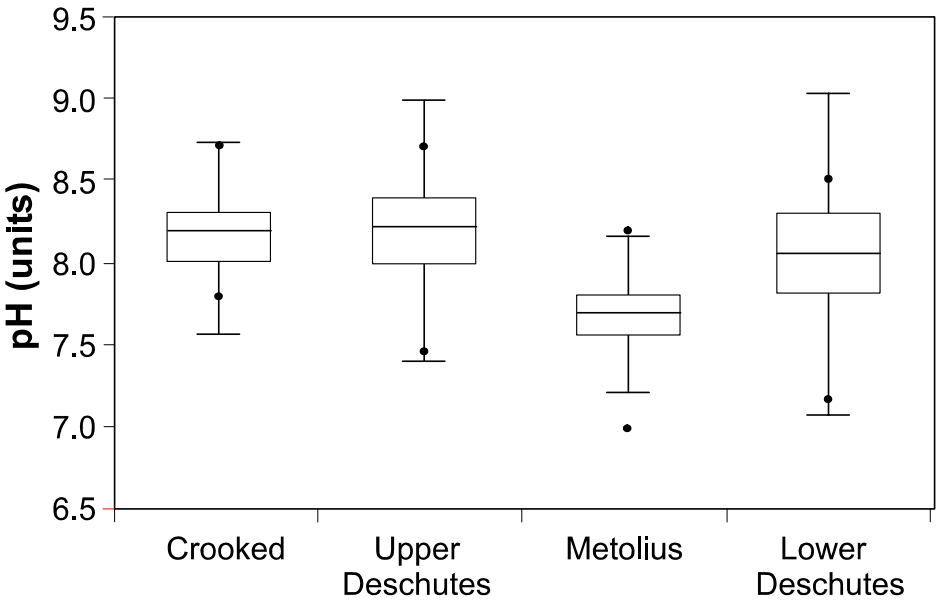

Figure 9.4.4-1. Box plot showing the distribution of pH values measured in the Crooked River (Site 11), the upper Deschutes River (Site 14), the Metolius River (Site 17), and the lower Deschutes River below the Reregulating Dam (Site 2) during June 1994 through October 1996.

The seasonal pattern of pH in Lake Billy Chinook is similar to that of temperature and DO (Figure 9.4-2): vertical stratification is pronounced in the summer and decreases markedly winter. Values of pH near the surface regularly exceed 8.5 during the summer, with a maximum value of 9.4 and a median value of 8.6 based on monthly daytime samples in 1994 through 1996. Values at depth are not as extreme, with a median of 7.5 and a maximum of 8.3 at the approximate depth of the powerhouse intake. Even with the breakdown of stratification in the winter, pH in Lake Billy Chinook maintains a vertical gradient throughout the year.

Seasonal patterns of pH in Lake Simtustus are similar to Lake Billy Chinook, but more intense. Lake Simtustus shows a more intense stratification, with summertime pH values at the surface regularly exceeding 9.4, based on monthly daytime samples. The median pH was 8.8 and the maximum 9.7, based on monthly samples. In contrast to Lake Billy Chinook, pH in Lake Simtustus is vertically uniform during the winter.

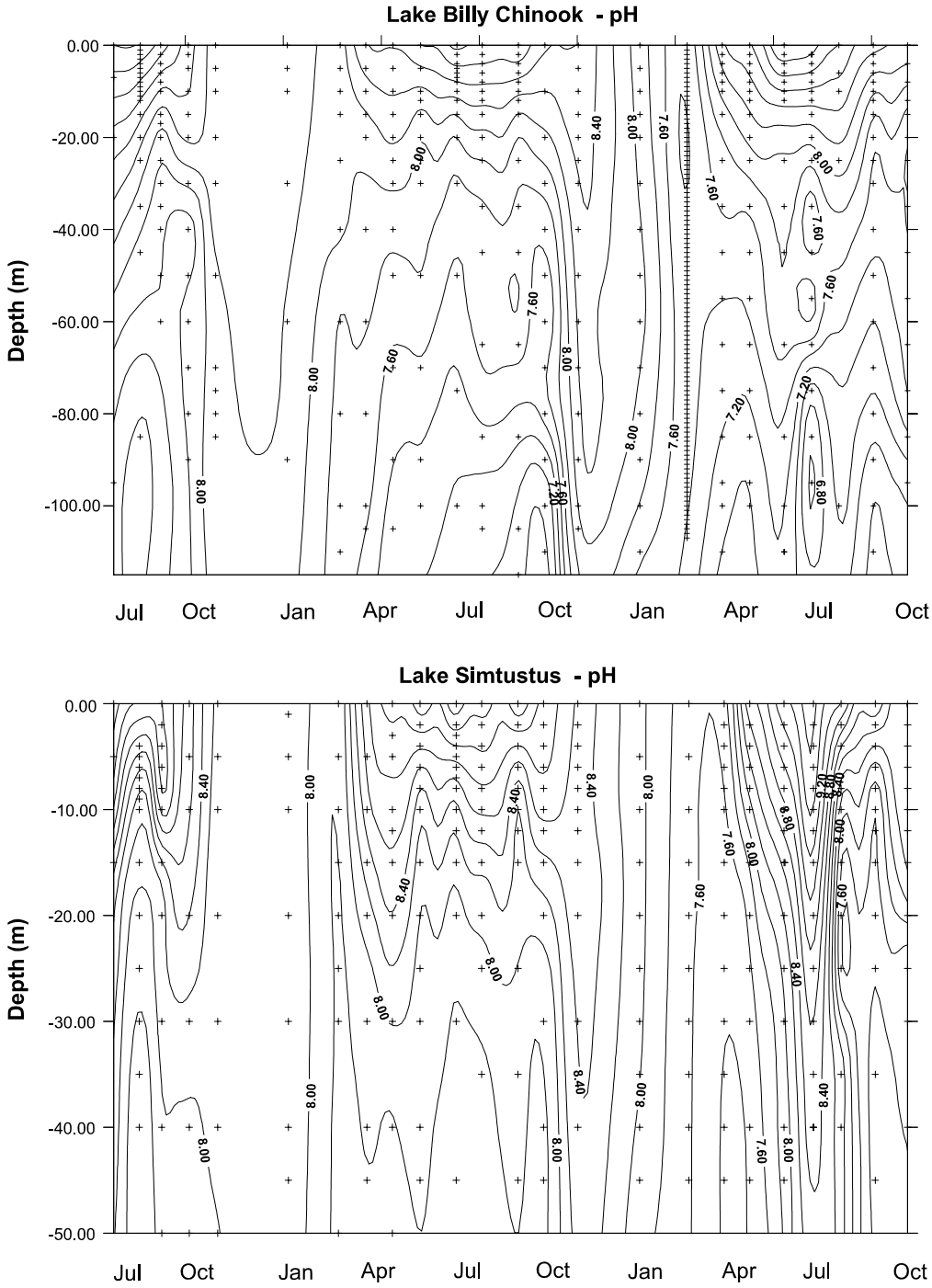

Figure 9.4.4-2 Seasonal profiles of pH measured in Lake Billy Chinook and Lake Simtustus during July 1994 through October 1996.

Values for pH in the Deschutes River immediately below the Project did not exceed 8.5 during the 1994–1996 study. During 1999, pH values immediately below the Project did not exceed 8.5 during three 48-hour measurement periods in April, July, September, and October. However, on September 19, 1999, water was spilled at Pelton Dam when all generation there was shut down as the result of a powerline failure caused by a range fire east of Lake Simtustus. During that day, pH below the Reregulating dam rose above 8.5 from noon until approximately 9:00 PM. No other

instance of pH exceeding 8.5 has been recorded below the Reregulating Dam during studies from 1994 through 1999.

During the 1997 survey in the Lower Deschutes River, pH exceeded 8.5 at Sherars Falls daily during one week in May, but not at all during one week in July (Figure 9.4-3). Measurements taken at different points in the river in July and September 1997 show that pH increases throughout the day along the length of the river (Figure 9.4-4). These results were corroborated in June and September 1998 and August 1999.

These diurnal changes in pH are the consequence of the depletion of carbon dioxide through the photosynthetic activity of plants. Visual observation of the riverbed during the 1997–1999 surveys and water samples collected in 1999 recorded high chlorophyll *a* abundance and locally high abundance of filamentous green algae (*Cladophora* sp.) and attached macrophytes (*Elodea* sp.) growing throughout the length of the lower Deschutes River. Photosynthetic activity is sufficient to reduce the nitrogen concentration to near zero at times in the water near the mouth of the Deschutes River (Raymond et al. 1998).

Water quality data collected during synoptic surveys in April, July, and October 1999 were used to calibrate a water quality model (QUAL-2E) of the lower river (Eilers et al. 2000). The calibration of the QUAL-2E model to the measured pH and DO concentrations indicated that the pH and DO fluctuations in the river are driven by high rates of primary production. There appear to be sufficient nutrients in the river to produce even greater production, suggesting that the availability of light to power photosynthesis is the controlling factor. The model results suggest that there are large populations of aquatic macrophytes or periphyton contributing to the primary production that was not represented by the chlorophyll *a* measurements made on suspended algae.

In response to concerns raised by ODEQ, water quality studies were conducted in 1999 to measure pH levels on an extended basis (48 hours) to capture any diurnal variations that might exist. Sampling below the Reregulating Dam in April, July, and October revealed no instances in which pH exceeded 8.5 at any time during the 48-hour sampling protocol (Figure 9.4-5).

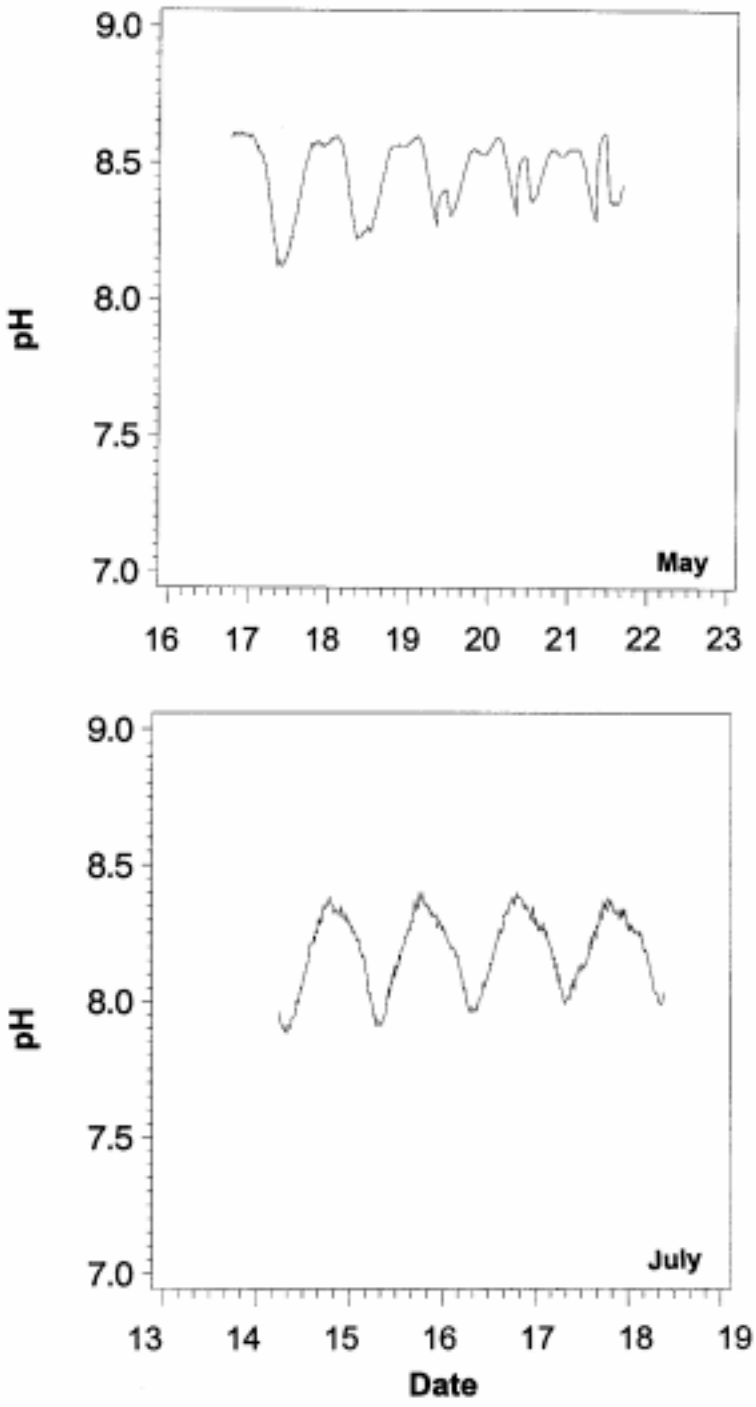

Figure 9.4.4-3 Values of pH measured above Sherars Falls by continuous data recorder during May and July 1997.

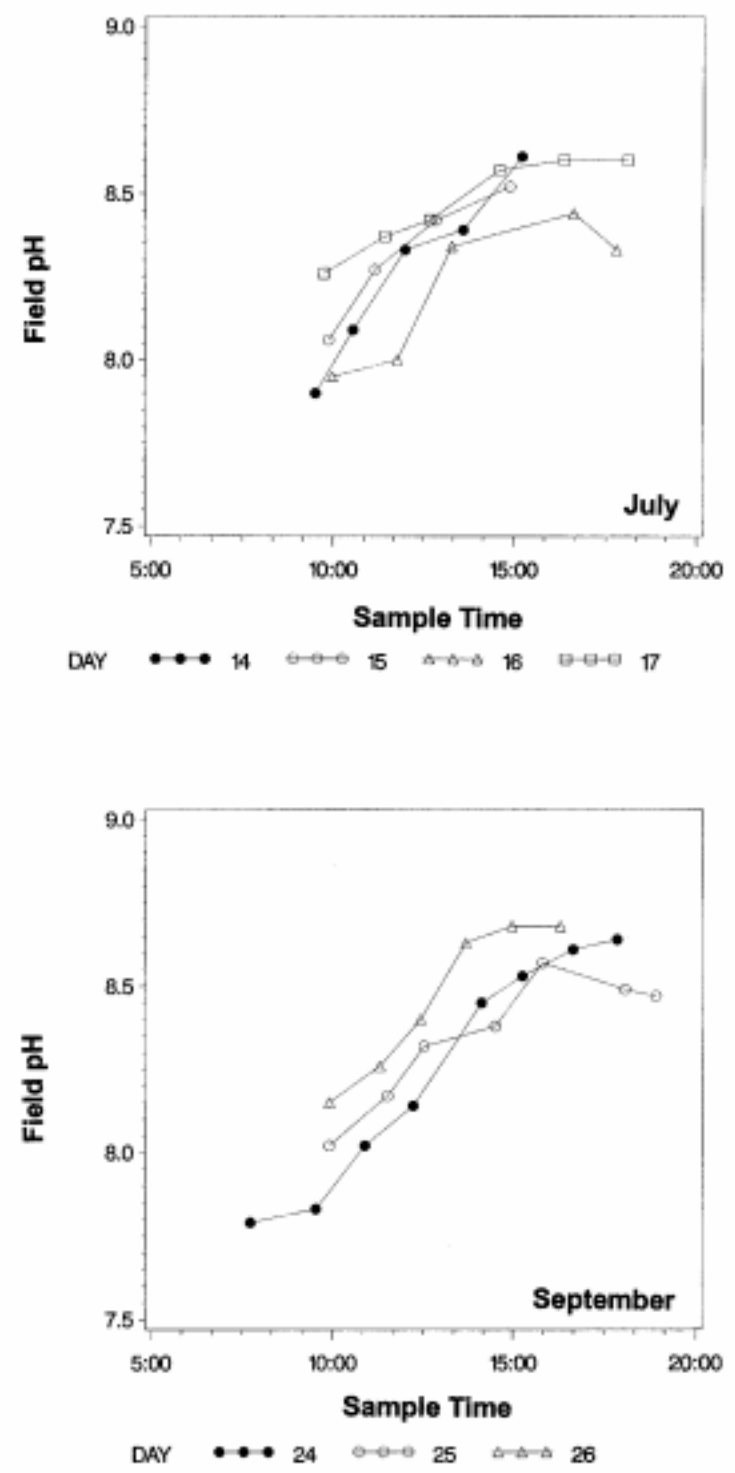

Figure 9.4.4-4. Changes in pH with time of day, measured during longitudinal surveys of the lower Deschutes River in 1997. Each measurement was made at a different location along the river.

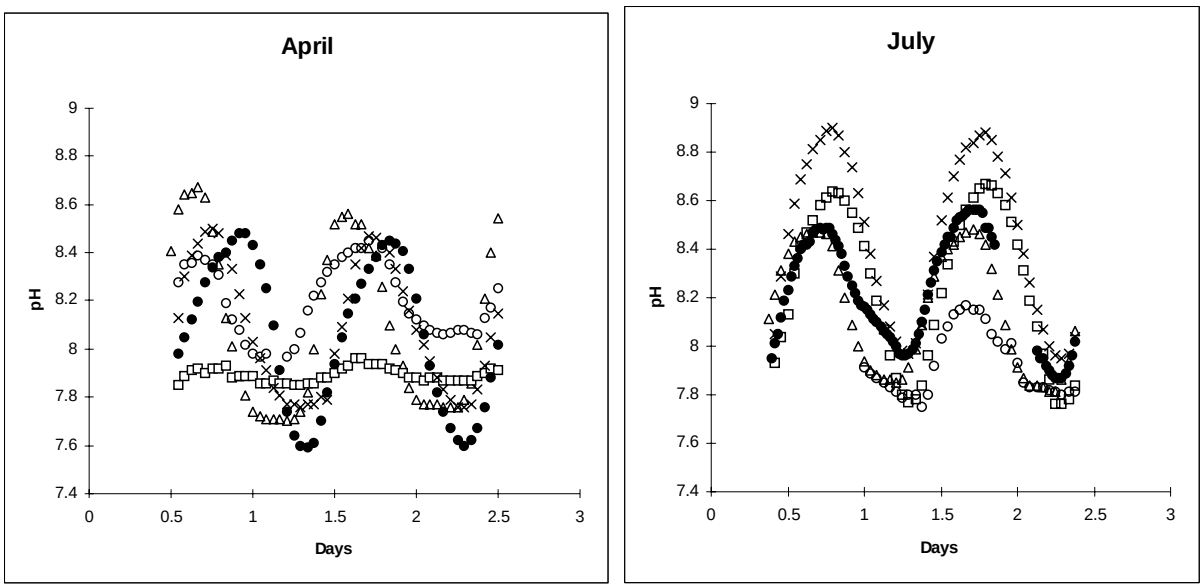

Figure 9.4.4-5. Diurnal pH cycles measured in the lower Deschutes River during three 48-hour periods in 1999. DRA0=RM 100, DR88=RM 88, DR57=RM 57, DR24=RM 24, DR01=RM 1.

9.4.5 Joint Applicants' Position

Standards for pH are exceeded during the summer in the Deschutes and Crooked rivers above the Project, in Lake Billy Chinook, in Lake Simtustus, and in the Deschutes River below the Project. These exceedances are the result of high levels of photosynthetic activity promoted by the high concentration of nutrients, principally phosphorus, in the waters of the Project. The phosphorus enters the Project in the tributary streams and appears to be largely of natural origin. No nutrients are contributed to the water by the Project.

High pH values in the reservoirs are limited to the surface waters. In the deeper water, pH remains within the standard at all times. Fish and other biota in the reservoirs can be expected to congregate in regions that are conducive to their survival and growth, and thus likely avoid regions where pH standards are exceeded substantially. As with temperature and DO, pH data are presented in a manner that permits direct spatial and temporal comparison with the location wherever sensitive beneficial uses — bull trout and kokanee — occur or would be expected to occur. For purposes of this analysis, the surface water pH criterion of 8.5 would apply year round in the lower river and within Lake Billy Chinook at the depths in which salmonids occur or would be expected to occur.

The occurrence of bull trout and kokanee is described above in connection with the temperature standard.

Figures 49 through 52 of the § 401 Application Appendix 1 (Khangaonkar et al. 1999) show current pH conditions in Lake Billy Chinook as predicted by the BETTER model. These figures show that pH levels in the surface waters regularly exceed the 8.5 criterion through the summer months. However, pH levels meet the pH criterion in substantial portions of the deeper waters of all three arms throughout the critical summer months. Lake Billy Chinook and Lake Simtustus existed as of January 1, 1996. The exceedance that is observed occurs as the result of the existence of the

impoundment, in response to primary productivity supported by nutrients that arise from upstream sources that are not associated with the impoundment.

These data are consistent with the locations where kokanee and bull trout are found or expected to be found. The beneficial uses of bull trout, and salmonid rearing and spawning appear not to be impaired by the conditions in the reservoir. As a result, it can be concluded that pH conditions in Lake Billy Chinook are not having an adverse impact on the relevant beneficial uses. Moreover, Lakes Billy Chinook and Simtustus will continue to fall within the exemption from the State and Tribal pH standards. Specifically, the reservoirs existed as of January 1, 1996, and the exceedance of the pH standard occurs as a result of the impoundment in response to primary productivity supported by nutrients that arise from sources not associated with the impoundment. Under these circumstances, the standard appears to be met.

Existing data show that water leaving the Project meets the pH standard at all times under normal operating conditions. High pH values in the lower Deschutes River well below the Project are the result of processes occurring in the lower river and would occur if the Project were not present. They are not the result of the existence or operation of the Project. It should be noted here, however, that the implementation of selective water withdrawal is projected to *increase* pH in the lower river by a very small amount. This impact is discussed below.

9.4.5.1 Joint Applicants' Conclusion

After implementation of selective water withdrawal, modeling indicates that discharges from the Reregulating Dam will continue to meet the pH criterion, with the possible exception of minor, brief, and isolated instances during the summer months. The exceedances that are predicted are within the error of the model, and the model predictions themselves are conservative in that they are at the upper end of the error range. Finally, the recently completed lower river water quality modeling shows that any increase in pH is temporary; it is significantly reduced by RM 88 and virtually undetectable below RM 57.

Conditions in Lake Billy Chinook will improve and will meet the relevant pH criterion where the associated beneficial uses occur or are expected to occur. Any increases that occur within Lake Simtustus will be minor and will not cause a failure of water quality in that reservoir. Moreover, Lake Billy Chinook and Lake Simtustus will continue to fall within the exemption from the State and Tribal pH standards. Specifically, the reservoirs existed as of January 1, 1996, and the exceedance of the pH standard occurs as a result of the impoundment in response to primary productivity supported by nutrients that arise from sources not associated with the impoundment. With the implementation of selective water withdrawal, the Joint Applicants will have taken all practicable measures to bring pH in the impounded waters into compliance with the criterion. As a result, the Joint Applicants believe that there will be a reasonable assurance that proposed Project operations, coupled with the Joint Applicants' proposals for mitigation, will not cause waters within or downstream of the Project to violate the pH standard.

9.4.6 Summary of Public Testimony

<u>Conservation Groups:</u>

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW are precluded in instances of capital expenditure. Considering the considerable term of FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed.

9.4.7 ODEQ Evaluation

During times of vertical stratification within the reservoirs, pH near the surface commonly exceeds 8.5 and has been measured as high as 9.4 and 9.7 in Lakes Billy Chinook and Simtustus, respectively. These exceedances are caused by high levels of photosynthetic activity promoted by the high concentration of nutrients, principally phosphorus, in the waters of the Project. The phosphorus enters the Project in the tributary streams and appears to be largely of natural origin, possibly owing to dissolution of phosphate minerals from the igneous terranes from which the tributaries flow. The high pH values in the reservoirs appear to be limited to the surface waters, while pH at depths greater than about 20 meters are generally within the acceptable range of the pH standard.

340-041-0565(2)(d) provides that pH in excess of the criteria are not to be considered violations in reservoirs if all practicable measures are being implemented to bring the pH into compliance. In the case of the Project reservoirs, no measures are currently being implemented at the Project to control pH. The summertime exceedances of pH in the reservoir epilimnions appear to be the result of high levels of photosynthetic activity promoted by high concentrations of nutrients derived from outside the Project. However, the existing deep water withdrawal allows strong stratification to develop such that the relatively warmer and more nutrient-rich Deschutes and Crooked River waters are generally isolated within the epilimnion of Lake Billy Chinook, thus likely exacerbating the pH problem. Both Lakes Billy Chinook and Simtustus are on the CWA 303(d) list for excessive pH.

Based upon Figure 9.4.1-1, the hydrogen ion concentration (pH) of Deschutes and Crooked River inflows to the Project occasionally exceeded the 8.5 upper criterion of the pH standard during the period of June 1994 through October 1996. During the same period, the Metolius River inflow rarely exceeded a pH of 8.0. Figure 9.4.1-1 does not provide an indication of inflow pH from groundwater; however, historic water chemistry data from USGS (Caldwell 1998) indicates a Lower Opal Springs pH ranging from 7.9 to 8.2. The pH of waters leaving the Project at the Reregulating Dam tailrace during the 1994-1996 limnology study was comparable to what would be expected when taking a flow-weighted mass balance of the hydrogen ion concentrations entering the system from the tributary steams and groundwater.

The Joint Applicants recently provided ODEQ with an update of pH data collected within the Project vicinity that include data from the limnology study up through 2001. This comprehensive data set is displayed in Figure 9.4.7-1, below.

Figure 9.4.7-1. pH data collected in the Project area between 1994 and 2001 (Khangaonkar et al. 2002).

As can be seen in the 1994-2001 data of Figure 9.4.7-1, and consistent with the 1994-1996 data of Figure 9.4.4-1, the pH concentration of the Deschutes and Crooked River are similar and greater than that flowing into the Project reservoirs from the Metolius River. Also, the variability of pH is greatest within the reservoirs, intermediate for the inflows, and least variable in the lower river. While the data indicate that at times maximum pH exceeds the 8.5 criterion at the lower river discharge, the Project inflows appear to have overall higher concentration. Thus, under current conditions, it appears that there may be a beneficial decrease in maximum pH after waters pass through the Project.

After implementation of SWW, modeling predicts that discharges from the Reregulating Dam will continue to meet the pH criterion, with the possible exception of minor, brief, and isolated instances during the summer months. The Joint Applicants report that these predicted exceedances are within the error of the model, and the model predictions themselves are conservative in that they are at the upper end of the error range. The lower river water quality modeling shows that any increase in pH is temporary; it is significantly reduced by RM 88 and virtually undetectable below RM 57, well upstream of the 303(d)-listed segment of the river below White River.

It appears that primary production within the lower river in the form of periphyton and macrophyte growth are the likely causal factors for elevated pH experienced in the reach downstream of White River. Diurnal monitoring results display the typical, pronounced sinusoidal variation in pH over the course of a 24-hour day as would be expected if primary production significantly contributes to excessive pH.

In response to a request by ODEQ, the Joint Applicants evaluated whether biological activity in the reservoirs may result in the transformation of organic forms of nitrogen, which are not readily available to plants, to inorganic forms, specifically nitrate, which are more available to plants and could possibly result in increased production and increased pH in the lower river. The Joint Applicants' data reveal that from the 1994-1996 limnology study reveal that this is not the case. Instead, nutrients, principally nitrogen, entering the Project are partially sequestered within the reservoirs and made unavailable downstream. In all cases, the measured concentration is lower than the expected concentration. For the three years with data, the average reduction in nitrate concentration below the Project for all dates is 48 percent. The average reduction during the summer season (April–September) is 43 percent. The data are presented in Table 9.5-3.

As discussed previously in Sections 9.2 and 9.3 of this report, the Joint Applicants have proposed the construction and implementation of a SWW facility to address the temperature and dissolved oxygen standards and to improve Lake Billy Chinook surface current to aid the fish passage plan. The proposed blending scheme to manage for pH is identical to that planned for temperature and dissolved oxygen management, and is expected to modify somewhat the levels of pH experienced within and downstream of the Project reservoirs. Like temperature and dissolved oxygen, the Joint Applicants have also proposed an adaptive management approach to ensure compliance with the pH standard. Chapters 5.0 and 7.0, respectively of the proposed WQMMP (Exhibit A) provide the Joint Applicants' proposed pH Management Plan (PHMP) and associated pH monitoring.

The WQMMP, inclusive of the PHMP, was available for review during the public comment period. Within ninety days of issuance of the § 401 certification, the Joint Applicants will need to revise the WQMMP to further refine and clarify necessary management and monitoring

measures, and then resubmit the document for ODEQ approval. It is not expected that the final revised WQMMP will include a substantial change in the management and monitoring plans upon which ODEQ's determination of reasonable assurance is based.

The PHMP includes provisions for adaptively modifying the SWW blending to address non-attainment of the pH standard. Because elevated pH of the Project discharge could occur as the result of withdrawal of surface water from Lake Billy Chinook (due to photosynthetic activity in the reservoir's epilimnion), the likely modification would be the reduction in the amount of surface withdrawal relative to bottom withdrawal. The change in the proportion would be determined on a case-specific basis, if such modification can be undertaken consistent with temperature, DO, and fish passage considerations.

With respect to Lake Billy Chinook, modeling indicates that depth of epilimnotic waters with excessive pH will decrease, with general improvement in pH at most depths throughout the summer time-of-concern. Available habitat for sensitive salmonids will increase within Lake Billy Chinook in terms of suitable pH. Any increases that occur within Lake Simtustus are expected to be minor. Moreover, Lake Billy Chinook and Lake Simtustus will continue to fall within the exemption from the State and Tribal pH standards. Specifically, the reservoirs existed as of January 1, 1996, and the exceedance of the pH standard occurs as a result of the impoundment in response to primary productivity supported by nutrients that arise from sources not associated with the impoundment. With the implementation of selective water withdrawal, the Joint Applicants will have taken all practicable measures to bring pH in the impounded waters into compliance with the criterion.

In addition to the adaptive management and monitoring described in the WQMMP to address Project-related pH impacts, the Project operations must comply with future TMDLs. The target dates for completing TMDLs for CWA 303(d)-listings for the Project reservoirs, including the pH listings, is 2003. The target date for completing TMDLs for CWA 303(d) listings on the lower Deschutes, including listings, is 2006. The Joint Applicants will be expected to comply with the TMDL including any related necessary modification of the revised and ODEQ-approved WQMMP. To provide further assurance that adaptive management and TMDL requirements will be reliable and enforceable in the context of a new FERC license, ODEQ and the Joint Applicants propose to enter a § 401 Implementation Agreement, attached as Exhibit B to this report, concurrent with issuance of a § 401 certification. The agreement will serve two purposes: (1) addressing ODEQ's role and the Joint Applicants' commitments regarding adaptive management measures required by § 401 certification conditions, and (2) providing ODEQ and the public further reasonable assurance that the Project as proposed to be relicensed will comply with water quality standards and future TMDLs.

With respect to public comment #CG-3, the WQMMP does, indeed, specify a restriction regarding ODEQ's ability to require modifications to the SWW structure. Based upon the information presented to ODEQ in support of 401 certification, and considering the proposed blending regime, ODEQ is reasonably assured that upon construction of the SWW structure and implementation of the proposed flow regime, that additional structural modification will not be necessary. However, as provided for by 33 USC 1341 and OAR 340-48, ODEQ may reconsider the proposed 401 certification and add, delete, or modify certification conditions as necessary to address changes in knowledge, Project conditions, or water quality standards or to address any failure of certification conditions to protect water quality and beneficial uses. ODEQ includes such a provision in the 401

certification and the § 401 Implementation Agreement to be signed by the Joint Applicants and ODEQ.

9.4.8 ODEQ Findings

ODEQ is reasonably assured that operation of the Project will comply with the hydrogen ion concentration (pH) standard provided that the Joint Applicants meet the following conditions:

Water Quality Management and Monitoring Plan

Within 90 days of issuance of the §401 certification, the Joint Applicants, in consultation with ODEQ, shall revise the Water Quality Management and Monitoring Plan attached to these certification conditions as Exhibit A and submit the revised plan to ODEQ for approval. The plan as approved by ODEQ is hereafter referred to in these certification conditions as the "WQMMP". Upon ODEQ approval, the WQMMP becomes a part of the §401 certification for the Project for purposes of any federal license or permit thereafter issued.

Selective Water Withdrawal Facility Construction and Operation

By no later than five years from the date of receiving a new FERC license for the Project, the Joint Applicants shall construct, test, and commence operation of the Selective Water Withdrawal (SWW) facility described in the Joint Applicants' §401 application.

Hydrogen Ion Concentration (pH)

1. The SWW facility shall be operated in accordance with the pH Management Plan (PHMP) contained in the WQMMP. In accordance with OAR 340-041-0565(2)(d), the PHMP shall identify those measures (including "all practicable measures" in impoundments) that the Joint Applicants will undertake to reduce the Project's contribution to exceedances of the water quality criterion for pH.

2. Upon issuance of a new FERC license for the Project, the Joint Applicants shall implement the Water Quality Monitoring Plan (WQMP) contained in the WQMMP. The WQMP shall specify the pH monitoring reasonably needed to determine (a) whether the pH criterion continue to be exceeded in waters affected by the Project, (b) the success of the PHMP in reducing the Project's contribution to any continued exceedances of the criterion, and (c) any additional measures that may be needed to reduce the Project's contribution to exceedances of the criterion.

3. Upon the U.S. Environmental Protection Agency's final approval or adoption of a TMDL for pH in waters affected by the Project, ODEQ may reevaluate the PHMP in light of information acquired since the certification of the Project. If additional pH measures are feasible and necessary to meet a Load Allocation (LA) for the Project under the TMDL (either as a component of the initial TMDL or any subsequent modification of the TMDL), ODEQ may require submittal of a revised PHMP that ensures attainment of the LA, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. If the TMDL does not include a specific LA for the Project, references to the "LA for the Project" shall refer to the LA that encompasses Project-related pH

contributions to waters affected by the Project.

4. At the end of the period determined by ODEQ to be necessary to implement the TMDL for pH in waters affected by the Project, ODEQ may:

   (a) Determine whether the LA for the Project has been achieved.

   (b) If the LA for the Project has been achieved, the Joint Applicants shall continue to implement the PHMP unless, at the Joint Applicants' request, ODEQ approves a modification or termination of the PHMP.

   (c) If the LA for the Project has not been achieved, ODEQ may reevaluate the PHMP to determine whether additional measures to reduce the Project's contribution to exceedances of the pH criterion are necessary and feasible. If additional measures are necessary and feasible, ODEQ may require submittal of a revised PHMP that ensures attainment of the LA, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. Any modification of the PHMP that would require the Project to reduce pH beyond what would be required by the LA for the Project shall be effective only upon modification of the LA to reflect the reduced load allocation.

   (d) If (i) additional measures to reduce the Project's contribution to exceedances of the pH criterion are necessary to achieve the LA but the measures are not feasible, and (ii) the pH water quality standard has not been achieved for waters affected by the Project, ODEQ shall verify whether all feasible measures have been undertaken within the Deschutes River Basin to achieve the LA for waters affected by the Project. If all feasible measures have not been undertaken, ODEQ, in conjunction with designated management agencies, shall take steps to ensure that all feasible measures are undertaken. If all feasible measures have been undertaken, ODEQ shall determine whether designated beneficial uses of waters affected by the Project are adversely affected by the failure to achieve the LA. If the designated beneficial uses are not adversely affected by the failure to achieve the LA, the Joint Applicants shall continue to implement the PHMP unless, at the Joint Applicants' request, ODEQ approves modification or termination of the PHMP. If the designated beneficial uses are adversely affected by the failure to achieve the LA, ODEQ may modify the PHMP to require additional pH measures, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. Any modification of the PHMP that would require the Project to reduce pH beyond what would be required by the LA for the Project shall be effective only upon modification of the LA to reflect the reduced load allocation.

5. ODEQ may make or require reasonable modifications to the WQMP that it considers to be reasonable and feasible if:

   (a) The WQMP proves inadequate to provide the data needed to make the determinations described in certification condition 2, above; or,

(b) Modifications to the PHMP require or indicate a need for modification to the WQMP.

6. With the approval of ODEQ, the Joint Applicants may cease implementing the PHMP and WQMP or may implement a modified PHMP and WQMP. ODEQ may approve termination or modification if ODEQ determines that it will not impair the achievement of any LA for the Project for pH and will not contribute to the exceedance of the relevant pH criterion in waters affected by the Project.

7. The Joint Applicants shall implement modifications requested by ODEQ under these certification conditions and the WQMMP.

9.5 Nuisance Phytoplankton Growth – OAR 340-041-0150 and CTWS Ordinance 80, 432.400

9.5.1 Applicable State Standard

The applicable State standard for nuisance phytoplankton growth is as follows:

340-041-0150 The following values and implementation program shall be applied to lakes, reservoirs, estuaries and streams, except for ponds and reservoir less than 10 acres in surface area, marshes and saline lakes:

(1) The following average Chlorophyll *a* values shall be used to identify waterbodies where phytoplankton may impair the recognized beneficial uses:

(a) Natural lakes which thermally stratify: 10 ug/L

(b) Natural lakes which do not thermally stratify, reservoirs, rivers and estuaries: 15 ug/L

(c) Average Chlorophyll *a* values shall be based on the following methodology (or other methods approved by the Department): a minimum of three (3) samples collected over any three consecutive months at a minimum of one representative location (e.g., above the deepest point of a lake or reservoir or at a point mid-flow of a river) from samples integrated from the surface to a depth equal to twice the Secchi depth or the bottom (the lesser of the two depths); analytical and quality assurance methods shall be in accordance with the most recent edition of *Standard Methods for the Examination of Water and Wastewater.*

(2) Upon determination by the Department that the values in OAR 340-041-0150(1) are exceeded, the Department shall:

(a) In accordance with a schedule approved by the Commission, conduct such studies as are necessary to describe present water quality; determine the impacts on beneficial uses; determine the probable causes of the exceedance and beneficial use impact; and develop a proposed control strategy for

attaining compliance where technically and economically practicable. Proposed strategies could include standards for additional pollutant parameters, pollutant discharge load limitations, and other such provisions as may be appropriate.

Where natural conditions are responsible for exceedance of the values in OAR 340-041-0150(1) or beneficial uses are not impaired, the values in OAR 340-041-0150(1) may be modified to an appropriate value for that water body;

(b) Conduct necessary public hearings preliminary to adoption of a control strategy, standards or modified values after obtaining Commission authorization;

(c) Implement the strategy upon adoption by the Commission;

(3) In cases where waters exceed the values in OAR 340-041-0150(1) and the necessary studies are not completed, the Department may approve new activities (which require Department approval), new or additional (above the current approved permit limits) discharge loadings from point sources provided that it is determined that beneficial uses would not be significantly impaired by the new activity or discharge.

9.5.2 Applicable Tribal Standard

The applicable Tribal standard for nuisance phytoplankton growth is substantively the same as that of the State's.

9.5.3 Application of Nuisance Phytoplankton Standard

Taste, odor, and visual qualities associated with algae, as well as negative impacts associated with algal agglomeration, can all reach nuisance condition proportions. This standard is intended to identify waterbodies where phytoplankton (floating algae) may impair the recognized beneficial uses due to such nuisance conditions. Dissolved oxygen and pH imbalances associated with phyto- and periphyton, although very important, are not addressed through this standard.

Applying this standard is subjective due to varying sensibilities and sensitivities of the human experience. ODEQ generally will rely on the expertise of the ODEQ field staff and other available information to evaluate if offensive conditions exist and whether nuisance conditions exist that must be corrected. Where questionable conditions exist, ODEQ, as a matter of agency policy, will endeavor to investigate circumstances and reach collaborative, voluntary, and informal resolution with responsible parties.

Certain types of wastes in water, provided the proper ambient conditions, may stimulate nuisance algal growths. The magnitude of such growths is determined by measuring chlorophyll *a*, a photosynthetic pigment that is very closely correlated to biomass.

Metabolically, algae utilize the CO_2 present in water for the synthesis of cell carbon. Three classes of pigments - chlorophylls, carotenoids, and phycobilins - are used to absorb light energy for

photosynthetic cell reproduction and cell maintenance. Oxygen is produced during the photosynthetic process. At night, in the absence of light, algae utilize oxygen. Although respiration also occurs in the presence of sunlight, the amount of oxygen released usually exceeds the amount used during daylight.

In an aquatic environment, algae will form a symbiotic relationship with bacteria. If allowed to predominate, they can affect the DO balance by causing anaerobic conditions to exist at night, potentially resulting in offensive odors. In the absence of bacteria or other sources of CO_2, some algal species can obtain the CO_2 needed for cell growth from the bicarbonate present in the water. This removal of bicarbonate from the water will generally result in an increase in pH. Algae also play an important role in nutrient cycling. In addition to CO_2, algae need nutrients to photo-synthesize.

Many species of algae have been associated with taste and odor problems. Taste and odor problems associated with algae can adversely affect beneficial uses such as public and private domestic water supplies, industrial water supply for certain industrial processes, livestock watering, fishing, boating, and water contact recreation.

Significant concentrations or agglomerations of algae may be considered unsightly and affect a beneficial use of aesthetics or interfere with boating, fishing, and water contact recreation.

Taste, odor, and visual qualities associated with algae, as well as negative impacts associated with algal agglomeration, can potentially reach nuisance condition proportions. OAR 340-041-0150 sets forth a process for determining when phytoplankton growths may be reaching nuisance proportions. This rule is designed to trigger further study and control strategies if the chlorophyll *a* values exceed specified levels in streams or lakes. Where natural conditions are responsible for the algal blooms, the existing level of chlorophyll *a* is considered to be the upper level of acceptability.

9.5.4 Joint Applicants' Description of Present Conditions

Chlorophyll *a* concentration measured above the deepest point in Lake Billy Chinook and Lake Simtustus exceeded the 15 µg/L numeric trigger of the standard during the period of study (1994–1996). Chlorophyll *a* measured in the Deschutes River in 1999 exceeded 15 µg/L. Suspended chlorophyll *a* is probably not a good measure of primary productivity in flowing rivers where much of the photosynthesis may take place in periphyton and attached aquatic macrophytes. Observations made during sampling visits suggest that periphyton growth is abundant in the Deschutes River.

Blooms of blue-green algae occur regularly in Lake Billy Chinook in the late summer. Wind-blown drifts of such algae can accumulate in localized areas. Although localized concentrations of chlorophyll *a* can be quite high during these events — values greater than 60 µg/L were measured — the average concentration of chlorophyll *a* measured on depth-integrated samples taken from the epilimnion during 1994 through 1996 was 18 µg/L. The annual cycle of chlorophyll *a* abundance in Lake Billy Chinook shows low values during the winter, increasing values through the spring to a peak in May, followed by a decrease to July. Another peak occurs in October. The spring peak is associated with increasing abundance of diatoms, while the October peak is associated with the bloom of blue-green algae (Figure 9.5-1).

Blue-green blooms typically form when there is an abundance of phosphorus, and a relative lack of nitrogen. Certain blue-green species are capable of fixing nitrogen from the atmosphere. This is likely to happen when phosphorus is abundant and the elemental ratio of nitrogen to phosphorus is less than 16:1. This ratio is rarely achieved in the Pelton Round Butte system. The median value for the N:P ratio is 5:1, with values throughout the system typically ranging between 3 and 5:1. The system is deficient in nitrogen, relative to the amount of phosphorus present.

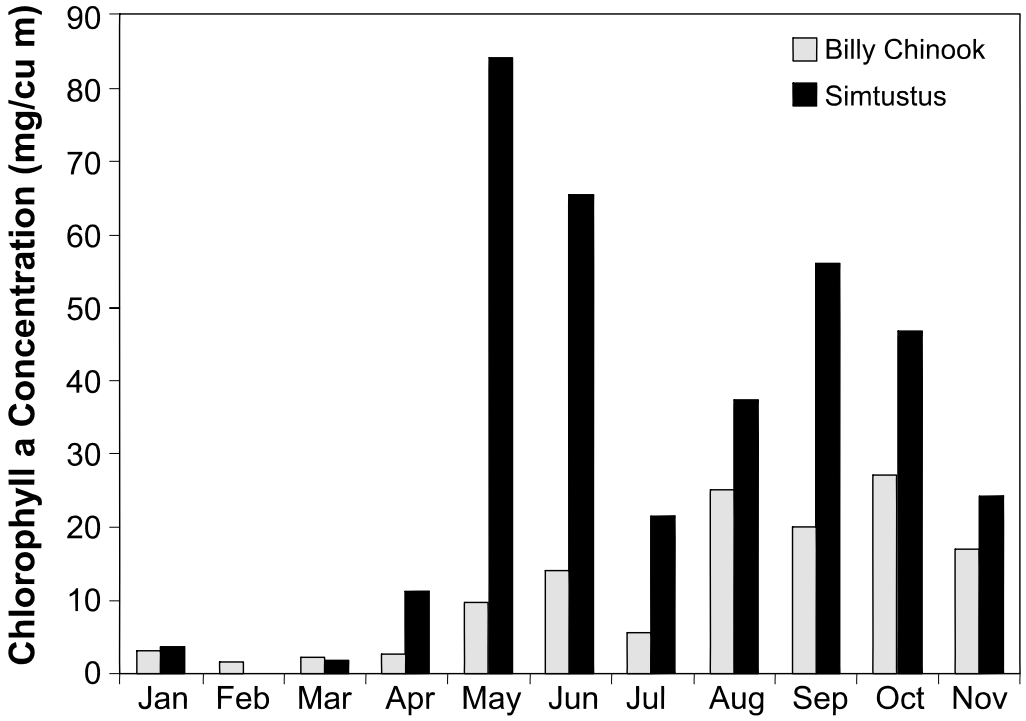

Figure 9.5.4-1. Mean monthly chlorophyll *a* values for all sites measured in Lake Billy Chinook and Lake Simtustus during July 1994 through October 1996.

The character of the algal growth that leads to the high concentration of chlorophyll *a* in Lake Simtustus is qualitatively different from that of Lake Billy Chinook. The annual cycle of chlorophyll *a* abundance in Lake Simtustus is similar to Lake Billy Chinook, but more intense. Chlorophyll *a* concentrations in Lake Simtustus are generally higher than in Lake Billy Chinook, and there is a peak in July that does not occur in Lake Billy Chinook. Peak chlorophyll *a* concentration in Lake Simtustus is greater than 90 µg/L; the mean of depth-integrated samples taken during 1994 through 1996 was 30 µg/L. Even though the mean chlorophyll *a* concentration in Lake Simtustus is nearly three times that of Lake Billy Chinook, it is not nearly as evident to the casual user of the reservoir. Blue-green algae do not dominate the phytoplankton in the fall in Lake Simtustus as they do in Lake Billy Chinook. Lake Simtustus receives a large load of nitrogen from Willow Creek, most of which is contained within the epilimnion during the summer. This contributes to the greater overall productivity in Lake Simtustus and tends to mitigate the frequency and density of blue-green blooms.

The abundance of chlorophyll *a* in the reservoirs is the result of nutrients, primarily silica, nitrogen, and phosphorus, entering the reservoirs from the tributary rivers and streams. All of the tributary streams to the Project flow through areas that have been affected by various disturbances, but the

Metolius River is relatively undisturbed; therefore, nutrient concentration in the Metolius River can be taken to represent near-natural conditions. Nutrient concentration in the tributary streams is quite high. Willow Creek, which flows into Lake Simtustus and the Crooked River, are notably high in nitrogen. Phosphorus is higher in the Crooked River than in the other streams. The concentration of nutrients entering the reservoirs from the tributaries is shown in Table 9.5-1.

Table 9.5.4-1. The average concentration of silicon, nitrogen, and phosphorus (mg/L as the element) in streams entering Lake Billy Chinook and Lake Simtustus, 1994 through 1996.

Stream	Nitrate-N	Total P	Si
Crooked River [1]	0.421	0.090	36.5
Deschutes River [1]	0.187	0.079	31.4
Metolius River [1]	0.013	0.072	28.2
Willow Creek [2]	2.486	0.051	39.4

1 Flows into Lake Billy Chinook

2 Flows into Lake Simtustus

The phosphorus content in the Project reservoirs is largely natural in origin. The concentration of phosphorus in the Metolius River is the result of the abundance of phosphorus in the basaltic bedrock of the basin. Basaltic bedrock is also a source for much of the phosphorus in the Deschutes River and possibly the Crooked River, although these rivers may be artificially enriched in phosphorus. If the concentration of phosphorus in the relatively undisturbed Metolius River is taken to be equal to the concentration derived from natural sources in the Deschutes and Crooked rivers, then perhaps more than 70 percent of the phosphorus load to Lake Billy Chinook is from natural sources. The Environmental Defense Fund (EDF 1995) estimated hypothetical phosphorus loads to Lake Billy Chinook for 1983 and 1987 based on standard models. These modeling results are shown in Table 9.5-2.

Table 9.5.4-2. Hypothetical phosphorus loading to Lake Billy Chinook. Concentration (as the element) in mg/L, load in kg/yr.

	1983			1987		
Source River	**Concentration (mg/L)**	**Load (kg/yr)**	**Percent**	**Concentration (mg/L)**	**Load (kg/yr)**	**Percent**
Crooked River	0.164	130,805	46.5	0.134	168,485	50.2
Deschutes River	0.087	46,038	16.4	0.062	46,017	13.7
Metolius River	0.084	104,295	37.1	0.075	121,111	36.1

Source: data from EDF (1995)

Late summer dominance by blue-green algae often occurs in lakes that have been artificially enriched with excessive phosphorus from anthropogenic sources. Even complete elimination of excess phosphorus load from the Deschutes and Crooked rivers would have little overall impact on chlorophyll *a* abundance in Lake Billy Chinook because nearly 40 percent of the total phosphorus load to Lake Billy Chinook is from the Metolius River. Even if average phosphorus concentration could be reduced by as much as 60 percent, the reservoir would remain in the range of eutrophic lakes.

Both Lake Simtustus and Lake Billy Chinook stratify during the summer when biological activity is at its peak. Because water from the Crooked River and Willow Creek, which are the major sources of nitrogen to Lake Billy Chinook and Lake Simtustus, tends to be sequestered in the epilimnion of each reservoir during the summer, the biological activity, and hence the nutrients, tend to be sequestered there as well. Water that leaves the reservoirs at depth might be expected to show a reduction in nutrient concentration because of the isolation of nutrients in the epilimnion.

Concern has been expressed that the existence of the Project may cause or enable transformations in forms of nitrogen that could contribute to excess production in the Deschutes River below the Project. Specifically, comments were received from ODEQ and the U.S. Department of Interior (USDI) that biological activity in the reservoirs may result in the transformation of organic forms of nitrogen, which are not readily available to plants, to inorganic forms, specifically nitrate, which are more available to plants and could possibly result in increased production in the lower River. The Joint Applicants' data reveal that this is not the case. Rather, nutrients, principally nitrogen, are sequestered within the reservoirs and made unavailable downstream.

Data collected from 1994 through 1996 during the Pelton Round Butte limnology study can be used to calculate the expected concentration of nitrogen in the Deschutes River below the Project. In all cases, the measured concentration is lower than the expected concentration. For the three years with data, the average reduction in nitrate concentration below the Project for all dates is 48 percent. The average reduction during the summer season (April–September) is 43 percent. The data are presented in Table 9.5-3.

Table 9.5.4-3. Calculated nitrate nitrogen concentration compared to measured nitrate nitrogen concentration in the Deschutes River below the Reregulating Dam.

Nitrate Nitrogen input and output at Pelton Round Butte Project			
Date	**Expected Concentration**	**Measured Concentration**	**Difference (Expected-Measured)**
27-Jul-94	0.166	0.160	0.006
23-Aug-94	0.293	0.200	0.093
15-Sep-94	0.318	0.100	0.218
11-Oct-94	0.308	0.140	0.168
8-Nov-94	0.467	0.160	0.307
19-Jan-95	0.427	0.234	0.193
14-Mar-95	0.273	0.189	0.084
10-Apr-95	0.254	0.208	0.046
8-May-95	0.190	0.190	0.000
5-Jun-95	0.230	0.204	0.026
12-Jul-95	0.276	0.190	0.086
7-Aug-95	0.303	0.170	0.133
13-Sep-95	0.332	0.120	0.212
9-Oct-95	0.400	0.068	0.332
13-Nov-95	0.532	0.105	0.427
15-Jan-96	0.402	0.188	0.155
3-Mar-96	0.204	0.296	0.165
8-Apr-96	0.228	0.130	0.170
6-May-96	0.319	0.150	0.167
12-Jun-96	0.256	0.130	0.167
10-Jul-96	0.251	0.154	0.157
6-Aug-96	0.364	0.113	0.155
9-Sep-96	0.333	0.136	0.160
14-Oct-96	0.374	0.157	0.167
Average	0.312	0.162	0.179

Expected Concentration = 3CiQi/Qt where Ci = concentration measured in tributary streams, and Qi is mean daily flow for the day from USGS data. Ungaged Q was considered as the difference between measured tributaries and flow measured at Madras gage. Ungaged C was set at the mean of surface concentration values.

This reduction in nitrogen concentration leaving the reservoirs may have the result of limiting the potential for plant growth in the Deschutes River below the Project. Studies in 1997 (Raymond et al. 1998) suggested that nitrogen could at times be the limiting nutrient in the lower Deschutes River.

9.5.5 Joint Applicants' Position

The high concentrations of chlorophyll *a* in Lake Billy Chinook and Lake Simtustus are similar to those in other comparable lakes and reservoirs in the region (Johnson et al. 1985; Raymond et al. 1998). The high chlorophyll *a* values are the result of input of nutrients from the tributary rivers and natural processes of seasonal stratification in the reservoirs. Blooms of blue-green algae in Lake Billy Chinook are the result of excess phosphorus and relatively low nitrogen. Much of the phosphorus in the reservoirs appears to be of natural origin. It is unlikely that even extreme measures to reduce phosphorus loading would have a measurable impact on chlorophyll *a* abundance.

Data available to the Joint Applicants do not support a conclusion that beneficial uses of the Project impoundments are adversely affected by nuisance phytoplankton growth. For example, although recreational users (house boaters) were asked about factors affecting their use or enjoyment of these waterbodies, their responses did not mention this as a significant concern, indicating that their enjoyment of water-contact recreation, fishing, and aesthetics was not affected. The heavy use of Lake Billy Chinook by on-water recreationalists and the excellent condition of the Lake Billy Chinook salmonid fisheries — including not only the abundant kokanee and bull trout populations, but also the thriving fisheries themselves — leads to a similar conclusion. The photosynthetic activity of the abundant phytoplankton in the reservoirs can influence the DO concentrations and pH in the reservoirs. As noted above, however, the beneficial uses are not affected by the existing DO and pH, and it is the Joint Applicants' expectation that these levels will improve during the term of the new FERC license.

Studies by the Joint Applicants have determined the probable cause of the exceedance and identified the effects on beneficial uses. It appears that natural conditions are responsible for the exceedances and that the beneficial uses are not impaired. The measures outlined in OAR 340-41-150 to modify the rule to set an appropriate value for chlorophyll *a* for Lake Billy Chinook and Lake Simtustus should be implemented.

9.5.5.1 Joint Applicants' Conclusion

Although the State's nuisance phytoplankton standard is exceeded in the surface waters of Lake Billy Chinook and Lake Simtustus, the Joint Applicants believe that this condition is not adversely affecting any beneficial use of either impoundment, and that the condition is due to elevated inputs of nutrients from tributaries. The heavy use of Lake Billy Chinook by on-water recreationalists, the excellent condition of the Lake Billy Chinook salmonid fish populations and fisheries, and the survey responses of recreational users (as well as the lack of complaints from other users) demonstrate that beneficial uses of the Project impoundments are not adversely affected by nuisance phytoplankton growth. There are no technically and economically practicable strategies to control this condition in the Project itself, although the implementation of selective water withdrawal may tend to reduce measured chlorophyll *a* levels somewhat. As a result, the Joint Applicants believe that there will be a reasonable assurance that Project operations, coupled with the Joint Applicants'

proposals for mitigation, will not cause waters within or downstream of the Project to violate the nuisance phytoplankton growth standard.

9.5.6 Summary of Public Testimony

Conservation Groups:

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW are precluded in instances of capital expenditure. Considering the considerable term of FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed.

9.5.7 ODEQ Evaluation

The reservoir trigger concentration of 0.015 mg/L Chlorophyll *a* of the state's nuisance phytoplankton growth standard is exceeded during the summer within Lakes Billy Chinook and Simtustus, and has led to these waterbodies being placed on the CWA 303(d) list for Chlorophyll *a*. High summertime concentrations of Chlorophyll *a* are associated with high primary production within the epilimnions of the reservoirs. This primary production is fed by nutrients that are primarily derived from outside the Project. However, the artificial impoundments created by the Project dams provide a suitable environment for this high level of primary production to take place. Thus, if nuisance phytoplankton conditions exist within the reservoirs, the Project would be considered to be a contributor to the problem.

With respect to the high Chlorophyll *a* levels, the Joint Applicants have conducted extensive studies describing present reservoir water quality; assessed impacts on beneficial uses; assessed probable cause of the trigger exceedance and beneficial use impact; and developed a proposed control strategy for attaining compliance where technically and economically practicable. These actions are consistent with an action process lined-out in the standard as OAR 340-041-0150(2)(a).

ODEQ concurs with the Joint Applicants' position that while the trigger value is exceeded in the reservoirs during the summers, the beneficial uses of water contact recreation, boating, fishing and aesthetics appear to be supported. The heavy use of Lakes Billy Chinook and Simtustus by on-water recreationalists, and the survey responses of recreational users (as well as the lack of complaints from other users) seem to indicate that these beneficial uses of these Project impoundments are not adversely affected by nuisance phytoplankton growth.

With respect to the Reregulating Reservoir, public access for fishing, boating, and water contact recreation is restricted due extreme hazard conditions associated with the dramatic daily drafting and refilling of the reservoir, thus concern for nuisance conditions impacting these uses is not an issue. ODEQ is not aware of any reports of nuisance phytoplankton conditions impairing the aesthetic enjoyment of the Reregulating Reservoir at the non-restricted-access wildlife overlook.

ODEQ is not aware of any tastes or odor problems associated with public or private water supplies taken from the reservoirs or the river downstream of the Project.

As discussed in previous sections of this report, the Joint Applicants have proposed the construction and implementation of a SWW facility to improve water quality and to improve Lake Billy Chinook surface currents to aid fish passage. Based upon water quality modeling, it appears that the proposed blending regime may also result in a potential slight decrease in phytoplankton growth within the reservoirs. The Joint Applicants have proposed an adaptive management approach to ensure compliance with the nuisance phytoplankton growth standard. Chapters 6.0 and 7.0, respectively, of the proposed WQMMP (Exhibit A) provide the Joint Applicants' proposed Nuisance Phytoplankton Growth Management Plan (NPGMP) and associated monitoring.

The WQMMP, inclusive of the NPGMP, was available for review during the public comment period Within ninety days of issuance of the § 401 certification, the Joint Applicants will need to revise the WQMMP to further refine and clarify necessary management and monitoring measures, and then resubmit the document for ODEQ approval. It is not expected that the final revised WQMMP will include a substantial change in the management and monitoring plans upon which ODEQ's determination of reasonable assurance is based.

The NPGMP calls for operating the SWW facility to blend surface and deep waters within a bracketed range bounded by Blends 13 and 16 (Table 9.2.7-1). Monitoring of Chlorophyll *a* concentrations and Secchi disk depths would be used to evaluate changes in phytoplankton growth. Post-SWW data would be compared against a pre-SWW baseline to identify any changes Chlorophyll *a* concentrations. If average chlorophyll *a* concentrations after implementation of selective withdrawal exceed average pre-selective withdrawal concentrations by more than 10% for two consecutive years, the Joint Applicants will be required to consult with ODEQ and the WCB regarding the need to conduct a recreational user survey to assess whether or not beneficial uses have been impaired. If results of any required recreational survey indicate that impairment has occurred, the Joint Applicants, under the guidance of ODEQ and the WCB, would be required to assess the feasibility of implementing a control strategy for attaining compliance that is technically and economically practicable.

In addition to the adaptive management and monitoring described in the WQMMP to address Project-related contribution to phytoplankton growth, the Project operations must comply with future TMDLs. The target date for completing TMDLs for CWA 303(d) listings for the Project reservoirs is 2003. The Joint Applicants will be expected to comply with the TMDL including any related necessary modification of the revised and ODEQ-approved WQMMP. With respect to the nuisance phytoplankton growth standard, any additional required measures required by the TMDL would need to be technically and economically practicable. To provide further assurance that adaptive management and TMDL requirements will be reliable and enforceable in the context of a new FERC license, ODEQ and the Joint Applicants propose to enter a § 401 Implementation Agreement, attached as Exhibit B to this report, concurrent with issuance of a § 401 certification. The agreement will serve two purposes: (1) addressing ODEQ's role and the Joint Applicants' commitments regarding adaptive management measures required by § 401 certification conditions, and (2) providing ODEQ and the public further reasonable assurance that the Project as proposed to be relicensed will comply with water quality standards and future TMDLs.

With respect to public comment #CG-3, the WQMMP does, indeed, specify a restriction regarding ODEQ's ability to require modifications to the SWW structure. Based upon the information presented to ODEQ in support of 401 certification, and considering the proposed blending regime, ODEQ is reasonably assured that upon construction of the SWW structure and implementation of

the proposed flow regime, that additional structural modification will not be necessary. However, as provided for by 33 USC 1341 and OAR 340-48, ODEQ may reconsider the proposed 401 certification and add, delete, or modify certification conditions as necessary to address changes in knowledge, Project conditions, or water quality standards or to address any failure of certification conditions to protect water quality and beneficial uses. ODEQ includes such a provision in the § 401 certification and the § 401 Implementation Agreement to be signed by the Joint Applicants and ODEQ.

9.5.8 ODEQ Finding

ODEQ is reasonably assured that operation of the Project will comply with the nuisance phytoplankton growth standard provided that the Joint Applicants meet the following conditions:

Water Quality Management and Monitoring Plan

Within 90 days of issuance of the §401 certification, the Joint Applicants, in consultation with ODEQ, shall revise the Water Quality Management and Monitoring Plan attached to these certification conditions as Exhibit A and submit the revised plan to ODEQ for approval. The plan as approved by ODEQ is hereafter referred to in these certification conditions as the "WQMMP". Upon ODEQ approval, the WQMMP becomes a part of the §401 certification for the Project for purposes of any federal license or permit thereafter issued.

Selective Water Withdrawal Facility Construction and Operation

By no later than five years from the date of receiving a new FERC license for the Project, the Joint Applicants shall construct, test, and commence operation of the Selective Water Withdrawal (SWW) facility described in the Joint Applicants' §401 application.

Nuisance Phytoplankton Growth

1. The SWW facility shall be operated in accordance with the Nuisance Phytoplankton Growth Management Plan (NPGMP) contained in the WQMMP. The NPGMP shall identify those measures that the Joint Applicants will undertake to reduce the Project's contribution to exceedances of the nuisance phytoplankton growth standard criteria in the event nuisance conditions develop.

2. Upon issuance of a new FERC license for the Project, the Joint Applicants shall implement the Water Quality Monitoring Plan (WQMP) contained in the WQMMP. The WQMP shall specify the nuisance phytoplankton growth monitoring reasonably needed to determine (a) whether the nuisance phytoplankton trigger criterion is exceeded in the Project reservoirs, (b) the success of the NPGMP in reducing the Project's contribution to excessive phytoplankton levels that might lead to nuisance conditions within the Project reservoirs, and (c) any additional measures that may be needed to reduce the Project's contribution to nuisance phytoplankton conditions.

3. Upon the U.S. Environmental Protection Agency's final approval or adoption of a TMDL for nuisance phytoplankton growth in the portion of the Deschutes River affected by the Project, ODEQ may reevaluate the NPGMP in light of information acquired since the

certification of the Project. If additional nuisance phytoplankton growth reduction measures are technically and economically practicable and necessary to meet a Load Allocation (LA) for the Project under the TMDL (either as a component of the initial TMDL or any subsequent modification of the TMDL), ODEQ may require submittal of a revised NPGMP that ensures attainment of the LA, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. If the TMDL does not include a specific LA for the Project, references to the "LA for the Project" shall refer to the LA that encompasses Project-related impacts to nuisance phytoplankton growth within the Project reservoirs.

4. At the end of the period determined by ODEQ to be necessary to implement the TMDL for nuisance phytoplankton growth in the portion of the Deschutes River affected by the Project, ODEQ may:

   (a) Determine whether the LA for the Project has been achieved.

   (b) If the LA for the Project has been achieved, the Joint Applicants shall continue to implement the NPGMP unless, at the Joint Applicants' request, ODEQ approves a modification or termination of the NPGMP.

   (c) If the LA for the Project has not been achieved, ODEQ may reevaluate the NPGMP to determine whether additional measures to reduce the Project's contribution to exceedances of the nuisance phytoplankton growth criteria are technically and economically practicable and necessary. If additional measures are technically and economically practicable and necessary, ODEQ may require submittal of a revised NPGMP that ensures attainment of the LA, subject to the limits set forth in Chapter 1.0 of Exhibit A and incorporated into the WQMMP. Any modification of the NPGMP that would require the Project to reduce nuisance phytoplankton growth beyond what would be required by the LA for the Project shall be effective only upon modification of the LA to reflect the reduced load allocation.

5. ODEQ may make or require reasonable modifications to the WQMP that it considers to be reasonable and feasible if:

   (a) The WQMP proves inadequate to provide the data needed to make the determinations described in certification condition 2, above; or,

   (b) Modifications to the NPGMP require or indicate a need for modification to the WQMP.

6. With the approval of ODEQ, the Joint Applicants may cease implementing the NPGMP and WQMP or may implement a modified NPGMP and WQMP. ODEQ may approve termination or modification if ODEQ determines that it will not impair the achievement of any LA for the Project for nuisance phytoplankton growth and will not contribute to the exceedance of the relevant nuisance phytoplankton growth criteria in the Project reservoirs.

7. The Joint Applicants shall implement modifications requested by ODEQ under these certification conditions and the WQMMP.

9.6 Aesthetic Conditions – OAR 340-041-0565(2)(l) and CTWS Ordinance 80, 432.100(2)(l)

9.6.1 Applicable State Standard

The applicable State standard for aesthetic conditions is as follows:

340-41-565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(l) Aesthetic conditions offensive to the human senses of sight, taste, smell, or touch shall not be allowed.

9.6.2 Applicable Tribal Standard

The applicable Tribal standard for aesthetic conditions is substantively the same as that of the State's.

9.6.3 Application of Aesthetic Conditions Standard

This regulation prohibits activities, discharges, and other conditions that will result in water quality conditions that are offensive to human senses. Applying this standard is subjective due to varying sensibilities and sensitivities of the human experience.

ODEQ generally will rely on the expertise of the ODEQ field staff and other available information to evaluate if offensive conditions exist and whether nuisance conditions exist that must be corrected. Where questionable conditions exist, ODEQ, as a matter of agency policy, will endeavor to investigate circumstances and reach collaborative, voluntary, and informal resolution with responsible parties.

This standard does not apply to the aesthetic conditions of the terrestrial environment, or Project facilities, but instead applies strictly to the aesthetic condition of the water alone.

9.6.4 Joint Applicants' Description of Present Conditions

The Joint Applicants did not provide a statement of present condition in relation to the aesthetic conditions standard.

9.6.5 Joint Applicants' Position

Per Table 9.1.1-1, the Joint Applicants state that the aesthetic conditions standard should not be affected by the Project since "the Project produces no conditions that might be offensive to the human senses of sight, taste, smell, or touch." However, on page 61 of § 401 applications it is stated:

Certain parameters, specifically Aesthetic Conditions, Toxic Substances, and Discoloration, Scum, Oily Sleek, could be affected in the event of an abnormal event, such as a spill of hazardous or toxic materials. Such impacts are not addressed here. Rather, they have been addressed in four plans, entitled "Oil Spill Prevention Control and Countermeasure Plan," prepared by PGE, as operator of the Project. Separate plans have been prepared for each development, and for the Round Butte Switchyard. A fifth plan, entitled "Hazardous Materials Emergency Response Plan," has been prepared for the entire Project. The plans have been filed with ODEQ, and are regularly updated to ensure that all Project personnel are familiar with the plans' requirements. The most recent update took place in January 2001. Thus, as requested by ODEQ, a Project-specific spill prevention, control, and countermeasure plan and waste management guidelines to guard against adverse water quality impacts from spills have already been implemented.

9.6.6 Summary of Public Testimony

Conservation Groups:

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW are precluded in instances of capital expenditure. Considering the considerable term of FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed.

9.6.7 ODEQ Evaluation

ODEQ's primary concerns for compliance with this standard relate to the potential for offensive aesthetic conditions to develop as a result of intense summertime phytoplankton growth or as the result of a spill of hazardous or aesthetically offensive material to Project reservoirs or the lower Deschutes River. Aside from these two concerns, ODEQ is not aware of any discharges or activities that would cause a violation of this standard.

With respect to any potential aesthetic problem related to intense phytoplankton growth, ODEQ would consider the Joint Applicants to be partly responsible since the Project provides a suitable environment (reservoir impoundments) for such a condition to develop. ODEQ recognizes that according to modeling, implementation of SWW may tend to slightly reduce the intensity and perhaps the persistence of phytoplankton growth within the Project reservoirs. If this proves out, this would be a favorable condition with respect to potential development of aesthetically offensive conditions. More detailed discussion of the phytoplankton issue is provided in Section 9.5.

The Joint Applicants likely use petroleum products, hazardous materials, and non-hazardous materials in everyday operation and maintenance of the Project, which, if spilled, could result in offensive aesthetic conditions in violation of this standard. Thus, it is important that the Joint Applicants maintain and implement detailed plans and procedures for the use, handling, storage, disposal, and the clean up of petroleum products, hazardous materials, and non-hazardous

materials that could cause offensive aesthetic conditions in the reservoirs or lower river. Obviously, spill of these materials may result in much more than offensive aesthetic conditions, potentially resulting in actual harm to humans, aquatic organisms, wildlife and their habitats. However, evaluation of this standard with respect to spills, is directed is directed at the aesthetic conditions aspect. Harmful aspects of spills are discussed in Sections 9.10, 9.11 and 9.12 of this evaluation report.

The Joint Applicants indicate that they have existing plans to guard against or respond to potential spills. These include four separate "Oil Spill Prevention, Control, and Countermeasure Plans" for each hydroelectric development and for the Round Butte Switchyard, and a fifth plan for the entire Project entitled "Hazardous Materials Emergency Response Plan." In addition to these important plans, the Joint Applicants should also prepare and implement a spill prevention, control, and countermeasure plan or plans for hazardous and non-hazardous materials used at the facility, which, if spilled, may result in offensive aesthetic conditions. Comprehensive spill prevention, control, and countermeasure (SPCC) plans could be developed that address oil products, hazardous materials, and non-hazardous materials that include the attributes of the existing five plans.

With respect to public comment #CG-3, the WQMMP does, indeed, specify a restriction regarding ODEQ's ability to require modifications to the SWW structure. Based upon the information presented to ODEQ in support of 401 certification, and considering the proposed blending regime, ODEQ is reasonably assured that upon construction of the SWW structure and implementation of the proposed flow regime, that additional structural modification will not be necessary. However, as provided for by 33 USC 1341 and OAR 340-48, ODEQ may reconsider the proposed 401 certification and add, delete, or modify certification conditions as necessary to address changes in knowledge, Project conditions, or water quality standards or to address any failure of certification conditions to protect water quality and beneficial uses. ODEQ includes such a provision in the § 401 certification and the § 401 Implementation Agreement to be signed by the Joint Applicants and ODEQ.

9.6.8 ODEQ Findings

ODEQ is reasonably assured that operation of the Project will comply with the aesthetic conditions standard provided that the Joint Applicants meet the following conditions:

1. As per finding for Nuisance Phytoplankton Growth (Section 9.5.8).

2. The Joint Applicants shall maintain and implement current Spill Prevention, Control, and Countermeasure (SPCC) plans for oil, hazardous materials, and non-hazardous materials, prepared in accordance with the Clean Water Act requirements of 40 CFR 112. These plans shall address all locations at the Project where Project operations may potentially result in a spill of these materials and result in offensive aesthetic conditions within the Project reservoirs or the lower Deschutes River. In the event of a spill or release or threatened spill or release to Project reservoirs or the lower Deschutes River, the Joint Applicants shall immediately implement the site's SPCC plan and notify the Oregon Emergency Response System (OERS) at 1-800-452-0311.

9.7 Total Dissolved Gas – OAR 340-041-0565(2)(n)(A) and CTWS Ordinance 80, 432.100(2)(n)

9.7.1 Applicable State Standard

The applicable State standard for total dissolved gas is as follows:

340-041-0565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(n)(A) The concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed one hundred and ten percent (110%) of saturation, except when stream flow exceeds the 10-year, 7-day average flood. However, for hatchery receiving waters and waters of less than 2 feet in depth, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed one hundred and five percent (105) of saturation.

9.7.2 Applicable Tribal Standard

The applicable Tribal standard for total dissolved gas is substantively the same as that of the State's.

9.7.3 Application of the Total Dissolved Gas Standard

The supersaturation of atmospheric gases in water may cause either crippling or lethal gas bubbles to form in the tissues of fish. The standard, based on scientifically derived evidence, is designed to prohibit discharges or activities that will result in atmospheric gases reaching known harmful concentrations.

There are six ways that total dissolved gas (TDG) supersaturation can occur (EPA, 1976 and American Fish Society, 1979):

1. Excessive biological activity--dissolved oxygen concentrations often reach supersaturation because of excessive algal photosynthesis. Renfro (1963) reported gas bubble disease in fishes resulting, in part, from algal blooms. Algal blooms often accompany an increase in water temperature and this higher temperature further contributes to supersaturation.

2. Lindroff (1957) reported that water spillage at hydropower dams caused supersaturation. When excess water is spilled over the face of a dam, it entrains air as it plunges to the stilling or plunge pool at the base of the dam. The momentum of the fall carries the water and entrained gases to great depths in the pool; and, under increased hydrostatic pressure, the entrained gases are driven into solution, causing supersaturation of dissolved gases.

3. Natural waterfalls with deep plunge basins can cause supersaturation and subsequent adverse effects to fish (Harvey and Cooper, 1962).

4. The use of air in turbine intakes to avoid cavitation creates supersaturation--a condition that can be avoided if identified (McDonald and Hyatt, 1973).

5. Venturi action caused by improper engineering of hatchery water supplies has also been described by Harvey and Smith (1961), Wyatt and Beiningen (1971), and Rucker and Tuttle (1948).

6. Gas bubble disease may be induced by discharges from power generating and other thermal sources (Marcello, et al, 1975). Cool, gas-saturated water is heated as it passes through the condenser or heat exchanger. As the temperature of the water rises, percent saturation increases because of the reduced solubility of gases at high temperatures. Thus, the discharged water becomes supersaturated with gases and fish or other organisms living in the heated water may exhibit gas bubble disease (DeMont and Miller, 1972; Malouf, et al, 1972; Keup, 1975).

9.7.4 Joint Applicants' Description of Present Conditions

The following paragraph provides the Joint Applicants' description of present TDG conditions as stated in the June 2001 § 401 certification application:

The typical conditions that produce excessive concentrations of TDG are not present in the Pelton Round Butte Project. There is normally no surface discharge over the Project dams. On the rare occasions that surface spill does occur, the conditions are not amenable to producing gas supersaturation. Spillway discharges from the Project dams enter shallow water and do not plunge to great depth. TDG was measured below the Reregulating Dam during spill in 1999. No excessive values were recorded (Lewis and Raymond 2000).

In response to a request by ODEQ, on February 19, 2002, the Joint Applicants provided additional information regarding turbine and spill operations at the Project as they relate to TDG. This information is summarized below.

9.7.4.1 Turbine Operation

The issue related to turbine operation is whether or not any air is injected or admitted to the water passing through the turbines that may increase TDG levels. At the Round Butte development, air is admitted into the turbines as they are ramped up and down each day as they pass between 40% and 60% load. This air injection occurs for approximately five minutes per ramping cycle for a total of 10 minutes per day. The estimated net increase in TDG to downstream waters is 2% or less, and only occurs during this operating condition. As this condition occurs approximately 1.6% of the time at Round Butte development, the net gas addition below Round Butte Dam is negligible.

The turbines at the Pelton development have an atmospheric pressure draft tube air admission system. This system lets air into the turbines only when operated below 65% gate that occurs only during startup and shutdown of the units (usually one start and one stop each day). When the Reregulating Reservoir pool is high, there is often insufficient suction to allow air admission. Thus, air admission often does not occur during Pelton development shutdowns (when the Reregulating Reservoir pool is high). Overall gas addition rates at the Pelton development are similar to that of Round Butte. Direct estimates of the resulting gas level have not been made. However, the air admission system is operated infrequently, at a low rate of admission, and without pressurized air injection.

The single turbine at the Reregulating Dam has neither air injection nor air admission, so this unit has no affect on lower river TDG.

9.7.4.2 Spillway Operation

From a TDG perspective, the Project has unusually high turbine capacities at its developments, relative to the 10-year flood flow rate. The 10-year 7-day (7Q10) flood flow rate as calculated by the USGS is 10,334 cfs. The 7Q10 flood flow is less than the turbine capacities at the Round Butte development (14,000 cfs after current upgrades) and at the Pelton development (11,796 cfs). As a result, a 7Q10 flood flow event can be passed through the turbines of these developments without any spill.

At the Reregulating development, the turbine capacity of 6,276 cfs requires spill essentially every year. However, the spillway structure, stilling basin and lower river reach are very benign in terms of TDG problems due to spill. The spillway directs water downstream with a near horizontal jet and the spillway plunge pool is very shallow. Also, the spillway discharges into a free-flowing, shallow river which is an effective gas "stripper", where any elevated gas levels are reduced to near equilibrium over a short distance.

9.7.5 Joint Applicants' Position

Typical conditions for the development of excess total dissolved gas are not present at the Project. Water is rarely spilled over the dams, and when it is, no deep plunging discharges are created. The condition of excess total dissolved gas has not been documented in Lake Billy Chinook or Lake Simtustus but could arise during periods of intense algal photosynthesis, when DO can reach 140 percent saturation in the epilimnion.

This condition is a natural consequence of the limnology of the reservoir and is unlikely to create any damage to fish because it occurs only for short periods in highly localized regions of the near-surface water. Susceptible fish are rarely found in this region of the reservoirs and can easily avoid it. If this standard is ever exceeded, it is unlikely that any beneficial use would be impaired.

9.7.5.1 Joint Applicants' Conclusion

Conditions normally required for the development of excess total dissolved gas are not present at the Project. There are no deep or plunging discharges at any time. The only potential for excessive TDG would be during conditions of supersaturated DO levels associated with intense algal photosynthesis at the surface of the reservoirs, in waters not frequented by fish and not discharged from the Project. For these reasons, the Joint Applicants believe that there will be a reasonable assurance that Project operations, coupled with the Joint Applicants' proposals for mitigation, will not cause waters within or downstream of the Project to violate the TDG standard.

9.7.6 Summary of Public Testimony

No public comment was received specific to this water quality standard.

9.7.7 ODEQ Evaluation

The air injection and admission associated with startup and shutdown modes at the Round Butte and Pelton developments, respectively, are of very short duration and likely incorporate very little atmospheric gas. The turbine at the Reregulating development is without facility for air admission or injection.

Passage of water over the spillways at Round Butte and Pelton Dams occurs very infrequently in association with extreme high flow events in excess of the 7Q10 flood flow. If spilling during such high flow events occurs, possibly resulting in TDG in excess of 110% criterion, the excursions would not be considered violations of the standard considering the 7Q10 exemption allowance. Further, the Joint Applicants have indicated that the stilling basins are shallow, limiting opportunity for gas dissolution.

Under current operations, spilling occurs at the Reregulating Dam essentially annually. In the future, spilling may become more frequent to supplement discharged DO as per the DOMP. However, the conditions for development of excessive TDG concentrations do not appear to be present. The spillway directs flow in a nearly horizontal trajectory into a very shallow plunge pool. Nonetheless, to verify that spillage at the Reregulating Dam will not cause violation of the TDG standard, the Joint Applicants will monitor TDG for two years following implementation of SWW. The requirement to monitor for TDG is included in Chapter 7 of the proposed WQMMP (Exhibit A). If it is determined that spilling at the Reregulating Dam contributes to violations of the TDG standard, then modification of the spillway facilities and/or the plunge pool would be necessary.

9.7.8 ODEQ Finding

ODEQ is reasonably assured that operation of the Project will comply with the total dissolved gas standard provided that the Joint Applicants meet the following conditions:

1. The Joint Applicants shall monitor total dissolved gas at the Reregulating Dam tailrace in accordance with the WQMP contained in the WQMMP.

2. If monitoring of total dissolved gas at the Reregulating Dam tailrace at times of spill indicates noncompliance with the total dissolved gas standard, then the Joint Applicants shall immediately develop a plan and schedule for assessing the problem and developing a remedy. Such plan and schedule shall be submitted to ODEQ for approval within 60 days of identifying the excessive total dissolved gas concentrations via monitoring. Upon approval of the remedial plan by ODEQ, the Joint Applicants shall implement the plan in accordance with the approved schedule.

9.8 Turbidity -- OAR 340-041-0565(2)(c) and CTWS Ordinance 80, 432.100(2)(c)

9.8.1 Applicable State Standard

The applicable State standard for Turbidity is as follows:

340-041-0565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(c) Turbidity (Nephelometric Turbidity Units, NTU): No more than a 10 percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied and one of the following has been granted:

(A) **Emergency Activities:** Approval coordinated by ODEQ with the Department of Fish and Wildlife under conditions they may prescribe to accommodate response to emergencies or to protect public health and welfare.

(B) **Dredging, Construction or other Legitimate Activities:** Permit or certification authorized under terms of Sections 401 or 404 (Permits and Licenses, Federal Water Pollution Control Act) or OAR 141-85-100 et. seq. (Removal and Fill Permits, Division of State Lands), with limitations and conditions governing the activity set forth in the permit or certificate.

9.8.2 Applicable Tribal Standard

The applicable Tribal standard for turbidity is substantively the same as that of the State's.

9.8.3 Application of Turbidity Standard

Turbidity is a measure of the amount of light intercepted by a given volume of water due to the presence of suspended and dissolved matter and microscopic biota. Increasing the turbidity of the water decreases the amount of light that penetrates the water column.

High levels of turbidity are harmful to aquatic life. Turbidity due to a large volume of suspended sediment can reduce light penetration, thereby suppressing photosynthetic activity of phytoplankton, periphyton, and macrophytes, especially those farther from the surface. If turbidity is largely due to algae, light will not penetrate very far into the water, and primary production will be limited to the uppermost layers of water. Excess turbidity may lead to fewer photosynthetic organisms available to serve as food sources for many invertebrates. As a result, overall invertebrate numbers may also decline, which may then lead to a fish population decline.

Highly turbid waters may also be hazardous to the welfare of swimmers and boaters. Turbidity may obscure potentially dangerous obstructions such as boulders and logs. The organic constituents of turbid waters may harbor high concentrations of bacteria, viruses, and protozoans.

The standard is designed to minimize the addition of soil particles or any other suspended substances that would cause significant increases in the river's normal, seasonal turbidity pattern.

9.8.4 Joint Applicants' Description of Present Conditions

The Joint Applicants did not provide a statement of present conditions for turbidity in the § 401-certification application document. However, the 1994-1996 limnology study (Raymond et al. 1997), submitted in support of the § 401 application, provides the following observations of present turbidity conditions.

Turbidity values at most sites typically ranged from 1 to 2 NTU during the study period. Values greater than 2 NTU were observed in spring 1995 and 1996. Elevated turbidity values among the tributaries were associated exclusively with discharge from the Crooked River. The flows from the Metolius and Deschutes Rivers remained relatively clear, although short-term changes during individual storm events were not monitored in this project. Presumably, the elevated turbidity values in the Crooked River reflect the arid nature of this watershed and a greater proportion of agricultural land use in the watershed compared to the watersheds for the Deschutes and Metolius Rivers.

Most sites exhibited outliners on the upper end of their distributions related to the February 1996 flood. The Metolius River (station 17) had the lowest turbidity values of any site, with the Deschutes River and the outlet from Lake Billy Chinook (station 6) slightly greater. As a group, the surface water sites in the Crooked Arm had the greatest median turbidity values. Station 10 downstream from the Crooked River had the highest median turbidity value rather than, as expected in the river, at station 11. The difference may be an artifact of the sampling design of 10 times per year and consequently it may have under-represented high turbidity associated with storm events.

The surface sites with the greatest variability in turbidity are the Crooked River (11), station 10, and Lake Simtustus (4). The relatively high turbidity at the surface of Lake Simtustus probably reflects surface contributions from Willow and Seekseequa Creeks and the high algal productivity at the site. Turbidity values at the subsurface sites generally were slightly less variable than most of the surface sites with the major exception being the bottom samples at station 10 that were skewed towards low turbidity.

9.8.5 Joint Applicants' Position

Per Table 9.1.1-1, the Joint Applicants state that the turbidity standard should not be affected by the Project since "No physical or biological process associated with the Project increases the turbidity of the water. Ramping rates, and the local geology, limit the production of turbidity through Project operations."

9.8.6 Summary of Public Testimony:

Joint Applicants:

JA-6. To avoid FERC requirements to develop duplicate plans, the 401 requirements related to implementing a shoreline erosion control plan and a riparian planting plan should be modified to reference the relevant components of the FJAA proposed recreational PMEs (shoreline erosion control) and the terrestrial resource management plan (riparian planting).

9.8.7 ODEQ Evaluation:

It is difficult to apply Oregon's turbidity standard to an activity such as a hydroelectric project of this nature. The standard calls for comparison of upstream and downstream turbidity levels to determine if there is a greater than 10% increase related to the activity. In the case of this project, the activity is the temporary impoundment of water behind the dams and with ultimate discharge to the lower river. Comparison of upstream to downstream turbidity at this Project raises some questions regarding appropriate analysis and what such an analysis would mean in terms of meeting the intent of the standard. With respect to appropriate analysis, the upstream turbidity cannot simply be derived from a single upstream tributary, but would need to consider some flow-weighted average turbidity reflective of the tributary rivers, groundwater, and ungaged flows from various perennial and ephemeral smaller streams. The results of such an upstream/downstream comparison at this Project would not be expected to yield a true apples-to-apples comparison since the turbidity of the upstream inflows may be characterized by significantly greater inorganic constituency (that may settle out within the reservoirs in transit), whereas the downstream turbidity may be characterized by significantly greater organic constituency comprised of phytoplankton and zooplankton.

Although ODEQ does expect that the future operation of the SWW withdrawal may slightly increase turbidity discharged to the lower river, such increase would not be expected to adversely impact beneficial uses. In fact, implementation of SWW will likely result in the release of higher concentrations of seston into the lower river resulting in greater invertebrate taxonomic diversity owing to an increase in filter feeders (Kvam et al. 2002). Nonetheless, ODEQ considers it appropriate to monitor turbidity following implementation of the SWW to verify expectations and to potentially provide input into adaptive water quality management.

At Lake Billy Chinook, the seasonal drawdown in combination with wave action contributes to shoreline erosion in some areas with unstable soil types. These eroded areas may contribute to localized areas of higher turbidity. The Joint Applicants indicate in the FJAA that they plan to expand the current riparian shrub and tree planting program and to implement erosion control measures as part of a Shoreline Management Plan. These measures would help minimize localized turbidity along these more sensitive shoreline areas. ODEQ will condition the § 401 certificate to require such in support of the turbidity standard. To address public comment JA-6, the wording of the § 401 certificate conditions related to requirements for the riparian planting and erosion control measures will be modified. These conditions will specifically reference the relative components of the FJAA to help avoid FERC from interpreting such § 401 certificate conditions as being in addition to those proposed in the FJAA.

With respect to the construction of the SWW facility, there will likely be some level of disruption of the sediment at the bottom of the forebay next to the existing intake structure. Prior to performing such instream work, the Joint Applicants will need to obtain necessary permitting including a CWA § 404 permit from the Army Corps of Engineer or Oregon Division of State Lands and a Hydrologic Project Application (HPA) permit from CTWS. These permits will require that the Joint Applicants perform the instream work in a manner that minimizes potential impacts on water quality (including turbidity) and beneficial uses. A § 404 permit triggers a § 401 certificate process for the instream work that is independent of this § 401 certificate process for a new FERC license.

9.8.8 ODEQ Finding:

ODEQ is reasonably assured that operation of the Project will comply with the turbidity standard provided that the Joint Applicants meet the following conditions:

1. The Joint Applicants shall implement the erosion control measures for erosionally-sensitive shoreline areas of the Project reservoirs as proposed in the Final Joint Application Amendment, Exhibit E-VII-13.

2. The Joint Applicants shall continue the Shoreline Planting Program at all three Project reservoirs to enhance on-site riparian habitat, as proposed in the Final Joint Application Amendment, Exhibit E-IV-41.

3. The Joint Applicants shall monitor turbidity in accordance with the WQMP contained in the WQMMP.

9.9 Total Dissolved Solids – OAR 340-041-0565(2)(o) and CTWS Ordinance 80, 432.100(2)(o)

9.9.1 Applicable State Standard

The applicable State standard for total dissolved solids is as follows:

340-41-565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(o) Total Dissolved Solids: Guide concentrations listed below shall not be exceeded unless otherwise specifically authorized by ODEQ upon such conditions as it may deem necessary to carry out the general intent of this plan an to protect the beneficial uses set forth in OAR 340-041-0562: 500 mg/L.

9.9.2 Applicable Tribal Standard

The applicable Tribal standard for total dissolved solids is as follows:

CTWS Ordinance 80, 432.100(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes River:

(o) Total Dissolved Solids: Criteria listed below shall not be exceeded unless otherwise specifically authorized by the Tribe upon such conditions as it may deem necessary to carry out the general intent of this plan and to protect the beneficial uses:

(A)	Deschutes River Basin on the Reservation:	500.0 mg/L;
	Sodium Chloride and Sulfates in domestic water sources:	250.0 mg/L;

9.9.3 Application of the Total Dissolved Solids Standard

The primary purpose of the total dissolved solids water quality standard is protection of the Deschutes River Basin drinking water beneficial use. Oregon Health Division rules at OAR 333-061-0030(6)-Table 6 establishes 500.0 mg/L total dissolved solids as the "secondary maximum contaminant level" for public water systems. The standard protects drinking water against adverse aesthetic qualities of the water, primarily taste, but levels exceeding 500.0 mg/L do not generally pose a threat to public health.

9.9.4 Joint Applicants' Description of Present Conditions

The Joint Applicants did not provide a statement of present condition in relation to this specific standard.

9.9.5 Joint Applicants' Position

Per Table 9.1.1-1, the Joint Applicants state that the total dissolved solids standard should not be affected by the Project since "Nothing is added to the water by the Project that would increase the total dissolved solids."

9.9.6 Summary of Public Testimony

No public comment was received specific to this water quality standard.

9.9.7 ODEQ Evaluation

The reservoirs receive significant inflow from groundwater as well as tributary surface water inflow that has a significant groundwater origin. Groundwaters typically have higher concentrations of total dissolved solids than do surface waters due to generally longer times of contact with soils and rock. The concentration of total dissolved solids might potentially increase as water passes through the system due to evaporative concentration at the reservoir surfaces. Since both the reservoirs and the lower Deschutes River are designated for the beneficial use of public and private domestic water supply, it is appropriate to evaluate whether or not these water exceed the applicable criteria. The State and Tribal criterion for total dissolved solids is 500mg/L.

The 1994-1996 limnological study (Raymond et al. 1997) provides data on conductivity of waters in the vicinity of the Project, but not total dissolved solids. In general, conductivity is proportional to the concentration of major cations and anions. The total dissolved solids can be estimated by multiplying the conductivity by an empirical factor that range from 0.54 to 0.96. To be conservative, not knowing what an appropriate factor would be for this basin, the largest conversion factor of 0.96 is used here. Table 9.9.7-1 provides reported values for conductivity and estimated total dissolved solids concentrations for Project inflows, select reservoir locations, and the lower river just below the Project.

Table 9.9.7-1 Mean conductivity and estimated total dissolved solids for Project vicinity waters.

Location	Mean Conductivity (µS/cm)	Estimated TDS (mg/L)
Crooked River Inflow	189.8	182

Deschutes River Inflow	121.6	117
Metolius River Inflow	73.3	70
Groundwater Inflow[1]	131.6	126
Round Butte Dam Forebay	150.5	144
Round Butte Dam Tailrace	129.0	124
Pelton Dam Forebay	137.9	132
Pelton Dam Tailrace	131.8	127
Reregulating Dam Tailrace	132.4	127

[1]Estimated based upon five measurements reported by USGS for Lower Opal Springs (Caldwell 1998)

It appears, using a conservative approach to estimating total dissolved solids concentration, that concentrations within the reservoirs and discharged to the lower river (Reregulating Dam tailrace) are well within 500 mg/L criterion of the standard. Further, it appears that the Deschutes River exiting the Project has a total dissolved solids concentration comparable to what would be expected from a flow-weighted mass balance of the groundwater and the three tributary rivers. Thus, it appears that the Project has little, if any, impact on total dissolved solids.

It would not be expected that implementation of SWW will impact total dissolved solids concentrations in any significant manner.

9.9.8 ODEQ Findings

No additional conditions are needed to meet the total dissolved solids standard.

9.10 Toxic Substances – OAR 340-041-0565(2)(p) and CTWS Ordinance 80, 432.100(2)(p)

9.10.1 Applicable State Standard

The applicable State standard for toxic substances is as follows:

340-41-565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(p) Toxic Substances:

(A) Toxic substances shall not be introduced above natural background levels in the waters of the state in amounts, concentrations, or combinations which may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses;

(B) Levels of toxic substances shall not exceed the criteria listed in Table 20 which were based on criteria established by EPA and published in [the Code of Federal

Regulations, Protection of Environment, Chapter 40, Section 131.36 (July 1, 1995) as updated and amended, and the] *Quality Criteria for Water (1986)*, unless otherwise noted;

(C) The criteria in paragraph (B) of this subsection shall apply unless data from scientifically valid studies demonstrate that the most sensitive designated beneficial uses will not be adversely affected by exceeding a criterion or that a more restrictive criterion is warranted to protect beneficial uses, as accepted by the Department on a site specific basis. Where no published EPA criteria exist for a toxic substance, public health advisories and other published scientific literature may be considered and used, if appropriate, to set guidance values;

(D) Bio-assessment studies such as laboratory bioassays or instream measurements of indigenous biological communities, shall be conducted, as the Department deems necessary, to monitor the toxicity of complex effluents, other suspected discharges or chemical substances without numeric criteria, to aquatic life. These studies, properly conducted in accordance with standard testing procedures, may be considered as scientifically valid data for the purposes of paragraph (C) of this subsection. If toxicity occurs, the Department shall evaluate and implement measures necessary to reduce toxicity on a case-by-case basis.

9.10.2 Applicable Tribal Standard

The applicable Tribal standard for toxic substances is substantively the same as that of the State's.

9.10.3 Application of Toxic Substances Standard

This standard provides protection for humans, wildlife, and aquatic life from adverse effects resulting from the presence of toxic substances above natural levels, either alone or in combination with other chemicals or substances. Where needed, ODEQ can consider additional studies reported in the scientific literature to review applicability of numeric criteria, or to set guidance values. Bioassays can be used to determine effects of site-specific effluents or chemical substances on aquatic life.

9.10.4 Joint Applicants' Description of Present Conditions

The Joint Applicants did not provide a statement of present conditions for toxic substances in the § 401-certification application document. However, the 1994-1996 limnology study (Raymond et al. 1997), submitted in support of the § 401 application, indicates that metals testing was measured four times at all sampling stations in 1995 (January, April, July and October). This sampling included arsenic, cadmium, copper, lead, mercury, and zinc. These are metals that can inhibit algae, fish, and zooplankton production and can bioaccumulate. Most values were below the limits of detection and the concentrations of all the metals in all samples were well below the ambient water quality criteria. Metal concentration (µg/L) in water from the Project and its tributaries is shown in Table 9.10.4-1.

Table 9.10.4-1. Metal concentration (µg/L) in water from the Project and its tributaries.

Metal	Mean Analytical Result	Reporting Limit	Quantitation Limit
Arsenic	1.4	10	10.0
Cadmium	-0.16	0.25	0.25
Copper	0.073	10	10.0
Lead	-0.03	10	10.0
Mercury	0.032	<1	1.0
Zinc	0.78	<10	10.0

(Data from Raymond et al. 1997)

9.10.5 Joint Applicants' Position

Per Table 9.1.1-1, the Joint Applicants state that the toxic substances standard should not be affected by the Project since "No toxic substances are added to the water by the Project, and there are no known naturally occurring problems with toxics." However, on page 61 of § 401 application it is stated:

> Certain parameters, specifically Aesthetic Conditions, Toxic Substances, and Discoloration, Scum, Oily Sleek, could be affected in the event of an abnormal event, such as a spill of hazardous or toxic materials. Such impacts are not addressed here. Rather, they have been addressed in four plans, entitled "Oil Spill Prevention Control and Countermeasure Plan," prepared by PGE, as operator of the Project. Separate plans have been prepared for each development, and for the Round Butte Switchyard. A fifth plan, entitled "Hazardous Materials Emergency Response Plan," has been prepared for the entire Project. The plans have been filed with ODEQ, and are regularly updated to ensure that all Project personnel are familiar with the plans' requirements. The most recent update took place in January 2001. Thus, as requested by ODEQ, a Project-specific spill prevention, control, and countermeasure plan and waste management guidelines to guard against adverse water quality impacts from spills have already been implemented.

9.10.6 Summary of Public Testimony

No public comment was received specific to this water quality standard.

9.10.7 ODEQ Evaluation

No Project-affected waters within the Deschutes River Basin are listed on ODEQ's CWA 303(d) list for toxic substances, nor are waters tributary to the Project listed.

The toxic metals analysis, conducted as part of the limnology study, included one year of quarterly sampling at 21 sites. The sites included the tributaries to the Project, the Project reservoirs and two sites just downstream of the Project. Most values were below the limits of detection and the concentrations of all the metals in all samples were well below the ambient water quality criteria For the protection of human health and aquatic life.

Sediments within the Project impoundments were not sampled for toxic substances. However, ODEQ is not aware of any information that would suggest a potential toxic sediment problem nor does ODEQ suspect that such a condition would exist in these reservoirs.

ODEQ's primary concern for compliance with the toxic substances standard is the potential for a spill of oil or hazardous substance to the Project reservoirs or lower Deschutes River. The Joint Applicants likely use petroleum products and hazardous materials in everyday operation and maintenance of the Project, which, if spilled, could result in toxic conditions in these waterways. Thus, it is important that the Joint Applicants maintain and implement detailed plans and procedures for the use, handling, storage, disposal, and the clean-up of petroleum products and hazardous materials that could cause toxic conditions to Project reservoirs or lower river.

9.10.8 ODEQ Findings

ODEQ is reasonably assured that operation of the Project will comply with the toxic substances standard provided that the Joint Applicants meet the following conditions:

1. The Joint Applicants shall maintain and implement current Spill Prevention, Control, and Countermeasure (SPCC) plans for oil and hazardous materials prepared in accordance with the Clean Water Act requirements of 40 CFR 112. These plans shall address all locations at the Project where Project operations may potentially result in a spill of these materials to the reservoirs or the lower Deschutes River. In the event of a spill or release or threatened spill or release to Project reservoirs or the lower Deschutes River, the Joint Applicants shall immediately implement the site's SPCC plan and notify the Oregon Emergency Response System (OERS) at 1-800-452-0311.

9.11 Discoloration, Scum, Oily Sleek -- OAR 340-041-0565(2)(k) and CTWS Ordinance 80, 432.100(2)(k)

9.11.1 Applicable State Standard

The applicable State standard for discoloration, scum and oily sleek standard is as follows:

340-041-0565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(k) Objectionable discoloration, scum, oily sleek or floating solids, or coating of aquatic life with oil films shall not be allowed.

9.11.2 Applicable Tribal Standard

The applicable Tribal standard for discoloration, scum, and oily sleek is substantively the same as that of the State's.

9.11.3 Application of the Discoloration, Scum, and Oily Sleek Standard

This standard is intended to protect aquatic life from being coated with oil films as well as protect against objectionable waterway conditions characterized by discoloration, scum, oily sleek or floating solids. Many industrial and domestic wastewater discharges could cause these conditions to occur in receiving streams. Spills of petroleum products or hazardous materials could also bring about the conditions. The impact of such discharges or spills could vary from human annoyance to adverse effects or mortality on aquatic life.

Oil spills are regulated by several state and federal agencies depending upon respective jurisdictions in Oregon. ODEQ oil spill rules, OAR 340 Division 47, apply statewide.

9.11.4 Joint Applicants' Description of Present Conditions

The Joint Applicants did not provide a statement of present condition in relation to the discoloration, scum, and oily sleek standard.

9.11.5 Joint Applicants' Position

Per Table 9.1.1-1, the Joint Applicants state that the discoloration, scum, and oily sleek standard should not be effected by the Project since "Nothing is added to the water by the Project to cause objectionable discoloration, scum, or oily sleek deposits." However, on page 61 of the § 401 application it is stated:

> Certain parameters, specifically Aesthetic Conditions, Toxic Substances, and Discoloration, Scum, Oily Sleek, could be affected in the event of an abnormal event, such as a spill of hazardous or toxic materials. Such impacts are not addressed here. Rather, they have been addressed in four plans, entitled "Oil Spill Prevention Control and Countermeasure Plan," prepared by PGE, as operator of the Project. Separate plans have been prepared for each development, and for the Round Butte Switchyard. A fifth plan, entitled "Hazardous Materials Emergency Response Plan," has been prepared for the entire Project. The plans have been filed with ODEQ, and are regularly updated to ensure that all Project personnel are familiar with the plans' requirements. The most recent update took place in January 2001. Thus, as requested by ODEQ, a Project-specific spill prevention, control, and countermeasure plan and waste management guidelines to guard against adverse water quality impacts from spills have already been implemented.

9.11.6 Summary of Public Testimony

No public comment was received specific to this water quality standard.

9.11.7 ODEQ Evaluation

ODEQ's primary concern for compliance with the discoloration, scum, and oily sleek standard is the potential for a spill of oil or hazardous substance to the Project reservoirs or lower Deschutes River. The Joint Applicants likely use petroleum products and hazardous materials in everyday operation and maintenance of the Project, which, if spilled, could result in coating of aquatic life with oil films or objectionable waterway conditions characterized by discoloration, scum, oily sleek or floating solids. Thus, it is important that the Joint Applicants maintain and implement

detailed plans and procedures for the use, handling, storage, disposal, and the clean-up of petroleum products and hazardous materials that could such conditions in the Project reservoirs or lower Deschutes River.

9.11.8 ODEQ Finding

ODEQ is reasonably assured that operation of the Project will comply with the discoloration, scum, and oily sleek standard provided that the Joint Applicants meet the following conditions:

1. The Joint Applicants shall maintain and implement current Spill Prevention, Control, and Countermeasure (SPCC) plans for oil and hazardous materials prepared in accordance with the Clean Water Act requirements of 40 CFR 112. These plans shall address all locations at the Project where Project operations may potentially result in a spill of these materials to the reservoirs or the lower Deschutes River. In the event of a spill or release or threatened spill or release to Project reservoirs or the lower Deschutes River, the Joint Applicants shall immediately implement the site's SPCC plan and notify the Oregon Emergency Response System (OERS) at 1-800-452-0311.

9.12 Biological Criteria -- OAR 340-041-0027 and CTWS Ordinance 80, 432.300

And

Deleterious Conditions – OAR 340-041-0565(2)(i) and CTWS Ordinance 80, 432.100(2)(i)

Evaluation of compliance with these two standards has been grouped together in this report for several reasons. The Joint Applicants did not explicitly present a case for compliance with the "deleterious conditions" standard in the § 401 application, but provided a significant amount of information regarding the biological criteria standard that is applicable to both standards. Rather than providing nearly identical and extensive sections under two separate standards for present conditions, Joint Applicants' position, public testimony, ODEQ evaluation, and ODEQ findings, it is more efficient to group them together, here. However, for clarity and distinction, the rule language and standard application sections are parsed out for these two standards.

9.12.1 State Standards

9.12.1.1 State Biological Criteria Standard

The applicable State standard for Biological Criteria is as follows:

340-041-0027 Waters of the State shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

OAR 340-41-0006 defines several terms used in the Biological Criteria standard:

(32) "Aquatic Species" means any plants or animals which live at least part of their life cycle in waters of the State.

(33) "Biological Criteria" are defined as "numerical values or narrative expressions that describe the biological integrity of aquatic communities inhabiting waters of a given designated aquatic life use."

(34) "Designated Beneficial Use" means the purpose or benefit to be derived from a water body, as designated by the Water Resources Department or the [Environmental Quality] Commission.

(35) "Indigenous" means supported in reach of water or known to have been supported according to historical records compiled by State and Federal agencies or published scientific literature.

(36) "Resident Biological Community" means aquatic life expected to exist in a particular habitat when water quality standards for a specific ecoregion, basin or water body are met. This shall be established by accepted biomonitoring techniques.

(37) "Without detrimental changes in the resident biological community" means "no loss of ecological integrity when compared to natural conditions at an appropriate reference site or region."

(38) "Ecological integrity" is defined as the " the summation of chemical, physical and biological integrity capable of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat for the region."

(39) "Appropriate reference site or region" is defined as "a site on the same water body, or within the same basin or ecoregion that has similar habitat conditions, and represents the water quality and biological community attainable with the areas of concern."

9.12.1.2 State Deleterious Conditions Standard

The applicable State standard for deleterious conditions is as follows:

340-41-565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(i) The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed.

9.12.2 Tribal Standards

9.12.2.1 Tribal Biological Criteria Standard

The applicable Tribal standard for biological criteria is substantively the same as that of the State's.

9.12.2.2 Tribal Deleterious Conditions Standard

The applicable Tribal standard for deleterious conditions is substantively the same as that of the State's.

9.12.3 Application of the Standards

9.12.3.1 Application of the Biological Criteria Standard

The biologic criteria standard is meant to complement the other parameter-specific criteria in the following manner. The parameter-specific criteria are designed to give full protection to the most sensitive beneficial use, with the implicit assumption that if the most sensitive beneficial use is protected, then all uses will be protected. However, the application of these criteria is very limited in considering multiple stressors and cumulative effects. By contrast, the biological criteria are aimed at gaining the ability to assess total impact to the community in situ. Biological criteria make it possible to evaluate the impact of a source without a need for measuring every possible water quality variable. Thus, the standard is applied as a measure of the impact of a source by comparing the biological integrity (as represented by appropriate expressions) below the source with that at a reference site or region.

9.12.3.2 Application of the Deleterious Conditions Standard

The intent of this standard is very broad, as is its application. The standard is intended to protect the beneficial uses of public domestic water supply; private domestic water supply; anadromous fish passage; salmonid fish rearing; salmonid fish spawning; resident fish and aquatic life; and fishing. With respect to drinking water uses, the standard requires that discharges and activities not cause tastes, odors, toxicity or other conditions that would affect the potability of a drinking water supply. The State and Tribes have both designated the Project reservoirs and lower river for public and private domestic water supply. These water supply uses assume adequate pretreatment (filtration and disinfection) and natural quality to meet drinking water standards. With respect to fish and aquatic life, the standard requires that discharges and activities not contribute to conditions harmful to anadromous fish passage, rearing and spawning of salmonids, resident fish, or other aquatic life. Recognizing that the beneficial use of fishing also includes the collection of shellfish, and potential consumption of either, the standard also protects against discharges or activities that would contribute to their diminished palatability.

9.12.4 Joint Applicants' Description of Present Conditions

The Joint Applicants did not provide a statement of present conditions to specifically address the deleterious conditions standard. However, the Joint Applicants have provided considerable description regarding the biological criteria standard, much of which is applicable to both the evaluation of the biological criteria standard and the deleterious conditions standard, and is included here.

Results of macroinvertebrate sampling conducted in October 1999 and May 2000 indicate that the lower Deschutes River possesses a highly productive invertebrate community. The productivity of invertebrates in the lower Deschutes River helps provide an abundant food source for the resident/anadromous fish species in the river. Metrics of productivity is typical of streams that contain high quality fish habitat and that are not influenced by nutrient enrichment.

Taxa richness in the lower Deschutes River during the fall and spring sampling was high. Taxa richness at the "shallow" or margin sites was similar to the "normal" or mid-channel sites in the fall and spring, suggesting that Project operations were not affecting macroinvertebrate taxa richness in margin areas of the lower Deschutes River. Similarly, there was no consistent pattern in percent dominant taxon values between shallow and "normal" sites in the same locale,

suggesting Project operations do not affect margin habitats to a degree that favors the dominance of a particular taxon.

Although the ODEQ impairment score is not directly applicable to the lower Deschutes River because the river is larger than a "wadeable" stream, the trends suggest that the effects of the Project on the invertebrate community extend from the Reregulating Dam to approximately Site 7 (located 9.6 miles below the dam) in the fall and to approximately Site 4 (located 2.5 miles below the dam) in the spring. The Project does not appear to have major effects on the composition of invertebrates for the remaining 90 miles of the river downstream to the Columbia River.

The waters of the Project support a wide variety of fish species. Of particular concern in the relicensing process are steelhead, rainbow trout, and chinook salmon that inhabit the Deschutes River below the Project; kokanee that inhabit Lake Billy Chinook and spawn in the Metolius River; bull trout that inhabit the Metolius River above the Project, Lake Billy Chinook, and the Deschutes River and its tributaries below the Project; and steelhead, spring chinook salmon, and Pacific lamprey that have been blocked from portions of their historic spawning areas by construction of the Project. Other species of interest include smallmouth bass, and crayfish.

Rainbow trout are abundant in the Deschutes River below the Project and in all three tributaries to Lake Billy Chinook (Newton and Nelson 1996; Groves et al. 1999). Bull trout in Lake Billy Chinook and the Metolius River have a robust population that has been increasing or stable in recent years despite a continued fishery in the reservoir (Ratliff et al. 1996; Thiesfeld et al. 1999), in contrast to conditions in much of the rest of the bull trout range, where populations of this species are less robust. Kokanee are abundant in Lake Billy Chinook and support a major recreational sport fishery (Thiesfeld et al. 1999). Both steelhead and fall chinook spawn in the mainstem Deschutes below the Project (Zimmerman and Reeves 1999; Jonasson and Lindsay 1988). Crayfish are present in Lake Billy Chinook in sufficient abundance to support a commercial harvest when market conditions are favorable (Lewis 1997).

Impacts on the lower river in terms of interception of large wood and gravel, flow modification (minimum instream flows, ramping rates, attenuation of flood peaks, etc.), disconnection of populations for resident fish species, and prevention of anadromy are discussed in detail in the FJAA and in the previously filed FERC final license applications:

- *Large wood* — Since the Project was completed, there have been only two flood events that would have moved large wood to the lower river (Grant et al. 1999; Minear 1999), and the Joint Applicants believe these events would have deposited the wood out of the main channel. (Refer to the FJAA, section III.C.5 of Fish Resources in Exhibit E for further detail.)

- *Gravel* — While it is true that relatively minor amounts of spawning-size gravel have been deposited in the reservoir, the Joint Applicants believe there is no conclusive evidence that the Project has had any measurable impact on the deposition of gravel or armoring of substrate in the lower river immediately below the Reregulating Dam (Grant et al. 1999). (Refer to the FJAA, section III.C.5 of Fish Resources in Exhibit E for further detail.)

- *Flow modification* — The Reregulating Reservoir is used to redistribute upstream peaking flows and maintain nearly steady discharge into the Deschutes River approximately equal to the daily average inflow to Lake Billy Chinook. The proposed Project minimum flows will comply with the instream flows established in the State's instream water right. Ramping rates are controlled to the limits permissible by available control technology and, as discussed above, there is no evidence of biological impacts resulting from flow fluctuations (Zimmerman and Reeves 1999; Jonasson and Lindsay 1988; Kvam et al. 2001). Flood flows are attenuated for safety reasons, but the available evidence indicates that flows of the magnitude seen since the Project was completed are not powerful enough to mobilize bedload (Grant et al. 1999). (Refer to the FJAA, Exhibit B and section III.C.5 of Fish Resources in Exhibit E for further detail.)

- *Fish Passage* — The Project's impact on fish passage, disconnection of fish populations, and anadromy are well-documented and are the subject of the Joint Applicants' four-phase fish passage plan (Attachment III-2 to Fish Resources section). At the same time, Lake Billy Chinook supports a thriving population of kokanee and bull trout, and the lower river supports healthy spawning populations of a variety of salmonids (Thiesfeld et al. 1998; Ratliff et al. 1996; Zimmerman and Reeves 1999; Jonasson and Lindsay 1988). (Refer to the FJAA, section III.C.1 of Fish Resources in Exhibit E for further detail.)

9.12.5 Joint Applicants' Position

Per Table 9.1.1-1, the Joint Applicants state that the Creation of Tastes or Odors [or Conditions Deleterious to Fish or Aquatic Life] standard should not be effected by the Project since "The Project adds no nutrients to the water and withdrawal of water from deep in the reservoirs provides no opportunity for the introduction of objectionable tastes or odors." Note, the above-bracketed words were added by ODEQ to emphasize that in addition to conditions creating tastes or odors, this standard also addresses conditions that are considered to be deleterious to fish and other aquatic life. The Joint Applicants recognize that the Project does create conditions that are deleterious to fish and aquatic organisms, based upon what they have stated in their § 401 application under the biological criteria standard, and presented below.

The waters of the State and the Reservation affected by the Project, Lake Billy Chinook, Lake Simtustus, the Reregulating Reservoir, and the lower Deschutes River from RM 100 to approximately RM 85, support robust populations of a variety of native and introduced species. Macroinvertebrate populations in the lower river are healthy, and the species present are appropriate for the character of the stream. Although there is concern about fish passage and connectivity for separated populations, measures are being investigated to mitigate for those circumstances. Water quality conditions in portions of the reservoirs and the lower river do not always meet the applicable water quality standards, but at all times in the reservoirs and river there are substantial amounts of available habitat that is suitable for the species living in the system.

This is not to say that the Project is having no effect on the biological community in the lower river. Rather, the approximately 9.6-mile section of the lower Deschutes River below the Reregulating Dam does show a reduced taxonomic diversity of the invertebrate community. This reduced diversity may be attributed to the reduced transport of CPOM and FPOM inputs from headwater source areas, rather than extreme temperatures, low DO, or excessive pollutants.

This section of the river also contains high densities of *Pteronarcys californica,* a long-lived stonefly species that is intolerant of poor water quality conditions including warm water temperatures. This species is a shredder and apparently feeds on senescing macrophytes and the leaves of alders and other riparian vegetation that fall into the lower Deschutes River below the Reregulating Dam. The presence of pollution-sensitive species such as the caddisfly *Glossosoma* also suggest that water quality conditions in the 9.6-mile section of the lower Deschutes River are good.

Aquatic invertebrates collected during the 1999/2000 lower river macroinvertebrate studies were both abundant and taxonomically diverse. The assemblage of aquatic invertebrates observed was indicative of a healthy invertebrate community and good water quality conditions. In addition, the presence of older salmonflies, a species relatively intolerant to pollutants and warm water temperatures, indicates sustained cold and clean water quality conditions. Finally, the relatively diverse and abundant invertebrate community present in the Deschutes River below the Project is indicative of mesotrophic reservoir conditions, because nutrient concentrations appear to be high enough to support good invertebrate production but are not high enough to cause water quality problems (Kvam et al. 2001 [Appendix 4]).

It is the Joint Applicants' position that data collected in 1999 and 2000 in response to concerns expressed by ODEQ indicate that the Project has not caused any significant detrimental changes in the resident biological community in the lower Deschutes River. Based upon the macroinvertebrates collected, the Joint Applicants believe there has been no loss of biological integrity and that the lower river is in fact supporting a balanced community of organisms of the type one would expect to find in a natural community in the lower river. In addition, the 1999 macroinvertebrate study found no species indicative of a loss of biological integrity. To the contrary, the presence of long-lived species that are intolerant of poor water quality indicates that there is no loss of ecological integrity. Combined with the robust populations present, it can be concluded that the beneficial use for biological criteria is being supported.

Accordingly, the Joint Applicants believe that this Biological Criteria standard is being met, insofar as it relates to fish and macroinvertebrate populations in the lower river. With respect to "Ecological Integrity," the Project reservoirs, particularly Lake Billy Chinook, do support a balanced, integrated, adaptive community of organisms with a species composition, diversity, and functional organization, comparable to other lakes and reservoirs in the region.

Moreover, as discussed below, the implementation of selective water withdrawal will have an overall positive impact on lower river water quality and the resident biological community. It will reduce the impacts on the lower river biological community that have been observed. Insofar as impacts on the lower river in terms of interception of large wood and gravel, flow modification (minimum instream flows, ramping rates, attenuation of flood peaks, etc.), disconnection of populations for resident fish species, and prevention of anadromy are concerned, it is the Joint Applicants' position that all of the demonstrated impacts will be satisfactorily addressed by the proposed PME package.

9.12.5.1 Joint Applicants' Conclusion

The macroinvertebrate studies completed in 1999 confirm that the waters of the lower Deschutes River are of sufficient quality to support aquatic species without detrimental changes to the

resident biological communities. The Joint Applicants believe that there has been no loss of "ecological integrity" in the lower river and that the macroinvertebrate communities are, in fact, indicative of a high quality stable community. While the 1999/2000 macroinvertebrate studies indicate that the Project is having a discernible impact on the first 9.6 miles of the lower river below the Reregulating Dam, the Joint Applicants believe that those same studies also show that the river is capable of supporting and maintaining a balanced, integrated, adaptive community of organisms comparable to the natural habitat of the region. The condition of the lower river fish communities is similar.

Moreover, these studies indicate that implementation of selective water withdrawal will more closely mimic the natural temperature regime and increase taxonomic diversity. The selective surface water withdrawal proposed at Round Butte Dam would also likely result in the release of higher concentrations of seston into the lower Deschutes River from winter through July compared to present operating conditions (i.e., deep water withdrawals from Lake Billy Chinook). The density of filter feeders in the river would increase substantially several miles downstream of the Reregulating Dam as a consequence of this operational change. The increased numbers of filter feeders in the upper reaches of the river below the dam would subsequently likely result in increased densities of collector-gatherers a considerable distance downstream of the dam. The taxonomic diversity of the river downstream of the Project would be expected to increase as a consequence of higher FPOM inputs from Lake Billy Chinook. Moderate inputs of FPOM would also likely increase the lower impairment scores presently observed in the 10-mile section of the river immediately downstream of the Project by increasing the diversity of functional food groups present in the river.

As noted above, current operations of the Project result in warmer than normal winter water temperatures downstream of the dam and cooler than normal summer temperatures. These temperature deviations may be contributing to the reduced diversity of endemic species downstream of the dam because some species may not receive the thermal cues needed to break egg diapause and/or stimulate emergence. The proposed operations implementing selective water withdrawal would more closely mimic the natural thermal regime of the lower Deschutes River. This shift in the existing temperature regime will likely accelerate development of larval instars and lead to earlier emergence times. The temperature increase should not result in decreased species diversity because the temperature change is not expected to be severe.

Similarly, relicensing studies indicate that the Project reservoirs, particularly Lake Billy Chinook, support a balanced, integrated, adaptive community of organisms with a species composition, diversity, and functional organization, comparable to other lakes and reservoirs in the region. Accordingly, the Joint Applicants believe that the Project impoundments are not causing detrimental changes to the resident biological communities; to the contrary, the condition of the fisheries indicates that the biological communities are balanced, integrated, and functional. As noted above, the beneficial uses associated with the Biological Criteria standard are anadromous fish passage; salmonid fish spawning; salmonid fish rearing; and resident fish and aquatic life. With implementation of the proposed fish passage plan and selective water withdrawal meeting the design criteria of the consultation agencies, the Project's adverse impacts on these beneficial uses should be adequately mitigated.

The PMEs proposed by the Joint Applicants will address the Project's impact on other components of the Biological Criteria such as large wood, gravel, flow modification, fish

passage, and fish habitat. Thus as noted elsewhere in the FJAA, the Joint Applicants propose to move all large wood discharged into Lake Billy Chinook to the lower river. The Joint Applicants will institute an experimental gravel supplementation program in the reach immediately below the Reregulating Dam. The Joint Applicants will adopt a minimum flow regime calculated to attain the flows established in the State's instream water right, will maintain outflows from the Project to within ±10 percent of inflows to the Project, and will implement ramping restrictions and flow monitoring to ensure that flows below the Reregulating Dam approximate natural conditions as much as is possible with current technology. The fish passage plan is intended to mitigate the Project's impact on upstream and downstream fish passage, and studies completed to date indicate that the Project is having no adverse impact on fish rearing and spawning in the lower river.

As a result, the Joint Applicants believe that there will be a reasonable assurance that Project operations, coupled with the Joint Applicants' proposals for mitigation, will not cause waters within or downstream of the Project to violate the biological criterion.

9.12.6 Summary of Public Testimony

Joint Applicants:

JA-1. The Joint Applicants recommend deletion of 401 certificate requirement to notify and consult the HART if Lake Billy Chinook is forecasted to not fill by June 15 of any year. The proposed consultation requirement would be inconsistent with specific obligations for the Joint Applicants to maintain defined water levels within the reservoir, and to maintain specified minimum flows in the Deschutes River below the Project. Such a consultation requirement would neither relieve the Joint Applicants of those obligations nor improve ability to meet them. The implication that this consultation process is needed to apportion water between minimum flows to the lower river and reservoir refill is misplaced. A reservoir refill allowance (outflow less inflow) of 150 cfs would equate to barely more than a 0.05 foot stage change in the lower river [at the Madras Gage], and would have no biological impact for the refill period.

JA-2. The reservoir levels prescribed for Lake Billy Chinook contain an appropriate exception for defined "extraordinary circumstances". Inclusion of such an exemption for Lake Simtustus and the Reregulating Reservoir is also needed since it is essential to the safe operation of the Project.

JA-3. The 401 certificate requirement to construct, operate and maintain a fish screen and/or bypass device as part of the fish passage structure or outlet structure(s) is inconsistent with the WCB 401 language on this subject and the ODEQ 401 requirement that the Joint Applicants construct fish passage facilities "as shall be set forth in the [FERC] license. Discussions to date within the FTS do not contemplate fish protection measures at the Pelton or Reregulating developments. The Joint Applicants recommend that conditions related to fish entrainment (screening/bypass) be modified to be consistent with the ODEQ 401 requirement that references the future license condition.

JA-4. The 401 certificate condition related to large wood is inconsistent with the WCB 401 certificate related to large wood. ODEQ and WCB should consult with one another to ensure that the final conditions are consistent.

JA-5. The fifth step of the 401 certificate condition related to sediment transport and spawning gravel is inconsistent with that of the WCB's 401 certificate and should be changed. The study of historical data and

the quality of spawning habitat proposed by the WCB is a logical precursor to the experimental placement of spawning gravel proposed by ODEQ. The Joint Applicants recommend that ODEQ replace its language with that of the WCB's related to this fifth step, and that the new paragraph would provide ODEQ sufficient authority to require a gravel placement program if necessary.

JA-8. The compliance point for measuring ramping rates should not be the Madras Gage, but instead should be determined by flow set points for the Reregulating Powerhouse generating unit. Details of such a proposal are contained in Attachment B-2 of Exhibit B to the FJAA.

Conservation Groups:

CG-1. The 401 certification should include measures in addition to the Selective Water Withdrawal (SWW) structure. The Conservation Groups (CG) support the development and implementation of the SWW structure to address water quality impacts. However, the CG consider the proposed 401 certificate to be too reliant on the SWW, and that ODEQ should require other, non-structural water quality solutions, particularly habitat-related improvements, that have a high probability of success.

CG-2. The proposed Section 401 conditions fail to adequately protect and restore the lower river. By requiring the licensees to provide target flows in the lower river, or "inflow", whichever is less, ODEQ fails to provide reasonable assurance that beneficial uses in the lower river – in particular, salmon and steelhead – will be protected for the term of the license or that instream water rights will be met. The "or inflow" provision should be removed to allow state minimum instream flows in the lower river to be met more often, and help offset increasing upper basin demand on limited water supplies. Second, the provision allowing the licensees to reduce lower river flows by an additional 150 cfs to ensure refill of Lake Billy Chinook by a date certain, further undermines the likelihood that the lower river will be protected, and, in conjunction with other conditions, will be detrimental to the public's interest in downstream instream water rights. Lastly, the 401 certificate fails to require a comprehensive habitat restoration plan for the lower river. Healthy habitat below the project is necessary to rebuild and protect anadromous fish runs, a specified beneficial use. ODEQ should revise the proposed 401 certificate to include a long-term habitat restoration and acquisition program.

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW are precluded in instances of capital expenditure. Considering the length of a typical FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed.

CG-4. The restriction on using storage capacity to enhance water quality during droughts should be removed. While the CG's are generally supportive of the 401 certificate requirement of maintaining Project outflows within 10% of inflow, ODEQ should not foreclose the potential use of the reservoirs for temporarily enhancing lower river water quality during emergency drought conditions. The certificate should contain an emergency exemption provision whereby outflows can temporarily exceed inflows by greater than 10% to obviate lower river drought emergency conditions affecting anadromous and resident fish populations.

CG-5. Variances from several conditions must be consistent and well defined. Regarding several provisions – ramping rates, reservoir levels, run-of-river operations – the proposed 401 certificate identifies

situations allowing for exemption from specified requirements. While some of the circumstances allowing variance appear designed to address similar situations (e.g. flood events, flow higher than 6,000 cfs), there is a lack of consistency. ODEQ should revise the provisions to ensure consistency to the extent appropriate, and more clearly define the triggering events throughout.

U.S. Forest Service/U.S. Bureau of Land Management:

FS/BLM-2. There is no ODEQ finding for macroinvertebrates even though there is good monitoring data available from PGE. There appears to be a tailwater affect directly below the Reregulation Dam. There appears to be some difference between shallow and deeper habitats during the fall that were not evident with the spring samplings. What is ODEQ's finding for macroinvertebrates?

FS/BLM-3. The 401 certificate does not require a hard minimum flow be maintained to protect the State of Oregon instream water right, whereas ODFW recommends such in the Second Unified State Position. ODFW's request may require drafting of the Project reservoirs at times when Project inflow drops below the hard minimum flow. BLM is the federal manager of the Wild and Scenic River below the Project, and acknowledges the state's instream water right as the flow needed to protect the outstandingly remarkable values of the lower Deschutes River. Failure to protect these flows may be inconsistent with the Wild and Scenic River Plan.

FS/BLM-4. The program to maintain instream wood recruitment to the lower Deschutes River needs to be coordinated with BLM, the federal managers for the Wild and Scenic River Plan. An environmental assessment would be needed prior to any instream project.

FS/BLM-5. The 401 certificate requires that bedload movement monitoring be initiated at flows over 10,000 cfs, whereas ODFW's recommends a trigger flow of 7,000 cfs. The USFS and BLM are requesting that monitoring be initiated at flows greater than 6,500 cfs, since in most rivers the bed is moved at high flows that occur 10% of the time. For the Deschutes River, this 10% exceedance flow is less than 6,500 cfs.

FS/BLM-6. The 401 certificate should not require gravel augmentation unless the bedload monitoring and sediment budget of the tributaries indicate a need based upon lack of supply and more frequent modeling than suggest by [Fassnacht's] modeling.

FS/BLM-7. The 401 certificate requires that outflow can only vary by ± 10% of inflow when Project outflows are less than 6,000 cfs, whereas ODFW's recommendation uses a 7,000 cfs upper flow limit for this restriction. The USFS and BLM are requesting that FERC apply a ± 10% restriction for flows less than 7,000 to 8,000 cfs, after an assessment of flood risk is made.

9.12.7 ODEQ Evaluation

9.12.7.1 Potability of Drinking Water

With respect to drinking water uses, the Project operations could potentially contribute to tastes, odors, toxicity or other conditions that would affect the potability of a drinking water supply. Spills of petroleum products, hazardous materials, or even non-hazardous materials could adversely impact existing or future water supplies taken from the Project reservoirs or the lower Deschutes River by imparting taste, odor, toxicity or other conditions that could render the water nonpotable.

Thus, spill prevention, control, and countermeasure plans should be implemented at all Project locations where such spill might potentially occur.

Frequent summer algal blooms within the reservoirs also have the potential to cause unwanted taste and odor to downstream domestic water supplies. The Joint Applicants indicates that withdrawal of water from deep in the reservoirs provides no opportunity for the introduction of objectionable tastes or odors. However, with the future implementation of SWW at Lake Billy Chinook, there may be a greater potential to pass more algae downstream as a result of passing surface waters. As the Lake Simtustus withdrawal structure will remain a deep withdrawal, this may not be a very likely scenario. ODEQ is not aware of any problems or complaints of drinking water taste or odor problems associated with downstream domestic water supplies.

9.12.7.2 Palatability of Fish

ODEQ is not aware of problems or complaints related to palatability of fish or shellfish taken from the Project Reservoirs or the lower Deschutes River. ODEQ does not suspect that activities associated with the operation of the Project would lead to reduced palatability of fish or shellfish.

9.12.7.3 Macroinvertebrates and Periphyton

The macroinvertebrate and periphyton studies indicate that the lower Deschutes River is highly productive. Observed densities and taxa richness were generally high for all sites. Lower Deschutes River sites exhibited considerably higher invertebrate densities than that of the three reference sites just upstream of the Project. However, slightly depressed invertebrate taxa richness was observed in the upper 9.6 miles below the Project in the fall and about two or three miles in Spring 2000. Spring 2001 invertebrate sampling indicated depressed diversity for only about one mile below the Project, (Kvam 2002). The proposed implementation of selective withdrawal would be expected to increase particulate organic matter in the Project outflow, resulting in increased taxa richness directly below the Project owing to an increase in filter feeders (Kvam 2002). ODEQ is supportive of the Joint Applicants proposal to conduct additional macroinvertebrate and periphyton sampling post-SWW implementation to evaluate actual impacts on these communities, and to allow comparison with the expected impact.

Overall, it appears that the macroinvertebrate and periphyton densities and taxa richness downstream of the Project are indicative of a healthy, productive environment with only limited signs of Project impact in close proximity to the Project.

9.12.7.4 Fish Resources

The Project reservoirs support a wide variety of fish species. Lake Billy Chinook supports a robust population and major fishery for kokanee, as well as the only fishery for bull trout in the state. A limited number of kokanee and bull trout successfully pass through the turbines at Round Butte and Pelton Dams, supporting lesser population densities in the lower reservoirs. This is the primary recruitment for kokanee and bull trout since Lake Simtustus and the Reregulating Reservoir have no significant tributary spawning habitats for these species. Other salmonids present in the reservoirs include rainbow trout, brown trout and mountain whitefish. Warm water species include smallmouth bass, northern pikeminnow, and an assortment of other non-game species, many of which have been introduced.

The Deschutes River below the Project supports rainbow trout, bull trout, and anadromous species including spring and fall chinook salmon and steelhead. Construction of the Project has blocked spring chinook, steelhead, and Pacific lamprey from portions of their historic spawning areas, and led to fragmentation of resident rainbow and bull trout species above and below the Project.

Resource trends indicate an erratic but generally declining condition and trend for population of certain fish species and their habitats. For example, runs of wild spring chinook, *Oncorhynchus tshawtscha*, have declined since the Project was constructed in the mid-1950's. Wild spring chinook runs from 1956 to 1968 ranged from 112 to 1493 fish at the Pelton Trap (Ratliff and Schulz 1996), despite poor habitat conditions in the upper basin and a decade of low ocean productivity (Lichatowich 1998). Since the demise of spring chinook in the Metolius and upper Deschutes River above the Project, the only remaining wild spring chinook population is in the Warm Springs River.

There are multiple impacts related to the existence and operation of the Project that may be contributing to decline of certain fish species or otherwise limiting their full expression in terms species diversity, populations and health. Among the primary Project-related impacts is that the dams act as a barrier to upstream and downstream movement of anadromous species, in addition to blocking of volitional movement of resident species. Approximately 46 miles of riverine habitat, including important spawning and rearing habitat, has been and continues to be inundated by the Project. Lack of screening of reservoir intakes results in entrainment of fish into turbines, resulting in mortality and injury. Warm-water environments of the reservoir epilimnions provide for suitable habitat for introduced species of fish, such as smallmouth bass and northern pike minnow, that prey upon some of the native salmonid species. Artificial stage changes (ramping) of the lower river caused by Project operations may contribute to stranding of fish (and other aquatic and terrestrial organisms). Reductions in springtime flow in the lower river to accommodate refilling of Lake Billy Chinook may potentially de-water important spawning or rearing habitats. Fluctuations in reservoir levels may also impact the successful spawning of certain shoreline fish species and limit riparian growth, important for providing healthy littoral habitats. Although the modified run-of-river operations of the Project provides for nearly inflow-equal-to-outflow conditions above and below the Project, there is some level of reduction and attenuation of peak flows, possibly limiting the frequency of maintenance-level flows to the lower river sufficient to reset substrate, including potential spawning habitats. substrate changes important to channel maintenance and fish habitats. In addition to fish, the Project dams also block the movement of large wood and sediment, including gravel, important elements of spawning and rearing habitats.

As discussed in detail elsewhere in this document, the Project has also impacted water quality habitat. The Project, as currently configured with deep-water reservoir outlets, has shifted the temperature regime of the lower river in relation to the conditions that existed prior to the Project's construction. The Project causes temperatures below the Project to be unnaturally depressed in the spring and early summer and warmer in the late summer and fall. Other Project-related impacts include modified water quality habitat related to dissolved oxygen, pH, and primary production within and downstream of the Project.

9.12.7.5 Proposed Protection, Mitigation, and Enhancement Measures (PMEs)

At the heart of the Joint Applicants' PME proposals, is its plan to restore anadromy above the Project and allow for the reconnection of isolated resident fish species. The Joint Applicants indicate that they are committed to the re-establishment of fish passage upstream and downstream of the Project. The Joint Applicants' proposed Fish Passage Plan represents a multi-phase, multi-million dollar effort to restore spring-run chinook, steelhead, sockeye and Pacific lamprey runs to historic habitat above the Project and to enhance the already robust population of bull trout in the Metolius River and Lake Billy Chinook by reconnecting that population with other populations downstream of the Project. A key component of the Fish Passage Plan is the use of adaptive management principles to direct the implementation, monitoring, and evaluation of individual measures to guide passage decisions over the course of the new license. The passage plan includes measures to ensure that the implementation of proposed fish passage PMEs would not inadvertently put important existing fishery resources at risk. The fish passage effort includes cooperative identification, protection, and enhancement of upstream habitat; state-of-the-art upstream and downstream fish collection and passage technology; measures to minimize the risk of disease, predation, and competition to the existing valuable resident fisheries; and continuing a long-term commitment to hatchery mitigation until such time as increased natural production to support both ecosystem and harvest objectives allows a reduction in hatchery production.

In addition to the Fish Passage Plan, there are a number of other important PME measures being proposed by the Joint Applicants that argue for support of the biological criteria standard, support of the deleterious conditions standard (i.e. guard against such conditions), and directly support designated beneficial uses. Relevant beneficial uses include salmonid spawning, salmonid rearing, resident fish, aquatic life, and wildlife. These include the following, some of which have been previously discussed in Section 5.1, and in the case of SWW, Section 9.2 to 9.6.

- Selective Water Withdrawal (SWW): Improvement of overall water quality in the Project reservoirs and lower Deschutes River; Redirection of currents in Lake Billy Chinook to allow attraction and collection of downstream fish migrants.

  With respect to public comment CG-3, the WQMMP does, indeed, specify a restriction regarding ODEQ's ability to require modifications to the SWW structure. Based upon the information presented to ODEQ in support of 401 certification, and considering the proposed blending regime, ODEQ is reasonably assured that upon construction of the SWW structure and implementation of the proposed flow regime, that additional structural modification will not be necessary. However, as provided for by 33 USC 1341 and OAR 340-48, ODEQ may reconsider the proposed 401 certification and add, delete, or modify certification conditions as necessary to address changes in knowledge, Project conditions, or water quality standards or to address any failure of certification conditions to protect water quality and beneficial uses. ODEQ includes such a provision in the § 401 certification and the § 401 Implementation Agreement to be signed by the Joint Applicants and ODEQ.

  The Conservation Groups also indicate that they are of the opinion that the 401 certificate is too reliant on the SWW structure (CG-1); that ODEQ should require other, non-structural water quality solutions, particularly habitat-related improvements that have a high probability of success. While ODEQ would have greater comfort if there were multiple alternatives on the

table being proposed for implementation to assure compliance with water quality standards, ODEQ is reasonably assured of compliance given the proposed implementations of SWW, coupled with adaptive management provisions, monitoring, and ODEQ's ability to modify the certification as identified above. ODEQ is not aware of any non-structural water quality solutions that would be expected to have a high probability of success for this Project. ODEQ does not doubt, however, that non-structural, habitat-related improvements in the upper or lower basin could significantly benefit fish and aquatic organisms, aside from water quality improvement.

- Nonstructural Habitat Measures: Funding in the amount of $1.475 million for the implementation of upper basin habitat restoration and enhancement including the creation of riparian refugia, as well as improvements such as livestock exclusion, placement of large woody debris, planting of grass, shrubs, and trees, and the maintenance of wetlands. The Joint Applicants identify that such a proposal, to take place during the first five years of the license, will improve water quality entering the Project.

  As indicated in Section 9.12.7.4 above, ODEQ identifies a number of ongoing Project impacts that are expected to continue into the next license. Neither the certification nor license applications attempt to quantify the extent of ongoing impacts expected to continue into the next license, nor do the applications propose a fund to mitigate for these ongoing impacts. The $1.475 million proposal is not designed as a mitigation proposal for these ongoing impacts. Additionally, ODEQ does not expect that the $1.475 million proposal would nearly approach the funding level necessary to support mitigation for these ongoing impacts. ODEQ is supportive of the Joint Applicants proposal for upper basin enhancement and restoration, and will include a condition in the 401 certificate based upon said proposal. Nonetheless, ODEQ encourages the Joint Applicants to immediately initiate discussions with stakeholders to identify an appropriate level of funding to support habitat mitigation commensurate with the expected ongoing impacts related to the Project. Such a fund could be used for long-term, cost-effective habitat restoration and enhancement above, within, and below the Project, under stakeholder guidance.

  With Comment CG-2, the Conservation Groups indicate that the 401 certificate fails to require a comprehensive habitat restoration plan for the lower river; that healthy habitat below the project is necessary to rebuild and protect anadromous fish runs; and that ODEQ should revise the proposed 401 certificate to include a long-term habitat restoration and acquisition program. ODEQ acknowledges that the proposed certification does not require a comprehensive habitat restoration plan for the lower river. However, requirement of such a plan is not a necessary element for 401 certification. ODEQ is reasonably assured that given the requirements to be placed in the 401 certification, including incorporation of the Joint Applicants' $1.475 million proposal for the upper basin, that the Project will comply with water quality standards, including beneficial use support. These habitat-related certificate requirements include protection and enhancement measures for lower river minimum flow, ramping rates, large wood, and gravel, in addition to water quality improvement. Nonetheless, ODEQ encourages stakeholders to work with the Joint Applicants and FERC to identify needs for mitigation and an appropriate level of funding to be provided by the Joint Applicants for long-term habitat improvement to serve as mitigation for ongoing impacts.

- Fish Passage Plan: As discussed above, the Joint Applicants propose a four-phase, adaptive management approach to reestablish passage for anadromous and resident fish species through the Project, promoting species and life-history diversity and allowing for maximum utilization of existing and potential fish habitats within and upstream of the Project.

  With respect to fish passage, the Joint Applicants expressed (public comment JA-3) disfavor with ODEQ's proposed 401 requirements for construction, operation and maintenance of a fish screen and/or bypass device as part of the fish passage structure. The Joint Applicants indicate a preference that ODEQ's final condition instead reference FERC's future license condition regarding entrainment. ODEQ recognizes that the Joint Applicants, in consultation with the FTS, are still evaluating alternatives for a permanent downstream facility to collect downstream migrating fish. At this time, a decision has not yet been made whether to move smolts through Lake Simtustus or to trap and haul to the lower river. If Simtustus is used as a migrational corridor, a smolt pipeline may be used to transport fish around the Reregulating Reservoir. The Joint Applicants identify (FJAA E-III-57) that if the new passage facility at Lake Billy Chinook does not include exclusion of fish from water moving through the powerhouse, entrainment losses over different periods of the year will be determined. Considering that there is still much uncertainty regarding how fish will be passed downstream, and considering that there is very limited information available identifying entrainment mortality at the Project developments, ODEQ concurs that it is not prudent for ODEQ to include the earlier proposed entrainment language. However, ODEQ does not see utility in providing a 401 certificate requirement for entrainment that references a future FERC license requirement. In addition to both ODFW's authority to require screening under state law and their authority to recommend screening via their FPA 10(j) authority, ODEQ is reasonably assured that other agencies with mandatory conditioning authority will require screening/exclusion as is determined appropriate via ongoing evaluation. ODEQ will not include conditions related to screening in its final 401 conditions.

- Round Butte Hatchery: The Joint Applicants propose to continue to fund steelhead and chinook production at the Round Butte Hatchery. The expressed long-term goal is to coordinate the hatchery and reintroduction efforts and to continue to mitigate for Project impacts and eventually eliminate hatchery production of anadromous fish

- Adaptive Management Approach: To address uncertainty surrounding the ultimate effectiveness of proposed water quality and fish passage plan PMEs, the Joint Applicants have proposed to implement an adaptive management and decision approach. This approach consists of six main steps: problem assessment, plan design, implementation, monitoring, evaluation and adjustment.

- Flow and Operating Proposal (note, these proposed PMEs are detailed in Exhibit E, Section III-4 of FJAA and summarized here):

  - Ramping Rates in the lower Deschutes River: Proposed ramping rates are 0.1 foot/hour and 0.4 foot/day from October 16 to May 14, and 0.05 foot/hour and 0.2 foot/day from May 15 to October 15, except during certain extraordinary conditions. Minimizing Project-induced stage change in the river below the Project will help minimize the potential for stranding of aquatic and terrestrial life along the stream margins.

With public comment JA-8, the Joint Applicants identify that the compliance point for measuring ramping rates should not be the flow set points for the Reregulating Powerhouse generating unit as opposed to the Madras Gage. ODEQ has reviewed the discussion relating to "natural variation" in river level provided for in Attachment B-2 of Exhibit B to the FJAA and concurs with the Joint Applicants proposal. According to the Joint Applicants the Madras Gage demonstrates a 0.00 to 0.06 ft per hour "natural variation", a variation measured in the stilling basin of the gage that does not correspond to any control changes by the operators. Thus, compliance based on the record of its stage change commands (change in set points) appears appropriate.

- Reservoir Levels: The Joint Applicants have proposed maintaining Lake Billy Chinook at a stable pool elevation of 1,944 ft MSL to 1,945 ft MSL during the period June 15 to September 15 of each year. Proposed drawdowns limits for the reservoirs are as follows: 20 feet (elev. 1,925 ft MSL) for Lake Billy Chinook; elevation 1,576 ft MSL between June 1 and August 31, and 1,573 ft MSL between September 1 and May 31 for Lake Simtustus; and 1,414 ft MSL year-round for the Reregulating Reservoir. The Joint Applicants have proposed that under defined exceptional circumstances that they be allowed to deviate from the maximum drawdown. The exceptional circumstances include drawdowns necessary minimize risks to life and property relative to flood events, drawdowns necessary for emergency repairs, drawdowns necessary for periodic scheduled maintenance/repairs, and regional power system emergencies. Benefits of drawdown and seasonal limitations on drawdown include power production, dam and flood safety, boating safety, cultural site protection, riparian establishment and protection, and general recreation support.

  With respect to allowance to deviate from maximum drawdowns under extraordinary circumstances, the Joint Applicants' public comment JA-2 identifies that such allowance should not be restricted to Lake Billy Chinook operations, but should also include the two lower reservoirs. While ODEQ did not extend such allowance in its proposed 401 conditions, ODEQ concurs with the Joint Applicants argument that the allowance should also apply to Lake Simtustus and the Reregulating Reservoir operations. ODEQ will modify the condition accordingly.

  ODEQ is unclear, however, regarding what the qualifying parameters are that define the Joint Applicants-identified "extraordinary circumstances" that would justify deviation from the drawdown limits for the respective reservoirs. The Conservation Groups, with public comment CG-5, state that triggering events for variances to reservoir levels, ramping rates, and run-of-river operations should be consistent and well defined. ODEQ agrees that greater definition is desirable. Lacking specific definitions for what constitutes acceptable exception criteria, ODEQ considers it appropriate that the Joint Applicants provide justification to FERC and notification to the HART in instances when deviation occurs. ODEQ believes that aside from the Project operators, FERC will be best positioned to determine whether individual reservoir-level variance events indeed qualify per the exception criteria, and will be best positioned to rectify inappropriate variances. Thus, in addition to extending the "exception criteria" to the two smaller reservoirs for minimum reservoir levels, ODEQ will also modify the final condition to require justification of deviation events for FERC's consideration (cause, extent, and expected timeline to bring the reservoir(s) back to minimum allowable pool levels).

- Minimum Streamflows: Higher minimum flow requirements have been proposed below the Reregulating Development to improve downstream values. These monthly target flows are greater than the minimum flow requirements of the existing FERC license, and are consistent with state minimum instream water right flows. These minimum flow targets range from 3,500 cfs in August to 4,500 cfs in the months of December through March. Both the existing FERC minimum and proposed minimum flows include a provision of "or inflow, whichever is less." If the pool level of Lake Billy Chinook is projected to be below the summer operating level (minimum elevation 1,944.0 MSL) between June 15 and September 15, the Joint Applicants propose an allowance to reduce Project outflows by up to 150 cfs compared with inflows at times when inflow are less than lower river target flows to ensure the reservoir reaches the summer operating level by June 15.

  ODEQ received several interrelated public comments suggesting deletion, modification, or addition of 401 requirements related to maintenance of the proposed summertime full pool; allowance for the proposed 150 cfs flow reduction to refill; inclusion of the proposed "or inflow" allowance; HART consultation in the event of forecasted non-fill of the reservoir (by June 15) notwithstanding the 150 cfs allowance; and, provision for hard minimum instream flows for the lower river. There are numerous reasons relative to these comments (JA-1, CG-2, CG-4, and FS/BLM-3) and pertaining to beneficial use support for which ODEQ considers it appropriate to maintain a full-pool in the summertime at Lake Billy Chinook, including the following:

  - Scenarios modeled for water quality compliance have not been evaluated in terms of a variable and less-than-full pool level for Lake Billy Chinook in the summer. No reasonable assurance of water quality standards compliance for such a scenario can be made at this time.
  - No environmental assessment has been conducted for such a scenario.
  - Efforts to establish and enhance riparian plantings may be severely impacted due to desiccation.
  - Culturally significant plants growing along the proposed (and historic) summer pool level would be prone to desiccation.
  - Margin habitats/edge ecosystems associated with riparian would be dewatered affecting fish and other aquatic organisms.
  - Sensitive cultural sites present at elevations just below the proposed minimum pool level would become exposed during a time of elevated use providing a potential for greater risk of looting, vandalism, or destruction.
  - Bank erosion may be more pronounced with less-than-full, variable summertime water level, due to wakes from high summertime boating activity. This may also pose additional hazard to sensitive cultural sites.
  - Numerous recreational impacts including boating safety (new, unknown subsurface boating hazards for summertime boaters accustom to historic full summer pool); new hazards for swimmers/divers; docks, boat ramps, and swimming beaches less or non-usable; and visual impairment.
  - Reduced head for power production equating to less power production.
  - Significant drawdown may result in inability to refill to full or previous water levels in successive years.

ODEQ also recognizes the importance of maintaining sufficient flows in the lower river for the support of fish, other aquatic organisms, and recreation. Therefore, the Department is supportive of the Joint Applicants' proposal to target passage of flows to the lower river that are equal to or greater than the State's monthly minimum instream water right flows. However, in such instances when Project inflows are less than lower river target flows, ODEQ recognizes that the Project's existence does not contribute to such low-flow conditions.

The Conservation Groups and FS/BLM raise arguments related to the proposed § 401 certification's allowance to hold back 150 cfs of Project inflows. The allowance to skim 150 cfs off of the Project inflows would allow Lake Billy Chinook refill and would result in the passage of less than target flows to the lower river. Arguments are provided that such an allowance may be contrary to support of the State's instream water rights and possibly inconsistent with the Wild and Scenic River Plan.

While ODEQ recognizes the importance of satisfying lower river flows to support State instream water rights and flows supportive of Outstanding Remarkable Values per the Wild and Scenic River Plan, the Joint Applicants' storage water right for filling of the reservoir has a senior priority date. Although, the Joint Applicants' water right is senior to the lower river instream water rights, they have nonetheless proposed to target these instream flow levels as minimums to be passed when inflows are at least equal to the targets. As ODEQ is conditioning the 401 certification for honoring target minimum flows, it is also appropriate that ODEQ include the allowance for the 150 cfs provision to ensure reservoir refill and protection of beneficial uses associated with a full pool. Without such a provision, there is significant risk that in some years that the reservoir might not fill. ODEQ does not expect that skimming of 150 cfs flow, only as needed for reservoir refill, will significantly impact water quality or beneficial use support in the lower river. In fact, water quality modeling performed by Foster Wheeler Environmental Corporation (Khangaonkar, 2002), indicates that with SWW, temperature and water quality within and discharged from the reservoirs would likely be enhanced under lower inflow conditions related to drought, the condition likely prevalent when the 150-cfs allowance would likely be exercised. A 150 cfs flow reduction in the lower river equates to approximately a 0.06-foot stage change in river level at the Madras Gage, a change not expected by ODEQ to be significant for water quality or beneficial use support for the lower river during the spring. To provide greater certainty of refill, ODEQ includes a 401 certificate provision allowing the proposed hold-back of 150 cfs for refill of Lake Billy Chinook when inflows are less than the lower river targets and it is forecasted that exercise of such allowance is necessary to achieve refill by June 15.

The need to exercise the 150 cfs refill allowance may be caused by multiple contributing factors, including poor snow pack conditions, lack of runoff, management of upper basin reservoirs, excessive water withdrawals in the upper basin, and excessive or late drawdown conditions at the Project. ODEQ expects that the Joint Applicants will manage the Project reservoir drawdown and refill such that the latter factor is not a part of the mix and the former factors are planned for with safety margins. While the HART concurs that a requirement for the Joint Applicants to consult with the HART may not effectuate a difference in refill scheme or obligations to refill (public comment JA-1), the HART would like to be notified of the need to exercise of 150 cfs refill allowance and the projected refill

date, considering HART administrative responsibilities associated with the Project and associated interest in refill of the reservoirs.

Per public comment FS/BLM-3, the USFS and BLM identifies that in the State's Second Unified State Position (SUSP), ODFW requested that the Joint Applicants honor a hard minimum flow in the lower river, whereas ODEQ did not. A hard minimum was not proposed by the Joint Applicants in either the 401 certification or FERC license applications. Since going out on public notice with the PUSP, the HART has given additional consideration to the concept of a hard or flexible minimum flow requirement for the lower river during the fall. ODFW identifies in an email to ODEQ (June 18, 2002) that maintaining at least 3,000 cfs in the lower river is very important to meet spawning requirements of fall chinook during September to November. ODFW also indicates that maintaining such flow is also important to the overall ecology and fisheries of the lower river.

The Joint Applicants are concerned that a requirement to drawdown in the early fall may adversely impact beneficial uses associated with a full reservoir. However, the Joint Applicants in an email to ODFW and ODEQ dated June 13, 2002, now indicate that they are "OK" with a proposal for a fall-time supplementation of up to 200 cfs to the lower river when Project inflows drop below 3,000 cfs, assuming allowance for the 150 cfs refill provision in the Spring. While ODEQ also has concerns for potential adverse impacts associated with a required early drawdown, ODEQ is also concerned for the protection of fall chinook during such a critical condition. Chinook salmon are an important fish to both CTWS and non-Indians. Under the Joint Applicants' operating proposal, drawdown could potentially occur as early as September 16, but historically has not been typically initiated until October or November. The Joint Applicants indicate that they have an informal agreement, however, to delay drawdown in the fall beyond September 15, primarily to benefit efforts to enhance, protect, and reestablish riparian plants around the full-pool shoreline of Lake Billy Chinook. With respect to frequency of such extreme low flow conditions in the lower river, flows less than 3,000 cfs have only occurred once in the fall over the last 50 years at the USGS Madras Gage. However, there is concern by some stakeholders that the frequency of such extreme drought conditions may become more frequent if additional water rights are issued in the upper basin.

After Labor Day, use of the reservoir by recreationists drops off dramatically. Thus, ODEQ expects that adverse impacts associated with early drawdown, including exposure of sensitive cultural sites, would be significantly reduced after this end-of-the-summer holiday. A cap on the amount of required drawdown to meet a 3,000 cfs flow requirement in the lower river would be expected to further reduce risk to sensitive cultural sites and shoreline riparian plantings (concern for desiccation). ODEQ determined in a June 14, 2002 phone call with Julie Keil, PGE relicensing coordinator, that the Joint Applicants would be amenable to a flexible minimum flow that would have a four-foot cap on required drawdown. Ms. Keil indicated that the Joint Applicants would be okay with a flexible minimum flow requirement, whereby the Joint Applicants would supplement Project releases to the lower river during the identified time-of-concern to ensure 3,000 cfs flows, subject to a maximum required supplementation of 200 cfs. The WCB does not intend to include a similar requirement for a fall-time flexible minimum flow in its 401 certification, and will include a requirement for full pool through September 15. To avoid direct conflict

with the WCB full-pool requirement, and to further minimize potential impacts related to a required early drawdown under this extreme drought scenario, ODEQ will require that this extreme event requirement not initiate prior to September 16. Other than for such a severe drought conditions, ODEQ encourages the Joint Applicants to maintain a full pool or nearly-full pool late into the fall for the protection of sensitive beneficial uses at the reservoir, accepting for necessary drawdown to minimize risk to property and life.

- Run-of-River Operations: This proposal provides that the discharge to the lower river would be held to ± 10% of inflow under most conditions. Exceptions would be allowed for certain emergency situations, inflows in excess of 6000 cfs, and to safely pass flood flows to minimize damage to life and property.

  With public comment FS/BLM-7, the USFS and BLM point out that the proposed 401 certificate requires that outflow can only vary by ± 10% of inflow when Project outflows are less than 6,000 cfs, whereas ODFW's recommendation uses a 7,000 cfs upper flow limit for this restriction. The USFS and BLM are requesting that FERC apply a ± 10% restriction for flows less than 7,000 to 8,000 cfs, after an assessment of flood risk is made. FERC has requested that the Joint Applicants provide additional information related to this issue via a formal Additional Information Request (AIR). The timeline for development of this additional information will post-date the issuance of the § 401 certification. The Joint Applicants provided ODEQ with a draft response to this AIR that argues for the 6,000 cfs figure based upon flood/dam safety. ODEQ proposes to retain the proposed 6,000 cfs value in the final § 401 certification, but add additional language that calls for operating as close to the ±10% criterion as can be done safely. ODEQ's § 401 certification condition based upon 6,000 cfs would not control or be violated by a higher upper limit flow as may be determined appropriate by the final AIR.

  Per public comment CG-4, the Conservation Groups suggest that the § 401 certification should contain an emergency exemption provision whereby outflows can temporarily exceed inflows by greater than 10% to obviate lower river drought emergency conditions affecting anadromous and resident fish populations. As discussed earlier, ODEQ does not view it as the Joint Applicants' responsibility to obviate for adverse conditions for which they are not contributing to. If inflows to the Project are less than target, then ODEQ's expectation would be, however, that the Project not exacerbate the low flow condition in the lower river, by passing inflow. If the drought event occurred in the fall during the allowed drawdown period, the Joint Applicants would be free to augment flows by 10%.

- Stream Gaging: To provide for more accurate flow monitoring, the Joint Applicants have proposed to fund upgrades to USGS streamflow gages at the three Project tributary rivers, and the USGS Madras gage below the Project.

- Long-Term Water Quality Monitoring: In addition to monitoring of some of the more routine water quality parameters of concern, including those identified earlier in this document, such as temperature, dissolved oxygen, pH, Chlorophyll *a*, turbidity, total dissolved gas, and bacteria, the Joint Applicants have also proposed a long-term monitoring plan inclusive of sampling for parameters such as macroinvertebrates, periphyton, zooplankton, nutrients, and transport of large wood and sediment. The Joint Applicant's proposed long-term water quality monitoring plan is provided as Chapter 7.0 of the proposed Water Quality Management and Monitoring

Plan document (Exhibit A). As indicated in Section 9.2.7 ODEQ approves of the proposed WQMMP, inclusive of component management and monitoring plans, as the interim plan subject to further revision following issuance of the 401 certification. Monitoring of the chemical, physical and biological qualities of the Project-impacted waterways will provide valuable information in terms of compliance with water quality standards and any need for modified (adaptive) operations.

The interim WQMMP, inclusive of the proposed long-term water quality monitoring plan (WQMP), was available for review during the public comment period. Within ninety days of issuance of the § 401 certification, the Joint Applicants will need to revise the WQMMP to further refine and clarify necessary management and monitoring measures, and then resubmit the document for ODEQ approval. It is not expected that the final revised WQMMP will include a substantial change in the management and monitoring plans upon which ODEQ's determination of reasonable assurance is based.

- Large Wood: The Joint Applicants propose to remove all large wood (greater than 20 cm by 3 meters) entering Lake Billy Chinook and place it into the lower Deschutes River below the Project. This is expected to benefit aquatic habitats in the lower river and mitigate for the blockage of natural transport of this material caused by the dams.

  With respect to public comment JA-4, the Joint Applicants identify that 401 certification requirements related to large wood are different for the ODEQ and WCB certificates and request that the agencies consult one another and seek consistency. ODEQ has consulted with WCB and compared to the two conditions related to large wood. Although the conditions are different, ODEQ does not consider them to be substantively different. Both conditions require passing of all large wood intercepted by Lake Billy Chinook to be passed around the Project to the lower river. Neither ODEQ nor WCB were prescriptive in their respective proposed 401 certificate conditions regarding the "how, when, or where" the wood will be placed. To address these specifics, ODEQ proposed required consultation with ODFW and CTWS Natural Resources Department to address these specifics, whereas WCB proposed required coordination with "all appropriate" agencies, subject to approval by an Oversight Committee comprised of three members representing the WCB, ODEQ, and the Joint Applicants. With respect to the Oversight Committee, ODEQ understands that the WCB now intends to modify proposed language relative to the Oversight Committee to reflect that regulatory approvals pertaining to the 401 certification will not include the Joint Applicants, as is appropriate. Other differences between the ODEQ and WCB proposed large wood conditions is that the WCB requires some unspecified quantity (no minimum stated) of wood be placed as installed structures. WCB also provides some recommendations and suggestions (as opposed to requirements) regarding timing and placement of large wood and the use of habitat mitigation funds to supplement the large wood received from the upper reservoir. Overall, ODEQ does not perceive that the requirements of its proposed large wood condition to be substantively different from that of WCB. ODEQ will, however, broaden its large wood condition to require that all necessary regulatory licenses, permits, or approvals be obtained from tribal, federal, state and local authorities prior to large wood placement. This latter modification will address the concern raised by public comment FS/BLM-4, and bring the WCB and ODEQ conditions even closer together.

- Gravel Augmentation: Like large wood, the Project reservoirs trap the transport of sediment, including gravel. The Joint Applicants have proposed additional study of bedload movement in the lower river below the Project in addition to some experimental gravel augmentation. The availability of gravel-sized substrate is important to successful salmonid spawning.

  With respect to Public Comment JA-5,the wording under ODEQ's fifth bullet under the public notice proposed 401 certification condition (E.12), relative to gravel augmentation, is identical to that proposed by the Joint Applicants in both the 401 application (p.133) and FJAA (page E-III-90) and restated in Section 5.2.7 of this report. While ODEQ's proposal is consistent with what the Joint Applicants have proposed, we concur that it is different from that which the WCB proposed in their 401 certification. ODEQ has since consulted with the WCB and agrees that it may be premature to augment gravel in the reach between the Reregulating Dam and Shitike Creek. Additional study to identify the quality of gravel habitat for anadromous fish and the cause for reduction of anadromous spawning in the reach would be an appropriate precursor and potential identifier of need for gravel augmentation. It is apparent from comment JA-5 that the Joint Applicants would prefer that ODEQ retract its augmentation proposal, in favor of requirement to perform such studies as a precursor to experimental gravel augmentation. The Joint Applicants indicate that they are amenable to experimental gravel augmentation if the studies indicate need, and that adopting language similar to that of the WCB's would provide ODEQ sufficient authority to require gravel placement pending the outcome of such studies. ODEQ will modify the condition related to experimental augmentation as so requested appropriate.

  In addition to the Joint Applicants, the USFS and BLM (FS/BLM-6) also indicate that the 401 certificate should not require upfront gravel augmentation; that augmentation should not be required unless studies indicate a need. ODEQ believes the modification to this condition, as described above, addresses this comment.

  The USFS and BLM also commented (FS/BLM-5) on another element of the § 401 certification requirements related to gravel related to the trigger flow for which bedload movement would be monitored. ODEQ mirrored the Joint Applicants' proposal of 10,000 cfs, but intended to use a value of approximately 7,000 cfs. ODFW's proposed recommendation calls for 7,000 cfs, whereas the USFS and BLM are requesting that monitoring be initiate at 6,500 cfs, noting that in most rivers the bed is moved at high flows that occur 10% of the time. The 10% exceedance flow is less than 6,500 cfs. ODEQ is concerned that Fassnacht's model assumes equal velocity and shear stress across a cross-section. In reality, this would be expected to be variable, and that some portions of the bed would experience shear stresses much higher than the cross-sectional average. As a result of real-life variation in the stress field across the stream, portions of the bed would be expected to mobilize at flow rates much less than the average flow rate of mobilization. Also, if Fassnacht's model is at all errant on the high end, that, too, would argue for screening for movement at flows much less than 10,000 cfs. FERC has recognized that there is disparity amongst stakeholder regarding the appropriate flow to trigger bed movement monitoring, and has requested that the Joint Applicants file an AIR that aids resolution. The Joint Applicants will not file their AIR response with FERC until after the 401 certification is issued. ODEQ proposes to modify its condition related to this issue to identify a trigger flow of 7,000 cfs, consistent with ODFW and quite similar in magnitude to that of USFS and BLM. However, ODEQ will provide some flexibility in its final condition allowing that the Joint Applicants

may submit to ODEQ a proposal for a different trigger value pending the results of the AIR process.

- Riparian Planting: The Joint Applicants propose to implement a shoreline-planting program to enhance on-site riparian habitat at all three Project reservoirs. It is anticipated that most plantings will occur at Lake Billy Chinook. The Joint Applicants will first conduct a riparian planting feasibility assessment that will serve as the basis for the riparian planting program. This program can be expected to improve the quality of the littoral habitat, thereby enhancing the beneficial uses of salmonid fish rearing and resident fish and aquatic life. As discussed under the turbidity standard condition, this planting will also serve to stabilize sensitive erosional shoreline areas, potentially limiting turbidity associated with shoreline wave action. ODEQ is requiring implementation of this Joint Applicants-proposed program under the conditions for support of the turbidity standard.

9.12.7.6 ODEQ Evaluation Conclusion

With respect to the potability of drinking water or palatability of fish or shellfish taken from the Project reservoirs or lower Deschutes River, ODEQ is reasonably assured of compliance. ODEQ is not aware of any such potability or palatability problems associated with water or fish taken from these waterbodies, nor does the Department suspect that such deleterious conditions exist or will occur with occur with the advent of SWW.

With respect to the biologic criteria standard, the diversity and densities of macroinvertebrates and periphyton indicate that conditions downstream of the Project are of sufficient quality to support aquatic species without significant Project-related changes to the resident biological communities. ODEQ expects that invertebrate taxa richness will increase in the few miles downstream of the Reregulation Dam where there appears to be some limited impact. In response to public comment FS/BLM-2, ODEQ did make a finding relative to Project impacts on macroinvertebrates as identified above "conditions downstream of the Project are of sufficient quality to support aquatic species without significant Project-related changes to the resident biological communities." Recall that the standard, as cited in Section 9.12.1, states that "Waters of the State shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities." Thus, ODEQ finds for compliance with the standard with respect to macroinvertebrates. A discussion of the macroinvertebrate studies and findings is also provided for in the evaluation Section 9.12.7.3. ODEQ concurs with FS/BLM that the studies indicate a tailwater affect attributable to the Project.

With respect to diversity and density of fish populations, it appears that the Project reservoirs do support rather diverse and healthy populations. However, deleterious Project-related conditions (identified above) may be limiting the full expression of biologic diversity, health, and densities. General reductions in the number of returning spawners, such as spring chinook, may be partially attributable to Project-related impacts.

ODEQ considers, however, that with implementation of the host of proposed water quality-related and beneficial use-related PME measures, that habitat conditions will be improved and expanded such that operation of the Project will be compliant with both the biological criteria and deleterious conditions standards.

9.12.8 ODEQ Findings

ODEQ is reasonably assured that operation of the Project will comply with the biological criteria and deleterious conditions standards provided that the Joint Applicants meet the following conditions:

1. SWW Facility: The Joint Applicants shall construct, test, and commence implementation of the Selective Water Withdrawal (SWW) facility as provided for in the findings of Sections 9.2.8, 9.3.8, 9.4.8, and 9.5.8 and 9.6.8 of this report.

2. Monitoring: Upon issuance of a new FERC license for the Project, the Joint Applicants shall conduct all monitoring, record keeping, and reporting of all parameters in accordance with the WQMP contained in the WQMMP. The WQMP shall specify monitoring sufficient to determine compliance with § 401 certification requirements for water quality, Project operations, streamflow, ramping rates, and reservoir levels.

3. Spill Management: The Joint Applicants shall maintain and implement current Spill Prevention, Control, and Countermeasure (SPCC) plans for oil and hazardous materials prepared in accordance with the Clean Water Act requirements of 40 CFR 112. These plans shall address all locations at the Project where Project operations may potentially result in a spill of these materials to the reservoirs or the lower Deschutes River. In the event of a spill or release or threatened spill or release to Project reservoirs or the lower Deschutes River, the Joint Applicants shall immediately implement the site's SPCC plans and notify the Oregon Emergency Response System (OERS) at 1-800-452-0311.

4. Ramping Rates in the lower Deschutes River: The Joint Applicants shall operate the Project with the following criteria for ramping rates: 0.1 foot/hour and 0.4 foot/day from October 16 to May 14, and 0.05 foot/hour and 0.2 foot/day from May 15 to October 15, except during certain extraordinary conditions. These extraordinary conditions are: (1) flood events; (2) any event that triggers the Project Emergency Action Plan; (3) rapid changes in Project inflows, when the rate of inflow change exceeds the proposed stage change limits; and (4) equipment failures or emergencies at the Reregulating Development. To monitor compliance with this requirement, the Joint Applicants shall record the time and control signal value for all state change instructions at the Reregulating Development and shall report any control signal changes that are greater than the ramping limitations identified above.

5. Reservoir Levels: The Joint Applicants shall operate Lake Billy Chinook to maintain a stable pool level between 1,944 ft MSL and 1,945 ft MSL during the period June 15 to September 15 of each year. If it is forecasted that Lake Billy Chinook will not fill by June 15 of any year, then the Joint Applicants shall immediately notify the state Hydroelectric Application Review Team (HART) and advise of the expected refill date.. If the reservoir has not been filled to normal operating pool level by June 15 of any year, this provision shall not prevent filling if water is available for storage while maintaining the minimum flow. Except during certain extraordinary circumstances described below, the Joint Applicants shall restrict the drawdown of Lake Billy Chinook to a maximum of 20 ft (elev. 1,925 ft MSL) with a target of 10 feet during normal winter operations; Lake Simtustus to a maximum drawdown limit of elevation of 1,576 ft MSL between June 1

and August 31, and elevation 1,573 ft MSL between September 1 and May 31; and the Reregulating Reservoir to 1,414 ft MSL year-round. Extraordinary circumstances allowing deviation from maximum allowable drawdowns are: (a) flood events in which drawdown is needed for safe passage of flood flows to minimize damage to life and property; (b) unforeseen occurrences in which drawdown is required to complete emergency repairs on Project facilities; (c) periodic scheduled maintenance activities that require drawdown to complete normal repairs on Project facilities (including spillway gates, the intake structure, or other dam structures); and (d) regional power system emergencies. In instances where the Joint Applicants exceed maximum drawdowns, the Joint Applicants shall provide immediate written justification to FERC and notification to HART describing cause and need for the deviation, extent of deviation, and expected timeline for bringing the reservoir(s) back to minimum allowable pool levels. If the pool level of Lake Billy Chinook is projected to be below the summer operating level (minimum elevation 1,944.0 ft MSL) between June 15 and September 15, the Joint Applicants may reduce the flow release to ensure the reservoir reaches the minimum pool elevation of 1944.0 ft MSL. When inflows to the Project under this condition are less than target flows plus 150 cfs, then the flow release at the USGS Madras Gage No. 14092500 shall be defined as the daily inflow less 150 cfs. Target flows are defined in the next condition.

6. Minimum Streamflows: The Joint Applicants shall maintain minimum flows on a weekly basis equal to specified target flows or inflows, whichever is less. The target flows, as measured at the USGS Madras Gage No. 14092500, are as follows: January 4,500 cfs, February 4,500 cfs, March 4,500 cfs, April 4,000 cfs, May 4,000 cfs, June 4,000 cfs, July 4,000 cfs, August 3,500 cfs, September 3,800 cfs, October 3,800 cfs, November 3,800 cfs and December 4,500 cfs. During the period September 16 through November 15, the Joint Applicants shall supplement inflows as necessary to ensure a minimum flow release to the lower river of at least 3,000 cfs, subject to a maximum required supplementation of 200 cfs and cap on required drawdown of Lake Billy Chinook to achieve such supplementation equal to four feet.

7. Run-of-River Operations: The Joint Applicants shall hold river flows below the Reregulating Development to within ± 10 percent of the measured Project inflow under most conditions. Conditions or events where this criteria may not be followed include days with measured inflow in excess of 6,000 cfs when at least one of the following conditions exist: (1) any event that triggers the Project Emergency Action Plan; (2) power emergencies, as defined in the WSCC Minimum Operating Reliability Criteria (March 8, 1999); (3) equipment failures or emergencies at one of the Project dams or powerplants; or (4) reservoir drawdowns are needed for safe passage of anticipated flood flows to minimize damage to life and property. At times when flows are in excess of 6,000 cfs and one or more of the above exception conditions apply, the Joint Applicants shall minimize the variation beyond the ± 10% criterion as can be done safely

8. Stream Gaging: By no later than one year from the date of receiving a new FERC license for the Project, the Joint Applicants shall fund improvements at the existing USGS gaging stations on the Crooked (Gage No. 14087400), Deschutes (Gage No. 14076500) and Metolius (Gage No. 14091500) rivers upstream of the Project. These improvements shall include radio, telephone, or other telemetry systems to provide transmission of hourly

USGS flow readings to the Pelton control room.

9. Fish Passage: The Joint Applicants shall construct, maintain and operate, or shall arrange for the construction, maintenance and operation of such facilities and equipment for fish migration, propagation or conservation consistent with the proposed Fish Passage Plan and amendments thereto. In the event any modifications in the fish facilities are deemed necessary, the Joint Applicants shall cooperate with ODFW in the design of such modifications or operation of the facilities.

10. Large Wood: All large wood (greater than 20 cm by 3 m) entering Lake Billy Chinook shall be removed by the Joint Applicants and placed into the lower Deschutes River below the Reregulating Dam. Following a flow event that results in the transport of significant amounts of large wood into Lake Billy Chinook, the Joint Applicants shall consult with ODFW and CTWS Natural Resources Department to obtain specific guidance pertaining to the placement and monitoring of that large wood in the lower Deschutes River below the Project's Reregulating Dam. The Joint Applicants shall obtain all necessary regulatory licenses, permits, or approvals from tribal, federal, state and local authorities prior to large wood placement.

11. Sediment Transport/Spawning Gravel: The Joint Applicants shall perform the following studies with regard to sediment transport and spawning gravel:

- Verify the sediment transport model developed by Fassnacht (1998) by placing radio-tagged and/or colored rocks on selected bars in the Deschutes River below the Reregulating Dam. Determine at which flow levels these rocks are mobilized by checking their positions after each flow event greater than 7,000 cfs. The Joint Applicants may submit to ODEQ for approval a proposal for an alternate flow value for commencement of this monitoring pending the results of the AIR process. Buried columns of colored rocks will be utilized to determine the depth of scour at different flow levels.
- Resurvey channel cross sections at five locations utilized by Fassnacht (1998). Resurvey these annually for 5 years to determine if there is any active channel change associated with years having high flow events. If no change is detected after 5 years, resurvey them every 10 years, or after events greater than 15,000 cfs.
- If monitoring sediment transport and channel change shows significant transport or change at flows lower than predicted by Fassnacht (1998), initiate a program to measure actual bedload transport at different flow levels at the Warm Springs bridge (US Highway 26).
- If monitoring of channel change and measuring bedload shows significant transport at levels significantly below those predicted by the geomorphology study, revisit the sites used by McClure (1998) for particle size measurements and replicate these particle surveys.
- Coordinate and lead a study of historical fish counts and spawning data directed toward determination of the cause of anadromous spawning reduction in the Lower Deschutes River from below the Reregulation Dam downstream to the

mouth of Shitike Creek. In addition, the Joint Applicants shall conduct a study to determine the quality of gravel habitat for anadromous fish in this river reach. The results of this study shall be used by the Joint Applicants to determine if additional mitigation measures are necessary to improve habitat quality or quantity.

12. Upper Basin Habitat Enhancement and Restoration: The Joint Applicants shall work with private and governmental entities in the Deschutes River Basin to implement cost-effective habitat enhancement and restoration measures to improve the quality of water flowing into the Project. These upper basin measures shall include, but not be limited to, the creation of riparian refugia, as well as improvements such as livestock exclusion, placement of large woody debris, planting of grass, shrubs, trees, and the maintenance and creation of wetlands.

The Joint Applicants shall expend a minimum of $1.475 million for these upper basin measures over the first 5 years of the new license in accordance with the following table.

Required Mitigation Measure	**Minimum Required Expenditure**
Improved Riparian Corridor Management	$ 750,000
Community Habitat Education Activities	25,000
Establishment of Reserves and Refugia	700,000
Total	**$1,475,000**

9.13 Bacteria and Bacterial Pollution -- 340-041-0565(2)(e)&(f) and CTWS Ordinance 80, 432.100(2)(e)&(f)

9.13.1 Applicable State Standards

The applicable State standards for bacteria and bacterial pollution are as follows:

340-041-0565(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Deschutes Basin:

(e)(A) Numeric Criteria: Organisms of the coliform group commonly associated with fecal sources (MPN or equivalent membrane filtration using a representative number of samples) shall not exceed the criteria described in subparagraphs (i) and (ii) of this paragraph.

(i) 30-day log mean of 126 *E. coli* organisms per 100 ml, based on a minimum of five (5) samples;
(ii) No single sample shall exceed 406 *E. coli* organisms per 100 ml

(e)(B) Raw Sewage Prohibition: No sewage shall be discharged into or in any other manner be allowed to enter the waters of the State unless such sewage has been treated in a manner approved by the Department or otherwise allowed by these rules.

(f) Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health shall not be allowed.

9.13.2 Applicable Tribal Standards

The applicable Tribal standard for bacteria and bacterial pollution are substantively the same as that of the State's.

9.13.3 Application of the Bacteria and Bacterial Pollution Standards

OAR 340-41-0285(2)(e) and (f) are generally applied to protect the most sensitive beneficial uses. In the Project-affected waters of the Deschutes River Basin, the most sensitive beneficial uses are water-contact recreation and the Tribal use of cultural and religious practices. Although domestic water supply use assumes disinfection pretreatment, this is another use considered sensitive to bacteria.

On-site sewage disposal systems are regulated by ODEQ regulations found at OAR 340, Division 71.

9.13.4 Joint Applicants' Description of Present Conditions

The Joint Applicants did not provide a statement of present condition in relation to the bacteria and bacterial pollution standards.

9.13.5 Joint Applicants' Position

Per Table 9.1.1-1, the Joint Applicants state that the bacteria standard should not be affected by the Project since "There is no reason to suspect that the Project affects bacteria, because there is no significant Project-related discharge of raw or treated sewage or animal waste into Project waters. The toilets at Pelton Park drain to onsite facilities. Domestic wastes at the dams are treated in on-site septic systems. Discharge of domestic wastes from houseboats is prohibited by State and federal law."

Also per Table 9.1.1-1, the Joint Applicants state that the bacterial pollution standard should not be affected by the Project since "There are currently no known sources of bacterial pollution in the Project vicinity that would be subject to this standard."

9.13.6 Summary of Public Testimony

No public comment was received specific to this water quality standard.

9.13.7 ODEQ Evaluation

Although the Joint Applicants collected extensive water quality data in the vicinity of the Project, they did not sample for bacteria. It is unknown whether or not bacteria levels within the Project reservoirs exceed the standard criteria. If a problem exists, the Joint Applicants' few on-site wastewater systems would be considered a few of many potential sources. ODEQ considers

it appropriate that the Joint Applicants collect a limited amount of bacterial data to identify whether or not a bacteria problem exists for which the Project might possibly contribute to. If such monitoring reveals a bacteria problem, and any follow-up investigation of the source of such problem rules out any link to failing Project-owned wastewater facilities, then the Joint Applicants' responsibility to play a part in the remedy of the problem will be fully served by performing the monitoring set-out in the WQMMP. The proposed WQMMP provides for collection of *E. coli* bacteria samples on a monthly basis for two years following implementation of the SWW facility.

9.13.8 ODEQ Finding

The Department is reasonably assured that the bacteria and bacterial pollution standards will not be violated provided the Joint Applicants comply with the following conditions:

1. The Joint Applicants shall monitor for *E. coli* bacteria in accordance with the WQMP contained in the WQMMP.

9.14 Highest and Best Practicable Treatment – OAR 340-041-565(1) and CTWS Ordinance 80, 432.100(1)

9.14.1 Applicable State Rule

The applicable State rule for highest and best practicable treatment is as follows:

340-041-565(1) Notwithstanding the water quality standards contained below [the standards of OAR 340-041-565(2) evaluated in Sections 9.1 through 9.13 and Table 9.1.1-1 of this report], the highest and best practicable treatment and/or control of wastes, activities, and flows shall in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor and other deleterious factors at the lowest possible levels.

9.14.2 Applicable Tribal Rule

The applicable Tribal rule for highest and best practicable treatment is substantively the same as that of the State's.

9.14.3 Application of Highest and Best Treatment Rule

This rule requires the Department to minimize degradation of high quality waters and protect the recognized beneficial uses of such waters by requiring the highest and best practicable control of all waste discharges and activities.

9.14.4 Joint Applicants' Description of Present Conditions

The Joint Applicants did not provide a statement of present condition in relation to this specific standard-related rule.

9.14.5 Joint Applicants' Position

The Joint Applicants did not specifically state a position regarding compliance with this standard-related rule. However, with respect to the pH standard, the Joint Applicants state that by implementing SWW, they will have taken all practicable measures to bring pH in the reservoirs into compliance with the pH criterion.

9.14.6 Summary of Public Testimony

Conservation Groups:

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW are precluded in instances of capital expenditure. Considering the considerable term of FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed.

9.14.7 ODEQ Evaluation

ODEQ views the proposed construction and adaptive-management implementation of the SWW facility, including adaptive monitoring, to be consistent with highest and best treatment for temperature, dissolved oxygen, pH, and nuisance phytoplankton growth. Implementation of SWW will provide the capability to manage and control the quality of water exiting the largest and uppermost of the three Project reservoirs, resulting in potentially significant water quality improvement for all three reservoirs and the lower Deschutes River.

The Joint Applicants have also proposed spilling water over the Reregulating Dam, if necessary, to further improve dissolved oxygen concentrations of water discharged to the lower river. Spilling water at this dam has been demonstrated to be an effective treatment for improving dissolved oxygen levels.

With respect to public comment #CG-3, the WQMMP does, indeed, specify a restriction regarding ODEQ's ability to require modifications to the SWW structure. Based upon the information presented to ODEQ in support of 401 certification, and considering the proposed blending regime, ODEQ is reasonably assured that upon construction of the SWW structure and implementation of the proposed flow regime, that additional structural modification will not be necessary. However, as provided for by 33 USC 1341 and OAR 340-48, ODEQ may reconsider the proposed 401 certification and add, delete, or modify certification conditions as necessary to address changes in knowledge, Project conditions, or water quality standards or to address any failure of certification conditions to protect water quality and beneficial uses. ODEQ includes such a provision in the § 401 certification and the § 401 Implementation Agreement to be signed by the Joint Applicants and ODEQ.

9.14.8 ODEQ Finding

ODEQ is reasonably assured that operation of the Project will comply with the highest and best practices rule provided that the Joint Applicants meet the conditions previously discussed in Section 9 of this evaluation report for the protection of water quality standards.

9.15 Antidegradation Policy – OAR 340-041-0026(1)(a) and CTWS Ordinance 80, 432.020(1)(a)

9.15.1 Applicable State Policy

The applicable State policy for antidegradation is as follows:

EPA rules adopted pursuant to Section 303 of the federal Clean Water Act require state water quality standards to contain a statewide antidegradation policy. This policy must, at a minimum, provide that existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. The policy must provide that where existing quality exceeds that necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, the existing quality shall be maintained and protected, unless the state goes through an intergovernmental coordination and public participation process to conclude that lowering the quality without impairing existing uses is appropriate. The policy must also provide that where high quality waters constitute an outstanding national resource, such as waters of national parks, state parks, wildlife refuges, and waters of exceptional recreational or ecological significance, the existing high quality water shall be maintained and protected.

OAR 340-041-0026(1)(a) sets forth the state-wide antidegradation policy. This section reads as follows:

340-041-0026(1)(a) Antidegradation Policy for Surface Waters. The purpose of the Antidegradation Policy is to guide decisions that affect water quality such that unnecessary degradation from point and nonpoint sources of pollution is prevented, and to protect, maintain, and enhance existing surface water quality to protect all existing beneficial uses. The standards and policies set forth in OAR 340-041-0120 through 340-041-0962 are intended to implement the Antidegradation Policy;

(A) High Quality Waters Policy: Where existing water quality meets or exceeds those levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, and other designated beneficial uses, that level of water quality shall be maintained and protected. The Environmental Quality Commission, after full satisfaction of the intergovernmental coordination and public participation provisions of the continuing planning process, and with full consideration of sections (2), (3) and (5) of this rule, however, may allow a lowering of water quality in these high quality waters if they find:

(i) No other reasonable alternatives exist except to lower water quality; and

(ii) The action is necessary and justifiable for economic or social development benefits and outweighs the environmental costs of lowered water quality; and

(iii) All water quality standards will be met and beneficial uses protected.

(B) The Director or a designee may allow lower water quality on a short term basis in order to respond to emergencies or to otherwise protect public health and welfare;

Sections (C), (D), (E), and (F) of the antidegradation rule are not listed here as they do not apply here. Sections (D), (E), and (F) apply to "outstanding resource waters" and Section (C) applies to "water quality limited waters" where there will be new waste loads, increased waste loads, or waste discharges to lakes or reservoirs.

9.15.2 Applicable Tribal Policy

CTWS sets forth the Tribal antidegradation policy. This section reads as follows:

CTWS 432.020(1) In order to maintain the quality of waters on the Reservation, the following is the general policy of the Tribe:

(a) Antidegradation Policy for Surface Waters. The purpose of the Antidegradation Policy is to guide decisions that affect water quality such that unnecessary degradation from point and non-point sources of pollution is prevented, and to protect, maintain, and enhance existing surface water quality to protect all existing beneficial uses. The Antidegradation Policy consists of the following three tiers:

(A) Tier 1: Existing instream water uses and water quality necessary to support existing uses shall be maintained and protected;

(B) Tier 2: Where the actual water quality exceeds levels necessary to support the propagation of fish and wildlife and recreation in and on the water, that quality shall be maintained or protected unless the Tribe finds, after full satisfaction of the public participation of the Tribe's continued and integrated planning process, that

(1) allowing lower water quality is necessary to accommodate important economic or social development in the area where water is located and outweighs the environmental costs of lowered water quality,

(2) lowering the water quality will not violate the applicable criteria in Table 3, or site specific criteria established under 432.110,

(3) the resulting water quality will fully protect existing uses,

(4) lowering of a water quality standard for economic or social development purpose shall not authorize other users to increase their loading; and (5) all wastes and other substances discharged will be treated and controlled to achieve:

(i) the highest statutory and regulatory requirements for all new and existing point sources and

(ii) all cost-effective and reasonable best management practices for non-point sources.

(C) Tier 3: Where high quality waters constitute an outstanding resource of the Reservation, such as waters of National, and Tribal Wild & Scenic Areas, wildlife refuges and waters of exceptional recreational, ecological, cultural or religious significance, that water quality shall be maintained and protected. Such waters may be classified as "Outstanding Resource Waters of the Reservation".

9.15.3 Application of the Antidegradation Policy

The policy describes the intent and focus of the Environmental Quality Commission in applying water quality standards to new or modified sources and anthropogenic activities that may adversely affect water quality or beneficial uses. The policy outlines a review process to be completed before ODEQ may assign additional assimilative capacity in Oregon waters to a new or modified source of pollution.

In applying the antidegradation policy to § 401 certification, the proposed operating conditions of the hydroelectric project are evaluated to determine whether there is reasonable assurance no degradation of existing water quality will occur unless the identified degradation complies with the Antidegradation Policy.

The antidegradation policy, which is part of Oregon's water quality standards, requires that existing high quality waters where quality exceeds the levels necessary to protect fish, shellfish, wildlife, and recreation shall be maintained and protected unless the Environmental Quality Commission chooses to allow lowered water quality for justifiable reasons, or unless the director allows lower water quality on a short-term basis to respond to emergencies or otherwise protect public health and welfare. This section, in conjunction with other provisions of the water quality standards contained in Sections (1) and (2) of OAR 340-041-0565, are intended to assure that water quality is not changed so as to impair recognized beneficial uses of the water.

The Department has traditionally interpreted the antidegradation policy to allow approval of new discharges or activities that may have some theoretical or detectable impact on high quality waters provided that:

1. Adverse impact on water quality will not be significant,

2. Any change in water quality will not adversely affect recognized beneficial uses, and

3. Highest and best practicable treatment and control of waste discharges and activities are employed to minimize any adverse effects on water quality.

Under ordinary circumstances, compliance with the water quality standards in OAR 340-041-0565 would be considered sufficient to assure that beneficial uses will be protected. However, if a standard has not been adopted for a pollutant parameter of concern, or if new information indicates that an existing standard is not adequate to prevent adverse water quality impact on a beneficial use in the particular situation, the Department is required to impose more stringent water quality

protection measures to protect recognized beneficial uses, including denial of project approval if necessary.

9.15.4 Joint Applicants' Description of Present Conditions

Present conditions with respect to the various State and Tribal water quality standards have been provided in the previous sections. The present condition forms the basis for comparison for evaluating proposed future operations with respect to antidegradation.

9.15.5 Joint Applicants' Position

It is the Joint Applicants' position that the State and Tribal antidegradation policy will not be violated by the continued operation of the Project when selective water withdrawal is implemented. As a result, the Joint Applicants believe that they will have provided reasonable assurance that the Project will comply with all relevant water quality standards. It may prove, however, that ODEQ and the WCB will have to resort to the antidegradation policy to resolve any isolated or transient impacts on water quality that might result from the PMEs that are ultimately implemented.

Specifically, as discussed below, modeling of the impacts of Blend 13 indicate an improvement of all parameters of water quality with the possible exception of pH, which may be slightly increased during the summer, and temperature, which may increase slightly over existing conditions during a similar period. However, as discussed below, the change in temperature represents a return to pre-Project conditions, and so should not be construed as a violation of the antidegradation policy.

9.15.5.1 Joint Applicants' Conclusion

With the implementation of the PMEs they have proposed, the Joint Applicants believe that water quality in and below the Project will be improved. As noted above, the shift in temperature back toward pre-Project conditions will cause an increase over existing conditions during the first half of the year; but as this represents a *reversal* of a Project impact, it should not be construed to constitute a violation of the antidegradation policy. Current modeling results indicate that DO levels will improve throughout the year. pH levels may increase slightly for brief periods of time, but these increases, if they occur, are not predicted to have any adverse impact on water quality or on compliance with other standards, particularly the biological criteria standard. As shown by the recently completed modeling of the lower river, the overall impact on water quality will be beneficial. Accordingly, the Joint Applicants believe that there will be a reasonable assurance that Project operations, coupled with the proposals for mitigation in the FJAA, will comply with the State and Tribal antidegradation policies.

9.15.6 Summary of Public Testimony

No public comment was received specific to this water quality standard.

9.15.7 ODEQ Evaluation

With the implementation of the protection, mitigation, and enhancement measures in the ODEQ findings sections of Section 9 of this report, ODEQ believes that there will be an overall improvement to water quality within the Project reservoirs and the lower Deschutes River.

However, there will be times of the year that temperature and pH may increase over existing conditions in the lower river. With respect to lower river temperature, this increase during spring and early summer represents a *reversal* of current Project impacts as opposed to Project-induced degradation. For pH, increases relative to current conditions are expected to be slight and brief. Relative to pre-Project, this marginal increase in pH, like temperature, is suspected to reflect a reversal in Project impact. The adaptive management and monitoring approach will allow tracking of water quality conditions and adjusting management as indicated to ensure compliance with water quality standards and the antidegradation policy.

9.15.8 ODEQ Finding

No additional conditions are needed to meet the antidegradation policy.

9.16 Naturally Occurring Quality Parameters – OAR 340-041-0565(3) and CTWS Ordinance 80, 432.020(1)(a) and CTWS Ordinance 80, 432.110

9.16.1 Applicable State Rule

OAR 340-041-0565(3) The applicable State rule for naturally occurring quality parameters is as follows:

> Where the naturally occurring quality parameters of waters of the Deschutes Basin are outside the numerical limits of the above assigned water quality standards, the naturally occurring water quality shall be the standard. However, in such cases special restrictions, described in OAR 340-041-0026(3)(a)(C)(iii), apply to discharges that affect dissolved oxygen.

9.16.2 Applicable Tribal Rule

CTWS Ordinance 80, 432.100(3) The applicable Tribal rule for naturally occurring quality parameters is as follows:

> Where the naturally occurring quality parameters of waters of the Deschutes, Clackamas, and Santiam River Basins on the Reservation are outside the numerical limits of the above assigned water quality standards, the natural background water quality shall be the standard. Where no historical or background data exists, data collection and analyses for a 10-year period will be used to determine the standard. Data from an appropriate reference site, which reflects the natural condition, may also be used for this purpose. The Tribes will establish interim standards on a site-specific basis according to section 432.110.

CTWS Ordinance 80, 432.110 Tribal regulatory requirements for establishing site specific criteria and criteria based on natural conditions is as follows:

(1) The Tribe may revise criteria on a Reservation-wide or waterbody-specific basis as needed to protect aquatic life and human health and other existing and designated uses and to increase the technical accuracy of the criteria being applied:

(a) Whenever the natural conditions of the surface waters of the Tribes are of a lower quality than criteria assigned, the Tribe may determine that the natural conditions shall constitute the water quality criteria.

(A) If the natural condition varies with time, the natural condition will be determined as the prevailing highest quality natural condition measured during an annual, seasonal, or shorter period of time prior to human caused influence.

(B) The Tribe may, at its discretion, determine a natural condition for one or more seasonal or shorter time periods to reflect variable ambient conditions.

(C) Historical data or data from an appropriate reference site, that represents natural condition, may be used to determine the criterion.

(2) Any modifications to the criteria in Table 3 will be adopted in regulation.

(3) The Tribe shall formally adopt any revised criteria following public review and comment.

(4) Revised criteria will be submitted to EPA, after adoption by the Tribe, for review along with any information that will aid EPA to determine the adequacy of the scientific basis of the revised criteria.

9.16.3 Application of Naturally Occurring Quality Parameters

Naturally occurring conditions, such as geothermal springs, can cause ambient surface water quality to exceed certain standards. In such cases, as determined by ODEQ considering sufficient, scientifically valid study, the Department may adopt site specific criteria reflective of naturally occurring conditions for a given waterbody. The Department may adopt site specific criteria reflective of naturally occurring conditions for a given waterbody if it determines, via review of sufficient, scientifically valid studies, that the conditions are, indeed, naturally occurring. Before ODEQ can apply these exception criteria, ODEQ must go through a formal rule adoption process including opportunity for public comment, and adoption of the criteria by the EQC. Following approval by EQC, the criteria are then submitted to EPA for consideration and potential approval or rejection.

9.16.4 Joint Applicants' Description of Present Condition

Temperature, DO, pH, and biological productivity are interconnected through the physical and chemical processes that operate in aquatic systems. The results of these processes differ in lakes and rivers. In rivers, solar insolation and turbulent mixing tends to warm the entire river as it travels. Consequently, the temperature gradient in a river is along the length of the river, with relatively little change with depth. The constant mixing of the river through turbulent flow results in a close interaction of the water with the atmosphere, leading to short-term fluctuations in temperature on a daily and weekly basis. In the Deschutes River, this daily fluctuation can be as much as 2°C.

The degree of warming of a river depends on the ambient air temperature and the amount of sunlight. Rivers flowing through desert areas with hot days and little shading from riparian

vegetation will be warmer than rivers flowing through heavily forested mountain valleys. This is evident in the Deschutes Basin, where the tributary streams flowing into Lake Billy Chinook all exceed 10°C for the better part of the summer before reaching the reservoir. Temperature modeling in the Deschutes River below the Project (Huntington et al. 1999) suggests that the river leaving the Project is cooler during most of the summer than it would be if the Project were not there. Rapid warming of the Deschutes River can occur below the Project because the river is wide, relatively shallow, and has little riparian vegetation capable of shading a significant portion of the stream. Limited historical photographic evidence (Minear 1999) indicates that riparian vegetation along the lower Deschutes River was not a significant source of shade in the past.

In lakes, turbulent mixing due to flow is absent, so sunlight and wind mixing lead to warming only at the surface. As the surface warms, a density gradient develops because warm water is less dense than cooler water. Wind energy can overcome the density gradient to some extent, but eventually, in a deep enough lake, the density gradient becomes stable resulting in a wind-mixed, warm surface layer of uniform temperature separated from a cool bottom layer by a region of rapid temperature change with depth called the thermocline. The thermocline isolates the deep layer (hypolimnion) from the atmosphere and prevents further warming or the exchange of oxygen. In Lake Billy Chinook and Lake Simtustus stratification occurs with the epilimnion (surface layer) reaching temperatures of 20°C or greater while the hypolimnion remains below 15°C. Stratification of this nature is natural and common in lakes in temperate regions (Wetzel 1983).

A consequence of thermal isolation of the hypolimnion is that oxidative processes, such as bacterial respiration, that occur in the depths of the lake consume oxygen that cannot be replaced as long as the lake is stratified. In productive lakes, this can result in depletion of the oxygen in the hypolimnion. In extreme cases, DO concentrations in the hypolimnion can go to zero (Wetzel 1983).

The factors that determine how severe the oxygen depletion might be include the temperature of the hypolimnion, the volume of the hypolimnion relative to the epilimnion, and the productivity of the lake. Lakes with high productivity, warmer water, and a small hypolimnion are most susceptible to severe oxygen depletion. Lake Billy Chinook has a cool hypolimnion with a large volume relative to the epilimnion, but it is very productive, so some degree of oxygen depletion in the hypolimnion is to be expected.

During the period of stratification in Lake Billy Chinook, the rivers entering the reservoir are cooler than the water of the epilimnion. Because they are cooler, and therefore denser, they tend to flow under the epilimnion to find a depth where they match the density of the water in the reservoir. Ordinarily, such interflows rapidly lose momentum and mix with the surrounding layers of water (Thornton et al. 1990), but in Lake Billy Chinook withdrawal of water at depth for power generation permits the interflow to maintain its momentum and flow into, and perhaps through, the hypolimnion. This results in delivery of well-oxygenated water to the hypolimnion, tends to counteract the effects of oxidative processes, and keeps the DO in the hypolimnion at a higher concentration than might otherwise be the case (Ford 1990).

Stratification of the lake also serves to restrict photosynthetic activity to the well-mixed surface layer or epilimnion. Algae consume carbon dioxide and release oxygen when they are

photosynthesizing. By depleting the carbon dioxide in the water, the algae shift the equilibrium point of dissolved inorganic carbon compounds, and consequently raise the pH (Stumm and Morgan 1981). This effect was observed in Lake Billy Chinook, Lake Simtustus, and the lower Deschutes River during studies in 1994 through 1997 and is probably the cause of high pH values recorded in the tributary streams by ODEQ (§ 401 Application Table 7.3-1) and by the Joint Applicants.

The force driving productivity in the reservoirs of the Project and in the Deschutes River below the Project is the abundance of nutrients in the tributary streams, particularly phosphorus. The level of phosphorus in Lake Billy Chinook and Lake Simtustus would put them in the category of highly productive (eutrophic) lakes (Raymond et al. 1997). Eutrophic lakes and reservoirs are typical for Oregon east of the Cascades. The median value for total phosphorus measured in Lake Billy Chinook during the 1994-1996 limnology study was 0.060 mg/L. The median value for total phosphorus in 19 lakes outside the high Cascades in Deschutes, Crook, and Jefferson counties reported in *The Atlas of Oregon Lakes* (Johnson et al. 1985) was 0.053 mg/L. When the Cascade lakes are included, the median is 0.024 mg/L, a value still in the range of eutrophic lakes.

The aquatic biota living in the lakes and rivers of the Project appear to be successful. Lake Billy Chinook has abundant kokanee that support a popular recreational fishery and a robust population of bull trout that spawn in the Metolius River. Rainbow trout and smallmouth bass are also present in the reservoir, and crayfish are abundant enough to support a commercial fishery. Kokanee are found in greatest abundance in Lake Billy Chinook at depths between 15 to 60 m (Thiesfeld et al. 1999). In this region, DO typically remains above 8.0 mg/L, pH is typically below 8.0, and temperature ranges between 7.0°C and 16°C. Bull trout adults typically leave the reservoir by early June to spawn in the Metolius River. Bull trout fry and young stay in the tributary streams and move into the lake as subadults, where they remain until ready to spawn. The Deschutes River below the Project is well known for its abundant rainbow and steelhead trout.

9.16.5 Joint Applicants' Position

Water temperatures in excess of the current bull trout standard occur upstream of Lake Billy Chinook in the upper Deschutes River, Crooked River, and Metolius River sub-basins. The Metolius River is so little affected by anthropogenic activity that temperatures in excess of the standard in all likelihood occur naturally. Likewise, temperatures in the lower Deschutes River exceed the relevant standard even during summer, when water discharged from the Project is colder than would occur in the absence of the dams. Therefore, it is likely that natural conditions in the absence of the Project would lead to more frequent or more severe exceedance of the standard. It appears that temperatures in the streams of the Deschutes River Basin naturally exceed the standards that have been applied.

Water temperatures in Lake Billy Chinook and Lake Simtustus follow a pattern that is typical of lakes in Oregon (Johnson et al. 1985). Most lakes east of the crest of the Cascades achieve temperatures in excess of 20°C near the surface during the summer, while maintaining temperatures near 8°C or 10°C near the bottom when stratified. Because the water entering Lake Billy Chinook has a hydraulic residence time of approximately 2 months, and the tributary streams exceed 10°C for nearly this long during the summer, it is not likely that the temperature

in the reservoir could remain below 10°C. Lake Simtustus receives nearly all of its inflow from Lake Billy Chinook, so it, too, is unlikely to remain below 10°C.

Dissolved oxygen concentration in the hypolimnion of Lake Billy Chinook and Lake Simtustus follows a pattern that is typical of highly productive lakes. Biological oxidation of organic matter in the hypolimnion during the period of stratification results in depletion of oxygen. In many productive lakes, DO concentration in the hypolimnion can approach zero. In Lake Billy Chinook, however, this extreme condition is avoided because oxygen-containing water from the tributaries flows into the hypolimnion and provides a source of oxygen. In Lake Simtustus, the flow into the hypolimnion comes from the relatively well aerated mid-depths of Lake Billy Chinook.

The pattern of pH seen in the Project reservoirs and in the Deschutes River below the Project is, like the DO pattern in the reservoirs, a function of the high productivity of the waterbodies. Intense photosynthetic activity results in elevated pH levels in the water. This occurs in the reservoirs, in the lower Deschutes River, and in the Deschutes and Crooked rivers above the Project. It is a natural consequence of the relatively high nutrient concentration in the waters of the Project.

The Metolius River, flowing through a largely undisturbed watershed, may be representative of the natural nutrient conditions of the steams flowing into the Project reservoirs. The Metolius River is low in nitrogen and relatively high in phosphorus. The Deschutes and Crooked rivers have similar phosphorus concentrations but higher nitrogen concentrations, suggesting that they are being artificially enriched in nitrogen. The resulting high nutrient concentrations support the profuse algal production, which results in the patterns of DO and pH seen in the Project reservoirs and in the lower Deschutes River. Dense algal blooms would occur even in the absence of nitrogen enrichment because species of cyanobacteria (blue-green algae) present in Lake Billy Chinook are capable of meeting their nitrogen needs from the atmosphere in the presence of sufficient phosphorus. It is unlikely that phosphorus input could be reduced sufficiently to limit the growth of phytoplankton because of the naturally high concentration in the inflowing streams.

9.16.6 Summary of Public Testimony

No public comment was received specific to this water quality standard.

9.16.7 ODEQ Evaluation

The Joint Applicants have provided some compelling arguments for consideration of development of site specific criteria for naturally occurring quality parameters. ODEQ feels a stronger case can be made for temperature than for dissolved oxygen and pH.

With respect to temperature, ODEQ concurs that the temperatures of waters entering the Project from the Metolius River enter from a watershed that likely has little anthropogenic impact related to stream warming. The Metolius provides approximately 40% of the summertime flow to Lake Billy Chinook and generally exceeds the 50°F criterion for a couple of months each summer. Similarly, the proportionately large spring inputs that enter the Crooked and Deschutes Rivers just upstream of their inflow to Lake Billy Chinook measure approximately 53°F year-round.

Considering climate, solar exposure, soil types, stream gradients, distance of travel, and other factors that contribute to stream warming, one might expect that the summertime surface water components of the Crooked and Deschutes Rivers would be at least as warm as that entering from the Metolius, even after correcting for the many anthropogenic impacts contributing to warming in these two watersheds. Thus, a case could perhaps be developed for a seasonally-adjusted bull trout criterion, reflective of some determined natural condition, for portions of the Metolius River, the Project Reservoirs, and Deschutes River below the Project.

With respect to depressed dissolved oxygen and elevated pH levels experienced within the reservoirs, ODEQ views this as a product of primarily natural processes acting in an unnatural environment. The dissolved oxygen and pH levels within the reservoirs are a function of both natural and anthropogenic impacts occurring in the upper basin as well as primarily natural processes occurring in the man-made reservoirs. Although the natural processes occurring within the reservoirs are similar to that which occurs in natural lakes, they are reflective of an altered environment that is quasi-lentic as opposed to riverine. The impounded nature of the water must be considered when determining whether or not a quality parameter is naturally occurring or not. The relatively long-term residence and stratified nature of waters impounded behind the dams, as opposed to relatively quick, well-mixed movement through a free-flowing riverine environment, provides conditions for elevated temperatures and concentration of nutrients within the photic zone of reservoir epilimnions. This in turn results in an altered environment conducive to elevated primary production and decay and altered dissolved oxygen and pH concentrations.

Of primary concern regarding ODEQ's evaluation of naturally occurring conditions is whether or not alternate standard criteria may be considered for compliance, presently or in the future. With respect to the present, the necessary regulatory process of adopting site specific standards reflective of natural conditions has not taken place. Thus, determination of current compliance must be made based upon the existing criteria of OAR 340-041. However, ODEQ recognizes that over a length-of-license period of 30 to 50 years, criteria applicable today may be modified via ODEQ's formal processes of water quality standards triennial review or site specific criteria adoption. The adaptive management approach to certification provides the means to address future changes in applicable criteria to address naturally occurring conditions.

9.16.8 ODEQ Finding

No additional conditions, aside from those already identified in Section 9, are needed to address naturally occurring quality parameters.

10. PUBLIC TESTIMONY NOT SPECIFIC TO WATER QUALITY STANDARDS

The following public comments, not necessarily specific to water quality standards, were provided during the public comment period. Following the summary of comments are ODEQ's evaluation and findings regarding the comments.

10.1 Summary of Public Testimony

Joint Applicants:

JA-7. The 401 certificate provision reserving ODEQ right to modify the conditions of the certificate goes beyond that which has been preliminarily agreed upon between the Joint Applicants and ODEQ. The Joint Applicants note that FERC does not concede that § 401 permits such reservation of authority, and concur with this position. As noted in Section 3(f) of the draft Adaptive Management Agreement, the Joint Applicants do not waive any right to oppose any such actions by ODEQ or to seek administrative or judicial review of any such actions before state or federal administrative agencies or courts.

Conservation Groups:

CG-3. The 401 certificate should not limit possible structural modifications to the SWW. While the proposed 401 certificate provides that ODEQ may require modified operations of the SWW, it appears that ODEQ's ability to require structural modifications of the SWW are precluded in instances of capital expenditure. Considering the considerable term of FERC license, and considering additional water quality options necessary to address future TMDLs for the Deschutes River, this limitation on structural modification should be removed.

10.2 ODEQ Evaluation

ODEQ's ability to modify conditions of a 401 certificate to assure protection of water quality and beneficial uses are protected by law under 33 USC 1341 and OAR 340-48. ODEQ has *not* made a preliminary agreement to relinquish this legal right and responsibility. However, ODEQ has identified that aside from this specific condition related certification modification (401 Certification Condition L), that the Department is reasonably assured that Project will comply with water quality standards and beneficial use protection given that the Joint Applicants meet the 401 certification conditions that have been proposed at this time. The 401 certificate includes adaptive management conditions that are self-executing in that they neither require that the 401 certification be reopened nor the FERC license be reopened to affect change in Project management. The 401 certificate includes self-executing conditions to allow modification of Project management to address future TMDLs. ODEQ has come to preliminary agreement with the Joint Applicants regarding certain types of actions, however, that would not be self-executing under the proposed 401 certification and for which the Joint Applicants does not waive any right to oppose or seek review of said actions as provided for under the proposed 401 Implementation Agreement (Adaptive Management Agreement) Section 3(f). For instance, ODEQ is willing, at this time, to approve a certification that limits the Department's ability to require the Joint Applicants to make capital expenditures to structurally modify the SWW after it has been constructed and determined to be operational. Based upon the Department's current knowledge and proposed Project conditions, the Department is reasonably assured of water quality

compliance and beneficial use support without including in the 401 certificate self-executing conditions for modifications outside the preliminarily agreed upon limitations laid out in the proposed WQMMP Section 1.1.

10.3 ODEQ Finding

ODEQ will maintain Condition L in the 401 certification pertaining to modification of certification or FERC license conditions. ODEQ also intends to approve the WQMMP inclusive of the limitations provided for under Section 1.1 of the WQMMP and the Adaptive Management Agreement inclusive of General Stipulations and Reservations Condition 3(f).

11. EVALUATION OF COMPLIANCE WITH SECTIONS 301, 302, 303, 306, AND 307 OF THE CLEAN WATER ACT

In order to certify a project pursuant to § 401 of the federal Clean Water Act, the Department must find that the project complies with Sections 301, 302, 303, 306, and 307 of the Act and state regulations adopted to implement these sections.

Sections 301, 302, 306, and 307 of the federal Clean Water Act deal with effluent limitations, water quality related effluent limitations, national standards of performance for new sources, and toxic and pretreatment standards. All of these requirements relate to point source discharges and are the foundation for conditions to be incorporated in National Pollutant Discharge Elimination System (NPDES) permits issued to the point sources. Point source discharges at hydroelectric projects may include cooling water discharges, discharges from hatchery operations, and sewage discharges. The wastewater discharges (effluents) from both the Round Butte and Pelton Fish Ladder Hatcheries are covered by ODEQ-issued NPDES permits issued to ODFW (300J General Permits; Files 64535 and 105919, respectively). Because all sewage discharges from the dam powerhouses and at applicant-owned recreational facilities discharge to on-site wastewater facilities as opposed to discharge to surface waters, they do not require NPDES permitting.

The generator and turbine systems at the Project's three powerhouses require water for cooling, and this cooling water is subsequently discharged to the downstream tailraces. The Clean Water Act requires the permitting of cooling water discharges. ODEQ has developed a general NPDES permit that covers cooling and sump water discharges of hydroelectric projects, NPDES General Permit 100J. The 100J permit provides for effluent limitations and restrictions related to warming (temperature), chlorine, pH, and biocides; and requires minimal monitoring and reporting requirements. Currently, none of the three hydroelectric facilities within Project is covered by NPDES permits for their cooling water discharges. PGE, in a letter dated March 30, 2000, provided calculations which indicate that the quantity and temperature of cooling waters being discharged to the dam tailraces results in de minimus warming to the Deschutes River, and requested that NPDES not be required. ODEQ concurs that, based upon the calculations provided, that the thermal impact to Deschutes River associated with the cooling water discharges would be minimal. However, such a discharge still requires an NPDES permit in accordance with CWA Sections 301 and 302. Requirement of 100J NPDES permits for these discharges will provide ODEQ with regulatory oversight, via review of permit-required monitoring data, to ensure that continued discharge of cooling waters meet permit restrictions and limitations related to warming, chlorine, pH and biocides. Thus, a condition will be included in the certification that the Joint Applicants immediately file applications for the cooling water discharges at the three powerhouses. This condition could be removed from the proposed certification if the Joint Applicants apply for these permits prior to ODEQ taking action to issue the certification.

There are no other known or planned point source discharges at the Project that require NPDES permitting.

Section 303 of the Act relates to Water Quality Standards and Implementation Plans. The federal Environmental Protection Agency (EPA) has adopted regulations to implement Section 303 of the Act. The EQC has adopted water quality standards consistent with the requirements of Section 303 and the applicable EPA rules. The EQC standards are codified in Oregon Administrative Rules Chapter 340, Division 41. The Environmental Protection Agency has approved the Oregon standards pursuant to the requirements of Section 303 of the Act. Therefore, the applicant's Project must comply with Oregon Water Quality Standards and TMDLs to qualify for certification. Section 9 of this evaluation and findings report

detailed the conditions considered necessary by ODEQ to ensure compliance with water quality standards and TMDLs.

Section 306 of the CWA provides that new sources of pollutant discharge meet particular standards of performance for the control and reduction of pollutants being discharged. The Project is not a new source.

Section 307 of the CWA provides that dischargers of toxic pollutants meet certain pretreatment and effluent requirements. If the Project's limited cooling water discharges contain chlorine or biocides, their use would be restricted and or limited by ODEQ's NPDES permit for cooling water discharges, providing compliance with § 307. As per the findings in Section 9.10.8, the proposed § 401 certification will contain conditions that the Joint Applicants implement spill plans to guard against potential spills of toxic substances and provide for their immediate cleanup. ODEQ is not aware of any other toxic pollutant discharges from the Project.

11.1 ODEQ Finding

ODEQ is reasonably assured that operation of the Project will comply with Sections 301, 302, 303, 304, and 306 of the CWA if the Joint Applicants meet the conditions provided for in the findings subsections of Section 9 of this evaluation and findings report and apply for NPDES permits for the cooling water discharges from the three powerhouses.

12. EVALUATION OF WATER QUALITY-RELATED REQUIREMENTS OF STATE LAW

With the above discussion and a determination that the proposed Project can qualify for § 401 certification, it remains to be determined what additional conditions are appropriate in a certificate to assure compliance with water quality related requirements of state law.

The Department has reviewed the information in the record and the requirements of the state laws to determine the water quality related requirements that may be considered potentially applicable to the proposed Project. In determining whether particular requirements may be water quality related, the Department has relied on the following considerations:

a. The statute, or rules promulgated pursuant to the statute, contain explicit reference to water quality and are applicable to the proposed Project.

b. The statute, or rules promulgated pursuant to the statute, address factors that are necessary for maintenance of water quality in conjunction with the proposed Project, or for evaluation of water quality impacts of the proposed Project.

c. The statute, or rules promulgated pursuant to the statute, authorize, require, or control actions or activities that may, in conjunction with the proposed Project, be reasonably expected to impact water quality.

Based on these criteria, the Department has identified the following as potential water quality related requirements of state law.

12.1 Laws Administered by the Division of State Lands

ORS 541.605-695 requires that permits be obtained from the Division of State Lands prior to any fill and removal of material from the bed or banks of any stream. Such permits, when issued, may be expected to contain conditions to assure protection of water quality so as to protect fish and aquatic habitat.

12.2 Laws Administered by the Department of Fish and Wildlife

ORS 496.435 addresses restoration of native stocks of salmon and trout to historic levels of abundance.

OAR 635-007-510 prevents serious depletion of any indigenous fish species through protection of native ecological communities.

OAR 635-007-523 requires support of habitat protection and restoration on private and public lands.

OAR 635-500-020 requires protection and restoration of steelhead spawning and rearing habitat.

OAR 635-500-120 requires protection, restoration, and enhancement of trout habitat.

12.3 Laws Administered by the Department of Land Conservation and Development

ORS Chapter 197 contains provisions of state law requiring the development and acknowledgement of comprehensive land use plans. This chapter also requires state agency actions to be consistent with acknowledged local land use plans and implementing ordinances.

12.4 Laws Administered by the Department of Environmental Quality

ORS 454.705 et. seq. and OAR Chapter 340, Divisions 71 and 73 contain requirements that govern on-site disposal of sewage. The purpose of such rules is to prevent health hazards and protect the quality of surface water and groundwater. ODEQ contracts with local governments to administer the program pursuant to state rules.

ORS 466.605 et. seq. and ORS 468.780-815 establish requirements for reporting and cleanup of spills of petroleum products and hazardous materials. ORS 468.742 requires submittal of plans and specifications for water pollution control facilities to ODEQ for review and approval prior to construction. One of the purposes of these statutes, and rules promulgated pursuant thereto, is to prevent contamination of surface or groundwater.

12.5 Laws Administered by the Department of Water Resources

ORS 468B.040(2) requires ODEQ to determine whether certification is consistent with standards established in ORS 543A.025(2) to (4). Applicable standards under ORS 543A.025 (2)-(4) include (a) mitigation, restoration, or rehabilitation of impacts to fish and wildlife resources, (b) non-endangerment of public health and safety, (c) protection, maintenance, or enhancement of wetland resources, and (d) protection, maintenance, or enhancement of other resources. Most of these standards are to be implemented by OWRD in concert with the state HART when reauthorizing state water rights for a hydroelectric project. Based on OWRD's and ODFW's review of the proposed § 401 certification, ODEQ finds that certification of the Project is consistent with the standards set forth under ORS 543A.025.

12.6 ODEQ Finding

The Department has requested that the § 401 certification documents, including the above list of water quality related requirements of state law, be reviewed by other agencies participating on the hydroelectric application review team (HART). ODEQ has requested that these agencies identify any potential inconsistencies posed by the proposed § 401 conditions and identify any other water quality related requirements of state law that should be considered by the Department in its decision to certify the Project. Additionally, as provided by CWA § 401(d), and as considered appropriate by ODEQ, the Department may include additional § 401 certification conditions that relate to other water-quality-related requirements of state law aside from those deemed necessary to protect water quality standards.

In addition to this state agency review of the § 401 certification documents, the Jefferson County Planning Department has provided a Land Use Compatibility Statement indicating Project consistency with local land use planning and implementation ordinances.

Pursuant to 33 USC 1341(d) and OAR 340-048-0025, ODEQ has included conditions in the proposed § 401 certification that are consistent with other requirements of state law that are water quality related.

13. 401 IMPLEMENTATION AGREEMENT

Many of the ODEQ reasonable assurance findings in this *Evaluation and Findings Report* are premised on adaptive management and the ability of the Joint Applicants and ODEQ to modify Project operations in response to monitoring results and other new information during the term of the new FERC license. That license term is set by FERC and can range from 30 to 50 years. Further, TMDLs for various water quality parameters are scheduled to be adopted and will require implementation on waters affected by the Project. To provide further assurance that adaptive management and TMDL requirements will be reliable and enforceable in the context of a new FERC license, ODEQ and the Joint Applicants have developed and will enter a § 401 Implementation Agreement concurrent with issuance of a § 401 certification. This agreement will serve two purposes: (1) addressing ODEQ's role and the Joint Applicants' commitments regarding adaptive management measures required by the § 401 certification conditions; and (2) providing ODEQ and the public further reasonable assurance that the Project as proposed to be relicensed will comply with water quality standards.

14. CONCLUSIONS AND RECOMMENDATIONS FOR CERTIFICATION

The Department has evaluated the Joint Applicants' Project proposal for compliance with CWA Sections 301, 302, 303, 304, and 306, including the applicable provisions of Oregon Administrative Rules, Chapter 340, Division 41, and the specific provisions for the Deschutes Basin set forth in Sections 340-041-0562 and 340-041-0565 of Division 41. Section 340-041-0562 lists the beneficial water uses to be protected in the Deschutes Basin and Section 340-041-0565 describes the water quality standards to be met for the protection of those identified uses.

Based on the preceding analysis and findings, it is recommended that, pursuant to § 401 of the Federal Clean Water Act and ORS 468B.040, the Director conditionally approve the application for certification of the Pelton Round Butte Hydroelectric Project consistent with the findings of this document.

15. REFERENCES

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