February 2026

Pelton Round Butte Hydroelectric Project

Staff Report to Management - DRAFT

DEQ

This document was prepared by the Oregon Department of Environmental Quality, or DEQ, solely for internal discussion and review of the Department. This report was drafted by DEQ staff to inform management in response to inquiries received from members of the public and interested parties about water quality management under the Clean Water Act 401 water quality certification issued by DEQ for the Pelton Round Butte, or PRB, Hydroelectric Project. DEQ staff's assessment of the PRB's WQC is ongoing, and recommendations contained in the report do not represent final conclusions as to PGE's compliance with the certificate conditions or water quality standards generally. This draft may be revised by DEQ in the future as directed by management and as conditions warrant.

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Executive summary

The Pelton Round Butte Project, a series of three hydroelectric developments on the Deschutes River, in Jefferson County, is co-owned by the Portland General Electric Company, or PGE, and the Confederated Tribes of the Warm Springs Reservation, or CTWS, of Oregon. In June 2002, the Oregon Department of Environmental Quality issued a water quality certification, or WQC, for the hydroelectric project. In July 2004, CTWS, PGE, and 20 other parties, including state, federal, and tribal agencies, local parties, and non-governmental organizations, signed a settlement agreement that provided for the relicensing of the Pelton Round Butte Hydroelectric Project. In 2005, the Federal Energy Regulatory Commission, or FERC, issued PGE and CTWS, together called the licensees, a 50-year license for the project.

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The 2005 FERC license includes the Clean Water Act section 401 certifications from DEQ and the CTWS Water Control Board, or WCB, both issued in 2002. The certifications required the licensees to revise the initial Water Quality Management and Monitoring Plan, or WQMMP, that would state the applicable water-quality standards, their application to project operations, and the measures and monitoring used to provide reasonable assurance of compliance with the standards. The WQMMP was revised soon after DEQ issued the WQC, with input from parties of the settlement agreement, and approved by DEQ and the WCB in July 2004. Upon DEQ approval, the WQMMP became a part of the WQC for the project for the purposes of any federal license.

At the time the revised WQMMP was finalized in 2004, DEQ had recently adopted new water quality standards for temperature (Environmental Protection Agency approved in March of 2004). These standards included, for the first time, thorough designations of fish use and spawning periods for salmon and steelhead trout. As a result of the standards revision, the bull trout temperature criteria were no longer applied to the Deschutes River below the project and, consequently, the applicable temperature criteria for the project increased and the non-spawning dissolved oxygen criteria decreased. There was also no longer a year-round spawning criterion in effect for dissolved oxygen.

Fish passage was a major resource issue associated with the project during relicensing. Construction of the dams eliminated important historic migratory pathways, preventing upstream and downstream movement of anadromous and resident species. In addition, water could only be released from the project by means of a

discharge gate near the bottom of the dam. This caused an unnaturally cold temperature regime in the lower river and resulted in delayed seasonal warming, shifting peak seasonal temperatures to late summer/early fall. Fish passage and water quality in the lower river were of high importance to the Settlement Working Group and a key focus in FERC relicensing. As a result, the license and WQCs required construction and operation of a Selective Water Withdrawal, or SWW, facility to provide fish passage and improve control over water quality and temperatures leaving the project.

The SWW became operational in 2010 and allowed for a mixing of surface and bottom water to aim for a more natural thermal pattern below the project if the dams were not present. This operational change reverted the artificial thermal regime that had been in place on the Lower Deschutes River for over 50 years to a pattern that minimized impacts from the project. The change in spring temperatures has also been of interest to those regularly recreating and fishing in the lower river and continues to be a subject of attention and discussion by interested parties. The licensees and other groups continue to research both the intended and unintended effects of SWW operation in the lower river. The SWW is operated according to adaptive management outlined in the WQMMP to support all beneficial uses of waters, including at times balancing needs for fish passage and competing water quality targets. DEQ and other parties of the settlement agreement continue to oversee operations at the project through participation as members of several technical oversight committees.

DEQ and PGE, in consultation with CTWS, began discussing possible benefits to updating the WQMMP in mid-2020. This would require modification to DEQ's 401 WQC and coordination with CTWS and FERC for a license amendment because the WQMMP is a component of both certifications and outlines Project management to meet applicable standards for both regulatory entities. Modification of the WQC would allow for an update to DEQ's current water quality standards for temperature and dissolved oxygen below the project. Noted above, currently applicable standards protecting beneficial uses include both higher temperature and lower dissolved oxygen criteria than those used in the existing WQC evaluation and have not become more stringent since issuance of the 2002 WQC. DEQ and CTWS have coordinated in the past related to water quality standard revisions. DEQ's most recent revisions to standards in the Deschutes River Basin were completed in 2023 and await federal approval by the EPA. The CTWS are currently working through procedures to revise water quality standards applicable to the Deschutes River.

DEQ currently plans to wait to modify their WQC for the project for the purpose of including revised criteria for reasons including those listed above, and to wait until such a time that both certifying authorities have completed updates to water quality standards applicable to the project. The decision at this time, however, does not preclude DEQ from choosing to modify Oregon's WQC for the project in the future if other water quality regulations or requirements are updated, project activities or waterbody conditions change significantly, or conditions are violated. DEQ's oversight and assessment of WQC implementation at the project is ongoing. DEQ will continue to work with CTWS, the licensees, and technical committees on overseeing project operations, and in using adaptive management provisions in the existing WQMMP to make continued refinement in meeting water quality targets in the Deschutes River system. These pathways allow the licensees and other project partners to use new research and modeling to continue adapting blending at the SWW to improve water quality management.

Table of contents

Introduction

The following report was drafted by DEQ staff to inform management in response to inquiries received from members of the public and interested parties about water quality management under the Clean Water Act (CWA) 401 water quality certification (WQC) for the Pelton Round Butte Hydroelectric Project (Project). DEQ maintains oversight of Portland General Electric (PGE) and the Confederated Tribes of the Warm Springs (CTWS) implementation of the 2002 WQC for the Project, which remains in effect until such a time that a revised WQC may be issued. DEQ continues to receive monthly and annual water quality reports from PGE and the CTWS (Licensees) and communicates with Project staff, as needed, to provide input on management of operations to achieve water quality goals.

In the 2025 Water Quality Division workplan, DEQ committed to resuming discussions with the Licensees about water quality management under the existing DEQ-issued WQC and potential water quality-related issues that may be addressed by a WQC modification or other existing pathways. The scope of this evaluation is focused on water quality parameters directly linked to operations of the Selective Water Withdrawal (SWW), including temperature, dissolved oxygen (DO), pH, and nuisance phytoplankton. Each of these parameters has a management plan in the Project's Water Quality Management and Monitoring Plan (WQMMP) to guide operation of the SWW. DEQ's preliminary evaluation, findings, and planned next steps are described in the following sections of this draft report.

Background

The Pelton Round Butte (PRB) Project is located on the Deschutes River in Jefferson County, Oregon, and is jointly owned by PGE and the CTWS of Oregon. PGE and the CTWS Warm Springs Power Enterprises (WSPE) co-manage the project under the terms and conditions of the current hydropower license, issued by the Federal Energy Regulatory Commission (FERC) in 2005 (FERC Project Number P-2030).

Waters within the Project boundaries are under the jurisdictions of Oregon and the CTWS, each of whom are certifying authorities under Section 401 of the CWA. In 2002, DEQ and the CTWS each issued CWA Section 401 WQCs for the Project's FERC relicensing. Both WQCs were incorporated into the Project's 50-year FERC license, issued in 2005. The WQCs required the Licensees to develop a WQMMP describing operational activities necessary for implementation of the WQCs and adaptive management to ensure water quality requirements and goals continue to be achieved. Project operations must comply with conditions of both 401 certifications. Where requirements differ, the Licensees must comply with the more stringent applicable water quality standards or conditions.

During the relicensing process, 22 organizations and government agencies signed a Settlement Agreement (SA) to establish Project license implementation conditions, including resource management, environmental and habitat protections, and technical oversight of activities occurring within Project boundaries. The SA requires the Licensees to regularly convene multiple technical oversight committees composed of federal, state, and non-governmental organization (NGO) members with expertise in fisheries, water quality, and natural and recreational resources. DEQ is a participating member of the Fish Committee, Coordinating Committee, and Pelton Fund Governing Board. The SA and settlement workgroup discussions informed both 401 certification conditions and FERC license requirements. Restoring fish passage and reestablishing anadromous fish runs upstream of the Project were key objectives of the SA, WQCs, and FERC license. Construction of a Selective Water Withdrawal (SWW) Facility was agreed upon as the mechanism to address fish passage and improve control over water quality. The SWW allows for intake of surface and bottom water from the forebay of Lake Billy Chinook, creates surface flows for attraction and collection of migratory fish, and allows surface and bottom water blending to manage water quality in discharge from the Project.

Since its construction in 1964, only bottom water from Lake Billy Chinook could be released from Round Butte Dam. This caused artificial cooling of water downstream of the Project and delayed peak seasonal temperatures. The SWW became fully operational early in 2010 and allowed surface waters to be released to the lower river. Operational blending of surface and bottom water caused an intended shift in temperature patterns, allowing the thermal regime in the lower river to more closely resemble patterns that may be expected in the river system if the dams were not present.

DEQ updated water quality standards for Aquatic Life Uses applicable to the Lower Deschutes River in 2004, two years after issuing the WQC. These criteria were updated based on DEQ's first thorough designations of fish use and spawning periods for salmon and steelhead trout and resulted in higher year-round numeric temperature criteria and a lower dissolved oxygen criterion for part of the year in the lower river below the Project. More recently DEQ engaged in a triennial review of water quality standards that included updates to Aquatic Life Use locations and timing. As a result of the review some of Oregon's beneficial use designations were updated in specific locations, but ultimately no changes were proposed for fish use and timing in the Deschutes River. These updates were adopted by the EQC in late 2023 and await EPA approval. The CTWS are currently considering updates to their water quality standards applicable to the Lower Deschutes River.

The Lower Deschutes River below the Project is designated as a Wild and Scenic River and is a highly popular fishing and recreational area. Since the SWW began operating, interested parties have voiced concerns that water quality, and habitat conditions in the lower river have

deteriorated because of the increased amount of surface water blended into waters discharged from the Project. The Licensees funded a water quality study that ran from 2015 – 2017, to better understand current water quality conditions within and downstream of the Project and to evaluate possible effects of operations on water quality.

Between 2011 and 2020, PGE, CTWS, and DEQ entered into interim water quality agreements as an administrative framework to clarify Oregon's current water quality standards for management of the SWW and outline steps for coordination between CTWS, DEQ, and PGE while updates to water quality standards were under consideration. In 2016 litigation was initiated against the Licensees by the Deschutes River Alliance, alleging that Project operations were violating the Clean Water Act (*Deschutes River All. v. Portland Gen. Elec. Co., 331 F. Supp. 3d 1187 | D. Or., Judgment, Law, Casemine.Com*, n.d.) In 2018, the district court granted summary judgment in favor of the Licensees because undisputed evidence failed to establish that the Project operations were in violation of the relevant requirements in Oregon DEQ's Clean Water Act 401 WQC.

DEQ and PGE, in consultation with CTWS, began discussing possible benefits to updating the WQMMP in mid-2020. It is DEQ's position that this action would require a modification to DEQ's 401 WQC and coordination with FERC for a license amendment. No interim agreements have been formed since 2020, informed in part by the 2018 judicial opinion issued in the litigation proceeding and continued discussions between DEQ and the Licensees about potential needs or benefits to updating the WQMMP. In January 2023, further work on the modification evaluation was put on hold while DEQ and the CTWS separately considered changes to water quality standards in the Lower Deschutes River, compounded by staff turnover in DEQ's 401 hydropower program.

Project and Operations

The Project consists of a series of three developments located in sequence on the Deschutes River, in Jefferson County, Oregon. From upstream to downstream, the impoundments and dams include Lake Billy Chinook and Round Butte Dam, Lake Simtustus and Pelton Dam, and the Reregulating Reservoir and Reregulating Dam. The location of the Project, from Lake Billy Chinook to the Reregulating Dam, and major tributaries to the Deschutes River are shown in **Figure 1** (from Eilers and Vache 2021). The Project boundary includes about 8,300 acres of lands owned by the Licensees and NGOs, the CTWS, the US Fish and Wildlife Service (USFWS) and Bureau of Land Management (BLM), and the State of Oregon.

Round Butte Development

The 300-MW Round Butte Development is the largest within the Project, 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 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. The SWW was constructed at the Round Butte Development in the forebay of Lake Billy Chinook following FERC relicensing in 2005 to replace the original intake structure that drew water from the reservoir hypolimnion (about 246 ft below the surface). The SWW allows for intake of surface water (0-40 ft) and bottom water (~ 246 ft) that are blended prior to discharge and includes a fish collection and sorting facility to help meet the Project's major fish passage goals.

Lake Billy Chinook backs up into the Deschutes River, Crooked River, and Metolius River canyons. The reservoir waters extend from Round Butte Dam nine miles up the Deschutes River canyon, seven miles up the Crooked River canyon, and thirteen miles up the Metolius River canyon.

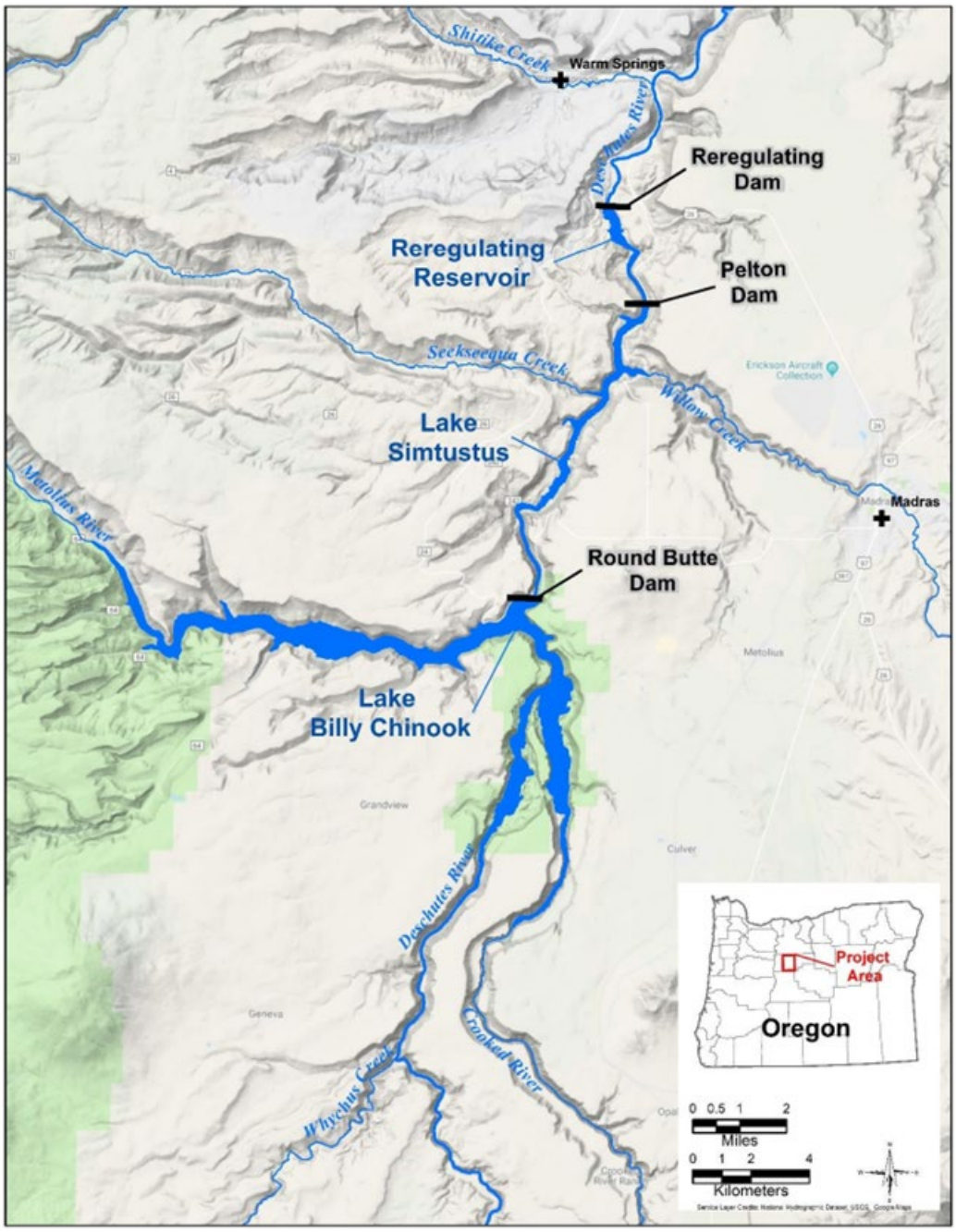

Figure 1. Location of the Pelton Round Butte Project (from Eilers and Vache, 2021).

Pelton Development

Pelton Dam, located at RM 103.4, is a 204-foot-high thin-arch variable radius reinforced concrete structure that impounds 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 up to the Round Butte Dam tailrace from Pelton Dam. 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.

Reregulating Development

The Reregulating dam was constructed in 1957 along with the Pelton Dam as part of the original Pelton Project. 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. There are four spillway gates measuring 14 feet high and 20 feet wide. 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.

Fish Passage and SWW Operations

Project dams act as a barrier to volitional upstream and downstream movement of anadromous and resident species. Construction of the Project blocked *Oncorhynchus tshawytscha* (Chinook), *Oncorhynchus mykiss* (steelhead), *Oncorhynchus nerka* (sockeye), and *Entosphenus tridentatus* (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 (State of Oregon, 2002). Prior to development of the Project dams in the 1950s and 60s, spring-run Chinook salmon and steelhead were known to spawn in the middle Deschutes and upstream waters; Pacific Lamprey were found within the middle Deschutes and Crooked River, along with documentation of fall Chinook in the area (Nehlsen, 1995). *Salvelinus confluentus* (bull trout) were passed above the Project annually during the early years of operation (Ratliff et al., 1996).

Ensuring continuation of anadromous fish runs was a primary concern for state, tribal, and federal fisheries agencies during construction of the Project dams. Under FERC's initial license for the Project, amended in 1960 to authorize construction and operation of the Round Butte Development, PGE anticipated managing fish passage by use of fish ladders and backup trap and haul methods (Oregon Department of Environmental Quality, 2002). By the mid-1960's, after a multi-agency steering committee determined that initial fish passage efforts were

unsuccessful (Ratliff & Schulz, 1999), PGE (as the initial licensee) began planning for mitigation of lost fish runs through fish hatchery operations for steelhead and spring Chinook.

During the settlement workgroup meetings to facilitate FERC relicensing, completed in 2004 and 2005 respectively, the fisheries agencies (NOAA Fisheries, USFWS, ODFW, and Warm Springs Bureau of Natural Resources) and other parties identified fish passage as the major resource issue associated with the Project. Construction and operation of the SWW facility became a centerpiece of the SA as a means of restoring fish passage (Settlement Agreement, Appendix A). Parties of the SA also determined that the Project Licensees must develop, fund and implement a Fish Passage Plan for effective upstream and downstream fish passage. The resulting plan includes a phased, 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. In coordination, DEQ's 2002 WQC also required the Licensees to construct and operate both a SWW facility (DEQ WQC Condition B) and facilities and equipment for fish migration, propagation or conservation consistent with the proposed Fish Passage Plan and amendments thereto (DEQ WQC Condition G.9).

As is typical in lakes and reservoirs, Lake Billy Chinook and Lake Simtustus thermally stratify, or separate into distinct layers based on differences in temperature, throughout warmer months. This commonly results in a gradient of physical and chemical characteristics from surface to bottom of the water column and distinct water quality differences between surface and bottom waters. The new SWW intake structure allows water withdrawal from both the surface (epilimnion) and the bottom (hypolimnion) of the reservoir. The SWW also creates surface flow attraction for smolt collection at Round Butte Dam. Fish passage is provided by the downstream migrant fish capture and transfer facilities at Round Butte Dam SWW/Fish Transfer Facility (FTF). The SWW was completed in late 2009, becoming fully operational in early 2010. The Licensees state in the WQMMP, "Two significant purposes of the SWW are to:

- Help the Project meet temperature and water quality goals and standards in the lower Deschutes River and Project reservoirs, and,
- Allow the withdrawal of surface waters during salmonid smolt migration periods to facilitate the capture of downstream emigrating smolts from Lake Billy Chinook in support of the anadromous fish reintroduction goal."

Currently, the Licensees collect thousands of downstream migrating salmon, steelhead, and trout at the SWW facility for transportation below the Project every year. For example, the Licensees reported the capture of 128,964 native and 2,808 non-native fish in the 2024 Annual Fish Passage Report. Anadromous and resident migratory fish that were passed downstream of

the Project in 2024 included 24,443 spring Chinook smolts, 15,143 steelhead smolts, 21,968 Sockeye (yearling kokanee), and 104 juvenile and five adult bull trout. The majority of the smolts were collected at the SWW between February and June, peaking in April - May (PGE and CTWSRO 2024 Fish Passage Annual Report). In a March 2025 report, PGE indicated that a record number of adult steelhead returned to the Project during the 2024-25 run, with more than 950 fish passed upstream of the Project. This is the highest number of steelhead reported in waters above the Project since the 1960s.

Temperature Management and Thermal Regime

After the Project construction was completed in the 1960s, downstream waters experienced a shift in annual thermal patterns, resulting from release of cooler water in the spring and early summer and warmer water in late summer until late fall relative to the patterns prior to impoundment (Huntington et al., 1999). A shift in the downstream thermal regime is a known effect of impoundment and is characterizable by delayed peak annual stream temperatures relative to natural regimes (Seyedhashemi et al., 2021). The release of bottom-only waters from the Project created an artificially cool and relatively stable thermal regime in the lower river.

The SWW was designed to allow surface and bottom water blending and intended to reduce the Project's influence on water temperature in the Lower Deschutes. The SWW is adaptively managed to reduce the Project's contribution to WQ standard exceedances, and to strike a balance in meeting the competing needs for pH, temp, DO, and fish passage compliance. Operation of the SWW therefore transitioned the Lower Deschutes River's thermal regime from the post-construction regime put in place in the 1960s, to a regime with minimized influence from the Project. The change in spring water temperatures was observable in data and noticeable to those regularly recreating and fishing the lower river.

The operational goal of the SWW for managing temperature is to not cause a measurable change in water temperature downstream of the project at any time of the year. To meet this goal, blending is adjusted to meet the "without Project temperature" (WPT) in discharge from the Reregulating Dam. The WPT calculation is based on inflow temperatures from the Metolius, Deschutes, and Crooked River tributaries to Lake Billy Chinook. Stratification of reservoirs can also be associated with differences in DO and pH in surface and bottom waters. For example, the release of cooler bottom water with lower DO levels at times has the unintended consequence of reducing DO in Project discharge. As an additional adaptive measure included in the WQMMP, the Licensees initiate controlled spills at the Reregulating Dam as needed to meet the applicable DO criteria immediately downstream of the dam (Confederated Tribes of Warm Springs Reservation of Oregon and Portland General Electric Company, 2004).

Water Quality Certification

Section 401 of the Federal Clean Water Act (Clean Water Act or CWA), 33 USC §1341, 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 will comply with applicable provisions of Sections 301, 302, 303, 306, and 307 of the Clean Water Act and any state regulations, including state water quality standards, adopted to implement these sections. The state may condition any granted certificate to assure compliance with state water quality standards and other appropriate water quality-related requirements of state law. DEQ is the agency of the State of Oregon authorized to implement certification functions prescribed by §401 of the Clean Water Act for state waters.

DEQ issued the Licensees a WQC for the Project in 2002 that was subsequently incorporated into the FERC license in 2005. The WQC remains in effect. Condition A of the WQC required the Licensees to revise and submit a WQMMP to DEQ for approval shortly after issuance of the WQC. Once approved, the WQMMP became a part of the WQC and therefore the FERC license. The WQMMP was required by both the DEQ and CTWS certifications and includes the operational procedures utilized to meet conditions of both certifications.

Condition B of DEQ's WQC required the Licensees to construct, test, and commence operation of the SWW facility. The Licensees are required to operate the SWW facility in accordance with plans for temperature, DO, pH, and nuisance phytoplankton contained in the WQMMP (Conditions C.1, D.1, E.1, F.1) that specify strategies used to reduce the Project's contribution to exceedances of water quality standard criteria.

WQMMP and Adaptive Management

Adaptive management is a formal and systematic approach to learning from the outcomes of management actions and making changes to further refine management. It involves synthesizing existing knowledge, exploring alternative actions, and making forecasts about possible outcomes. Actions and objectives are adjusted based on feedback and improved understanding. Adaptive management is an important component of the WQMMP. With respect to the SWW structure, the facility design and operational plan details had yet to be worked out and ultimately tested at the time the WQC was developed and issued. DEQ anticipated that the operational plan and/or facility would need to be modified over time to achieve desired objectives. Thus, as a component of the adaptive management approach, a monitoring program was proposed to assess water quality, determine the success of management, and to provide

input to future adaptive management decisions and actions. Further, the concept of adaptive management is important for operation of the SWW structure given the complex interaction among operational decisions, multiple water quality parameters, and fish passage feasibility.

Section 1.1 of the WQMMP states:

> "Because operation of the selective withdrawal facility has the potential to affect numerous water quality parameters, as well as fish passage success, changes in the operation of the selective withdrawal facility must consider all possible impacts, not merely a single water quality parameter. In addition, actual impacts to water quality and currents will not be known with certainty until the selective withdrawal facility is constructed, operated, and monitored, highlighting the need for an adaptive management approach to ensure compliance with water quality standards.
>
> For the purpose of satisfying water quality standards for temperature, dissolved oxygen, pH, and nuisance phytoplankton, as well as ensuring downstream fish passage and implementing the adaptive management requirements of the § 401 certification and the Section 401 Implementation Agreement, including the incorporated section 401 certification conditions, the Joint Applicants shall operate the selective withdrawal facility pursuant to general adaptive management considerations" (Confederated Tribes of Warm Springs Reservation of Oregon and Portland General Electric Company, 2004).

In the WQC, DEQ requires that the Project be managed to minimize exceedances of water quality criteria. Operational and adaptive management for each parameter is described within relevant sections of the WQMMP. The Licensees submit water quality reports to DEQ and the CTWS Water Control Board (WCB) on a monthly and annual basis, and provide regular notifications when operations require adjustments to blending or spill to meet water quality objectives. Additionally, the Licensees provide annual WQ reports to the Fisheries Technical Subcommittee for review and comment and provide updates to the public at the PGE and CTWS Annual Fisheries Workshops.

Since the SWW became operational in 2010, the Licensees have gained an improved understanding about optimal blending of waters to meet WQC and other license objectives. Table 2.1 of the 2004 WQMMP contains surface and bottom water blends proposed to meet WQC requirements throughout the year. Blends 13 and 16 were ultimately selected from a range of SWW blends considered for operations and are shown in **Table 1** below. The Licensees anticipated the ability to withdraw 100% bottom water when revising the WQMMP in 2004. However, after construction it was determined that bottom water can, at most, comprise 60% of the total intake from the SWW.

Table 1. Range of surface and bottom water withdrawals (%) proposed in 2004 WQMMP. The actual blend of surface and bottom withdrawal at a given time was intended to fall within the range of proposed percentages.

	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

Currently, the Licensees operate the SWW according to the adaptive management provisions of the WQMMP to balance fish passage and other water quality needs, adjusting blends within the operational constraints for bottom water mentioned above. Generally, in the spring and early summer (~ March 15 – June 15) surface flows are prioritized at the SWW to allow for collection of out-migrating smolts; incoming water temperatures are typically cool enough in the spring for the Project to meet WPTs and minimize exceedances of CTWS and DEQ water quality criteria while maintaining higher surface flows. Challenges arise when spring water temperatures are above seasonal averages. Cooler bottom water is typically preserved for release later in summer and fall to achieve temperature targets in discharge. Due to stratification of the reservoir, releasing bottom water low in dissolved oxygen may also cause challenges in meeting water quality targets, particularly in the spawning period. In these instances, the Licensees increase DO in discharge from the Project through controlled spill at the Reregulating Dam, as described in the WQMMP.

The WQMMP includes an additional adaptive management provision for modification of blending at the SWW, following procedures agreed upon in the SA for oversight of operations by the Fisheries Technical Subcommittee. Page 3 of the WQMMP states that DEQ or WQC "may request that the Joint Applicants modify the blend of water being discharged from the selective withdrawal facility such that the blend discharged is *outside* the range set forth in Table 2.1, provided the proposed modification is described in a written proposal submitted to the Joint

Applicants and the FTS (Fisheries Technical Subcommittee) at least two months prior to the date on which the proposal is intended to be implemented."

DEQ's WQC requires the Licensees to reduce the Project's exceedances of the nuisance phytoplankton growth standard criteria in the event nuisance conditions develop. Section 5.3 of the WQMMP describes adaptive management of nuisance phytoplankton through monitoring of chlorophyll *a* within Project reservoirs to meet requirements of the WQC. At the time the WQC was issued, levels of chlorophyll *a* in Lake Billy Chinook and Simtustus were above Oregon's standards for nuisance phytoplankton. At that time, existing survey information and recreational use of Project reservoirs was used to support the finding that beneficial uses of water contact recreation, boating, fishing and aesthetics were supported. The heavy use of Lakes Billy Chinook and Simtustus by recreationalists, and the survey responses of recreational users (as well as the lack of complaints from other users) indicated that these beneficial uses of these Project impoundments were not adversely affected by nuisance phytoplankton growth.

The WQMMP includes adaptive management provisions for further consultation with DEQ and the CTWS WCB regarding nuisance phytoplankton conditions and additional steps that may be taken if chlorophyll *a* concentrations are found to be increasing in Project reservoirs after construction of the SWW. If impairment is evident, the Licensees, with guidance from DEQ and CTWS WCB, can assess implementation and feasibility of an additional control strategy. The Licensees funded a larger study of water quality in 2015, including an assessment of chlorophyll *a* and periphyton (algae attached to substrate). Portions of the study findings are referenced in subsequent sections of this report.

DEQ's WQC for the Project also includes adaptive management conditions related to future development of Total Maximum Daily Loads (TMDLs) for water quality pollutants in the Deschutes Basin. DEQ has not yet developed TMDLs for the Deschutes Basin. Further analyses and source assessments of pollutants included in TMDL development are needed to restore and protect water quality throughout the watershed. Project operations must comply with future Total Maximum Daily Loads (TMDLs). The WQC includes conditions that relate to EPA's future approval of TMDLs for the Deschutes Basin. Once a TMDL is approved, DEQ may reevaluate applicable plans within the Project's WQMMP to determine if additional measures are feasible and necessary to meet assigned Load Allocations and warrant revisions to plans. At the time the WQC was under development, DEQ's anticipated date for completing TMDLs for CWA 303(d) listings on the lower Deschutes was 2006. Deschutes Basin TMDLs are included as a priority on DEQ's 2024 Integrated Report. Currently, initial scoping and data collection is underway in the Upper and Little Deschutes Subbasins, Upper and Lower Crooked Subbasins, and the Beaver South Fork Subbasin. A project team has been assembled and the development of a water quality modeling plan for TMDLs has begun. DEQ's current timetable estimates completion of the TMDLs for the Upper and Little Deschutes subbasins by 2030.

Applicable Water Quality Standards

Designated beneficial uses in the Deschutes River Basin include public, private and domestic water supply; industrial water supply; irrigation and livestock watering; wildlife and hunting; fishing; fish and aquatic life; boating; water contact recreation; aesthetic quality; and hydropower [OAR 340-41-0130, Table 130A]. Fish use designations in the Deschutes River basin are provided in OAR 340-041-0130 Figures 130A (**Figure 2**). Salmon and Steelhead spawning Use designations are provided in Figure 130B (**Figure 3**). Water quality standards applicable to this preliminary evaluation of SWW operations governed by the WQMMP are included below.

Temperature

DEQ establishes biologically based numeric criteria to support biological functions of aquatic organisms. Oregon's current water quality standards for temperature can be found in OAR 340-041-0028. Fish Use Designations are core cold water habitat in the Deschutes River downstream of the Round Butte dam and salmon and steelhead spawning in the Deschutes River downstream of the Reregulating Dam. Biologically based numeric criteria that apply to waters within and downstream of the Project are presented in **Table 2** below.

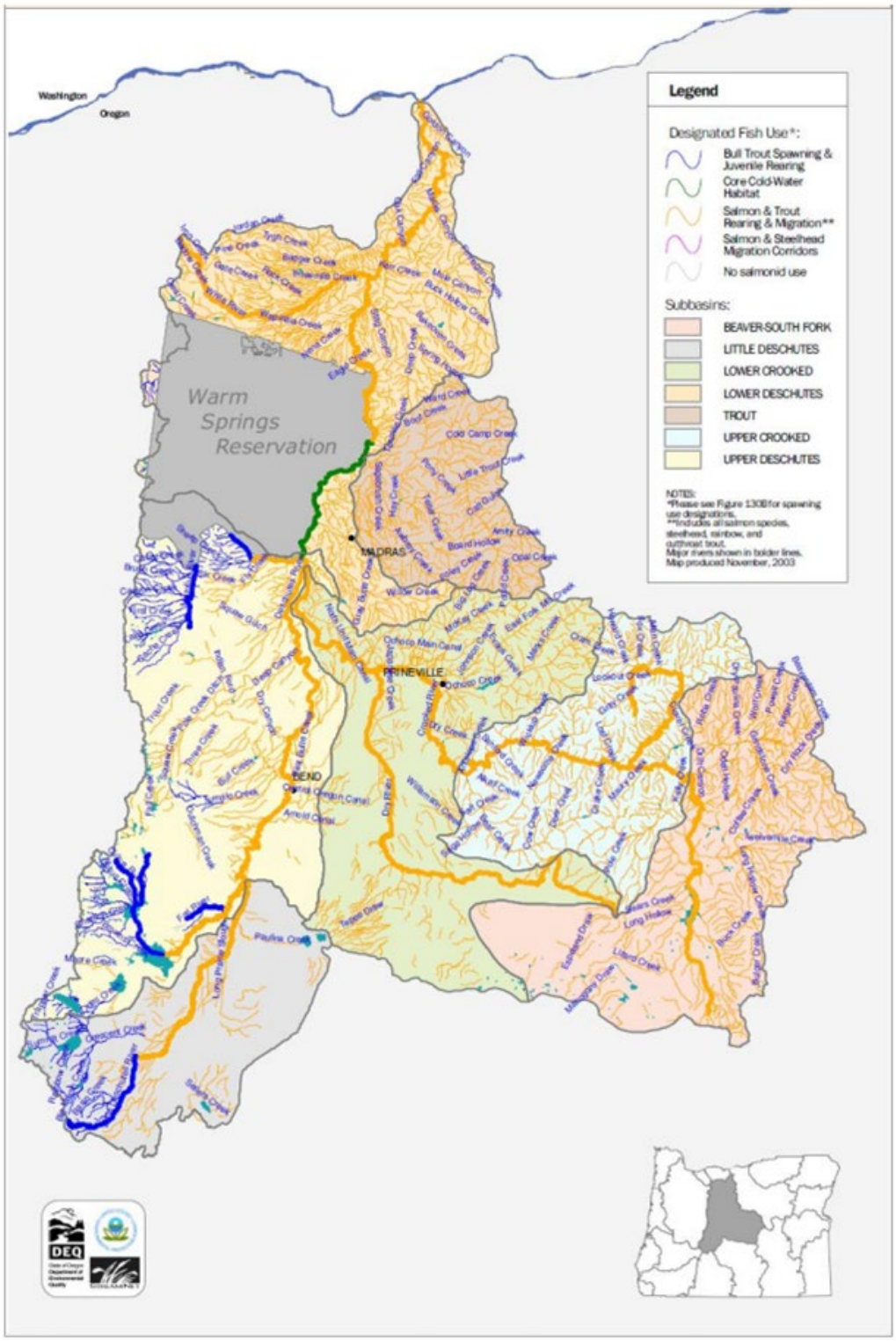

Figure 2. OAR 340-041-0130 – Figure 130A. Fish Use Designations in the Deschutes Basin, Oregon.

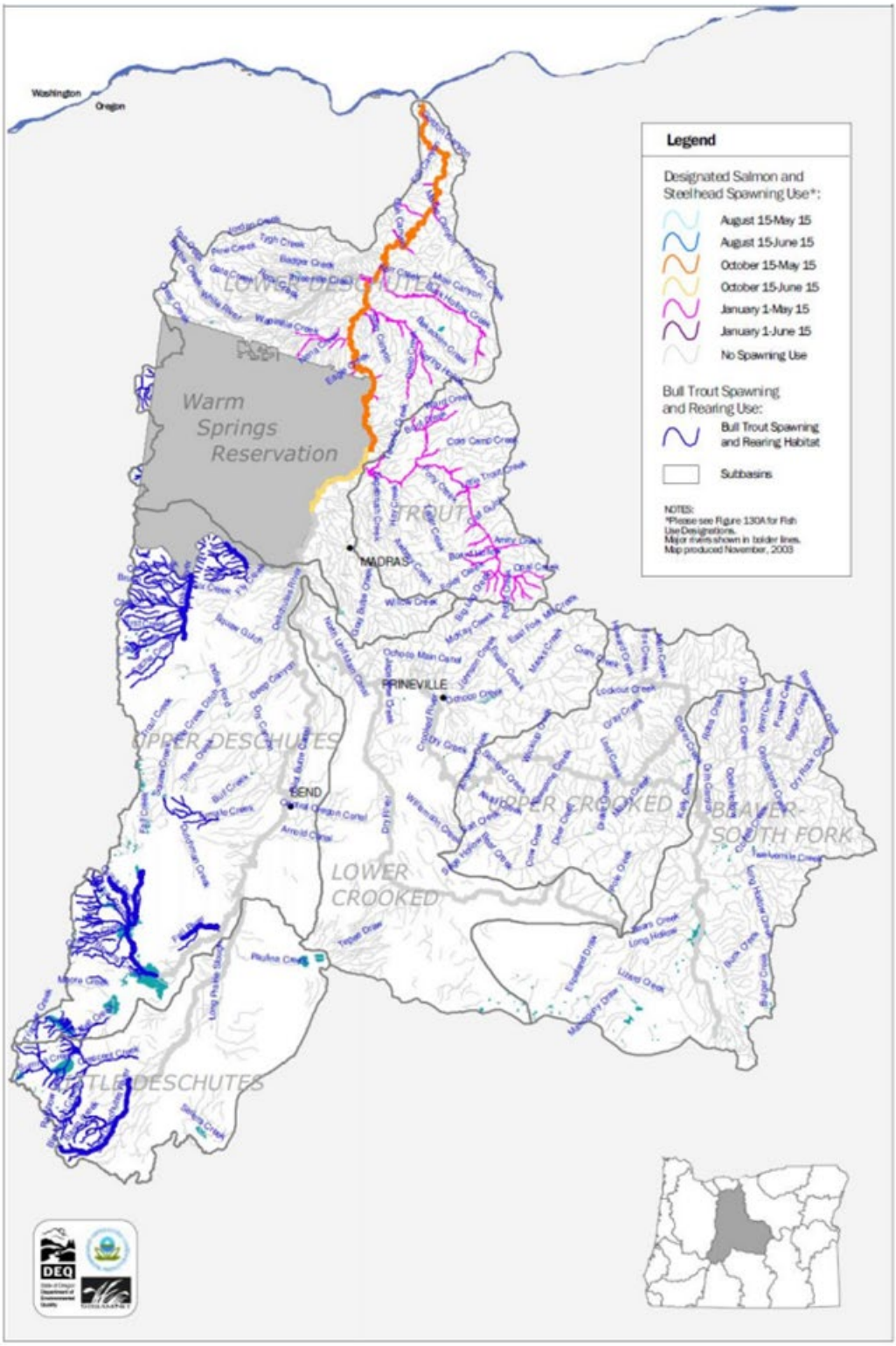

Figure 3. OAR 340-041-0130 – Figure 130B. Salmon and Steelhead Spawning Use Designations Deschutes Basin, Oregon.

Table 2. Summary of Applicable Temperature Criteria.

Applicable date	Criteria and use
June 16 – October 14	Core Cold Water 16ºC (OAR 340-041-0028(4)(b)
October 15 – June 15	Salmon/Steelhead Spawning 13 °C OAR 340-041-0028(4)(a)

Notes on Table 2: Criteria expressed as a seven-day-average maximum temperature. Definitions can be found in OAR 340-041-0002.

Applicable Water Quality Standards in 2002

When DEQ's 2002 WQC was in development, the most sensitive aquatic life uses downstream of the Project, to approximately Maupin, included spawning, rearing, or resident adult bull trout. These uses were protected by application of the 10°C (50 F°) temperature criterion. The salmonid spawning and rearing criteria (55°F and 64°F, respectively) applied in the Lower Deschutes downstream of Maupin (Oregon Department of Environmental Quality, 2002). In 2003 the Environmental Quality Commission (EQC) adopted revisions to water quality standards, further approved by the EPA in 2004. As a result of changes to designated fish uses in the Deschutes River, bull trout spawning protections are no longer applied to the Lower Deschutes River. Current water quality criteria for temperature applicable to the Lower Deschutes River immediately downstream of the Project are shown in **Table 2**. Between 2011 – 2020, DEQ, PGE, and CTWS entered interim agreements in part as a mechanism to clarify the applicable temperature criteria.

Dissolved Oxygen

Water quality standards for dissolved oxygen can be found at OAR 340-041-0016. As noted above, aquatic life use designations in the Deschutes River downstream of the Project (OAR 340-041-0130, Figures 130A and B) include Core Cold Water Habitat from June 16 – October 14 and Salmon and Steelhead Spawning from October 15 – June 15. Biologically based numeric criteria for DO applicable to Project waters are provided in Table 3.

Table 3. Summary of Dissolved Oxygen Criteria

Applicable date	Numeric criteria and use
June 16 – October 14	Core cold water: 8.0 milligrams per liter (mg/L) as an absolute minimum, or 90% saturation.

October 15 – June 15	Salmon/Steelhead Spawning: 11.0 mg/L as an absolute minimum, or 95% saturation.
Spawning period	**Intergravel DO**; OAR 340-041-0016(1)(a): The dissolved oxygen may not be less than 11.0 mg/l. However, if the minimum intergravel dissolved oxygen, measured as a spatial median, is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l;

Notes on Table 3: Definitions can be found in OAR 340-041-0002.

During the salmonid spawning period, the applicable criteria is 11 mg/L or 95% saturation. However, if the intergravel dissolved oxygen (IGDO) is measured at 8.0 mg/l or greater, then the dissolved oxygen criterion is 9.0 mg/l. The Licensees collect IGDO data downstream of the Reregulating Dam and provide results to DEQ via annual water quality reports. Data collected in previous years showed a spatial median IGDO concentration of more than 8.0 mg/L. As long as IGDO measurements downstream of the Project continue to meet or exceed this threshold, the DO criterion during the salmon and steelhead spawning applicable to the Project is 9.0 mg/l.

Applicable Water Quality Standards in 2002

As mentioned above, in 2002 the most sensitive aquatic life uses downstream of the Project included spawning, rearing, or resident adult bull trout. The period of salmonid spawning and incubation, and thus the spawning DO criteria, applied for the entire year in the Lower Deschutes River. After DEQ's 2003 updates to Oregon's Aquatic Life Uses in waters downstream of the Reregulating Dam, the DO criteria for salmonid spawning is now applicable for only part of the year (Table 3). The IGDO criteria has applied since the WQC was issued in 2002, following collection of sufficient IGDO data by the Licensees. The CTWS are currently considering updates to water quality standards that may apply the dissolved oxygen spawning criteria downstream of the Reregulating Dam year-round.

Hydrogen Ion Concentration (pH)

Oregon's water quality standards for pH are found at OAR 340-041-0021. Basin-specific water quality standards for the Deschutes are found at OAR 340-041-0135. pH values within the Project reservoirs and downstream waters may not fall outside the range of 6.5 – 8.5. The following exception also applies to Project reservoirs: Waters impounded by dams existing on January 1, 1996, which have pHs that exceed the criteria are not 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 (OAR 340-041-0021(2)).

Nuisance Phytoplankton Growth

Oregon's water quality standards for Nuisance Phytoplankton Growth are found at OAR 340-041-0019. For natural lakes that do not thermally stratify, reservoirs, rivers and estuaries, a concentration of 0.015 mg/l is used to identify water bodies where phytoplankton may impair the recognized beneficial uses.

Water Quality Status

Water Quality Impairments

Waterbodies that fail to meet certain water quality criteria are designated as water quality limited, pursuant to CWA §303(d). The EPA requires states to develop TMDLs for waters identified as water quality limited and identified as Category 5 on Oregon's 303(d) list. A TMDL identifies the maximum pollutant load that a water body may receive from combined point and non-point sources and still meet water quality standards necessary to support all designated beneficial uses. TMDLs quantify waste load allocations for point sources and load allocations for non-point sources. For hydroelectric projects located on a water quality-limited waterbody, a §401 certification may serve as the means for implementing LAs assigned to the project. Rules for developing, issuing and implementing TMDLs are in OAR Chapter 340, Division 042.

As of this draft report, the most recent information about water quality impairments is available from Oregon's 2024 Integrated Report (IR). The 2024 IR is considered "state final", or complete according to Oregon's processes, but awaits federal approval under the Clean Water Act. The 2024 IR was submitted to the EPA for review and approval on March 12, 2025. The river and reservoir assessment units immediately upstream and downstream of the Project within the Deschutes River Basin listed as Category 5 in the 2024 Integrated Report are summarized in **Table 4**, below. The 2024 Integrated Report and a full list of impaired waters within the Deschutes Basin and across Oregon may be found at Oregon DEQ's draft Integrated Report website.

Table 4. Category 5 Assessment Units in waters adjacent to the Pelton Round Butte Project on the Deschutes River (DEQ 2024 Integrated Report).

Assessment Unit ID	AU Name	AU Description	Parameter
OR_SR_1707030103_05_101713	Deschutes River	Little Deschutes River to Spring River	Dissolved Oxygen, spawning
OR_SR_1707030103_05_101713	Deschutes River	Little Deschutes River to Spring River	Sedimentation

OR_SR_1707030103_05_101713	Deschutes River	Little Deschutes River to Spring River	Temperature, year-round
OR_SR_1707030103_05_101713	Deschutes River	Little Deschutes River to Spring River	Turbidity
OR_SR_1707030104_05_102628	Deschutes River	Spring River to North Unit Diversion Dam	Sedimentation
OR_SR_1707030104_05_102628	Deschutes River	Spring River to North Unit Diversion Dam	Temperature, year-round
OR_SR_1707030104_05_102628	Deschutes River	Spring River to North Unit Diversion Dam	Turbidity
OR_SR_1707030104_05_102628	Deschutes River	Spring River to North Unit Diversion Dam	pH
OR_SR_1707030108_02_102627	Deschutes River	North Unit Diversion Dam to Whychus Creek	Temperature, year-round
OR_SR_1707030602_05_101812	Willow Creek	Newhill Creek to Lake Simtustus	Temperature, year-round
OR_SR_1707030603_05_102625	Deschutes River	Pelton Regulating Dam to Warm Springs River	Dissolved Oxygen, year-round
OR_SR_1707030603_05_102625	Deschutes River	Pelton Regulating Dam to Warm Springs River	Dissolved Oxygen, spawning
OR_SR_1707030603_05_102625	Deschutes River	Pelton Regulating Dam to Warm Springs River	Temperature
OR_SR_1707030603_05_102625	Deschutes River	Pelton Regulating Dam to Warm Springs River	Temperature, spawning
OR_SR_1707030603_05_102625	Deschutes River	Pelton Regulating Dam to Warm Springs River	pH
OR_SR_1707030611_05_101828	Deschutes River	Warm Springs River to Buck Hollow Creek	Methylmercury
OR_SR_1707030611_05_101828	Deschutes River	Warm Springs River to Buck Hollow Creek	Temperature, spawning
OR_SR_1707030612_05_101830	Deschutes River	Buck Hollow Creek to confluence with Columbia River	Methylmercury
OR_SR_1707030612_05_101830	Deschutes River	Buck Hollow Creek to confluence with Columbia River	Temperature, year-round

OR_SR_1707030612_05_101830	Deschutes River	Buck Hollow Creek to confluence with Columbia River	Temperature, spawning
OR_SR_1707030612_05_101830	Deschutes River	Buck Hollow Creek to confluence with Columbia River	pH
OR_LK_1707030110_05_100081	Lake Billy Chinook	Lake/Reservoir Unit	Chlorophyll-a
OR_LK_1707030110_05_100081	Lake Billy Chinook	Lake/Reservoir Unit	Harmful Algal Blooms
OR_LK_1707030111_02_100151	Lake Billy Chinook	Lake/Reservoir Unit	Chlorophyll-a
OR_LK_1707030111_02_100151	Lake Billy Chinook	Lake/Reservoir Unit	Temperature, year-round
OR_LK_1707030111_02_100151	Lake Billy Chinook	Lake/Reservoir Unit	pH
OR_LK_1707030511_02_100117	Lake Billy Chinook	Lake/Reservoir Unit	Chlorophyll-a
OR_LK_1707030511_02_100117	Lake Billy Chinook	Lake/Reservoir Unit	Harmful Algal Blooms
OR_LK_1707030511_02_100117	Lake Billy Chinook	Lake/Reservoir Unit	Temperature, year-round
OR_LK_1707030511_02_100117	Lake Billy Chinook	Lake/Reservoir Unit	pH
OR_LK_1707030601_02_100118	Lake Simtustus	Lake/Reservoir Unit	Chlorophyll-a
OR_LK_1707030601_02_100118	Lake Simtustus	Lake/Reservoir Unit	Temperature, year-round
OR_LK_1707030601_02_100118	Lake Simtustus	Lake/Reservoir Unit	pH

Water quality is listed as impaired in surface waters upstream, within, and downstream of the Project, and more broadly throughout the Deschutes River Basin. Sources upstream of Lake Billy Chinook may be contributing to exceedances of criteria for temperature, sediment, pH, DO, nutrients and other parameters in incoming waters and potentially in the lower river. TMDL development is needed to quantify pollutant contributions from point and non-point sources in the basin and to assign pollutant limits that will help improve water quality. DEQ began developing TMDLs for the lakes, reservoirs, rivers, and streams in the Upper Deschutes and Little Deschutes subbasins, initiated through water quality monitoring in the summer of 2019.

Available Water Quality Data and Reports

As required by the WQC, the Licensees monitor water quality and provide reports as described in the WQMMP. DEQ reviewed data and Annual Water Quality Monitoring Reports from 2021 to 2025 for this evaluation. Portions of the annual reports and data are summarized below.

Temperature

The Licensees collect temperature data at multiple locations upstream, within, and downstream of the Project. Continuous water temperature is recorded in inflowing waters from the Metolius, Crooked and Deschutes River tributaries to Lake Billy Chinook (**Figure 4**). Similar to recent years, waters are generally coolest in the Metolius and warmest in Crooked River inflows for much of the year. However, Deschutes River inflows were warmest overall from June to September, with a maximum recorded temperature of 16.8 C in August, and showed the greatest seasonal variability of all three tributaries.

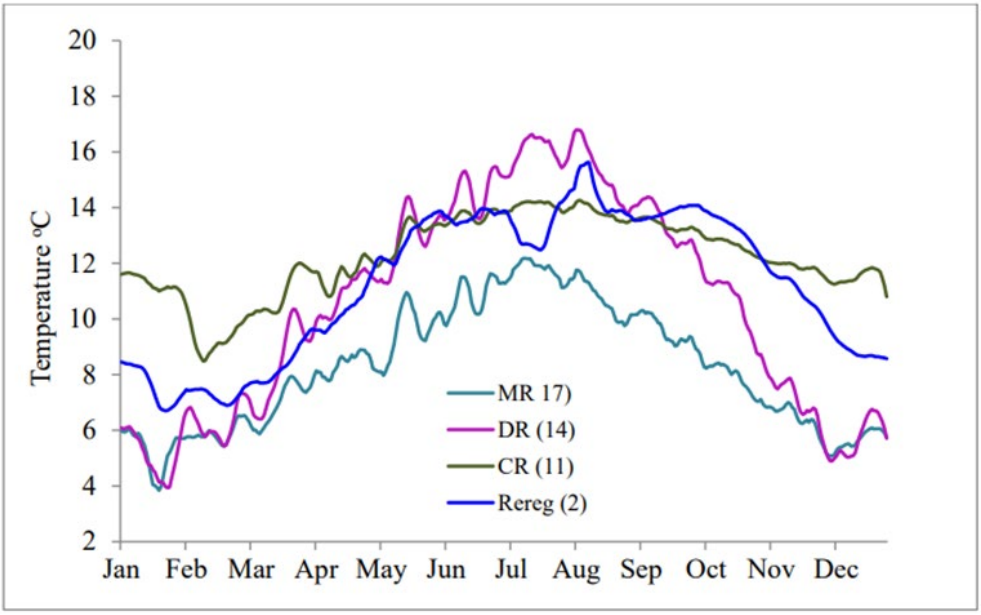

Figure 4. 7DADM inflow temperatures for the Metolius, Deschutes, and Crooked River, and lower Deschutes River at Madras (Sites 17, 14, 11, 2) in 2024 (from Campbell, 2025).

The calculated WPT, based on volume weighted temperatures from inflowing tributaries, is presented in **Figure 5** along with observed temperatures below the Project and an average of discharge temperatures in years prior to SWW operation (2006-2009). Springtime discharge temperatures were a little cooler than the WPT in early spring, and a little warmer than WPTs in the fall. The percentage of bottom water released from the SWW increased throughout the summer and was maintained at a maximum (60%) from late August through October. Consistent with recent years (2010 – 2023, **Figure 6**), annual peak temperatures in Project discharge

occurred about 4 – 6 weeks earlier than pre-SWW temperatures. Discharge water temperatures measured at the Reregulating tailrace from January 2021 through October 2025, provided in monthly data reports, were compiled by DEQ and are presented in **Figure 7**.

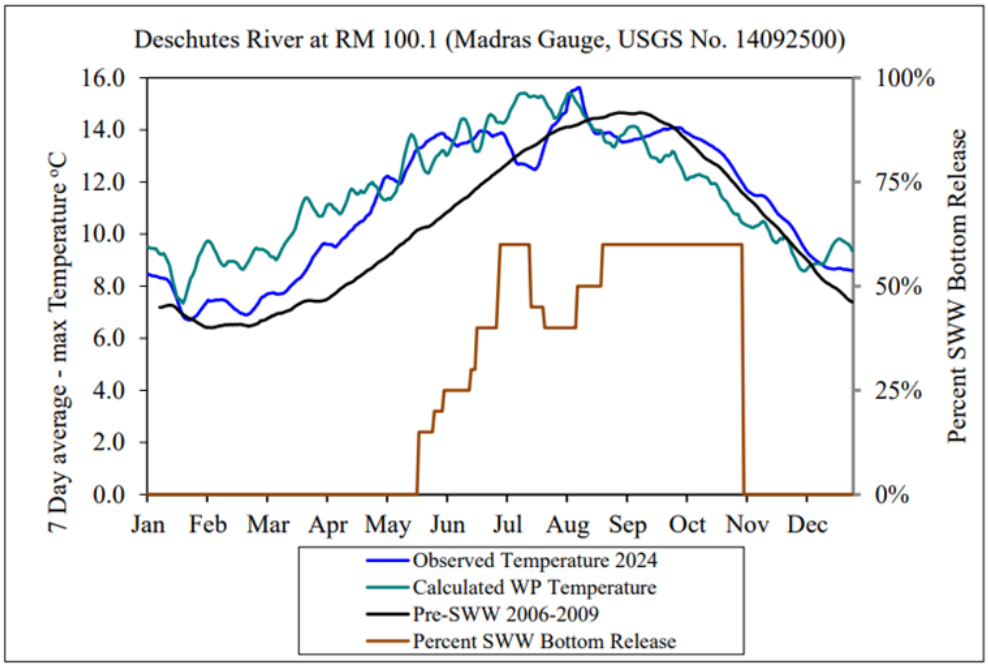

Figure 5. Calculated Without Project Temperatures (as 7d AM) with the pre-SWW four-year average (2006-2009) and observed 2024 7d AM discharge temperatures. Brown line reflects the percent bottom water withdrawal (from Campbell, 2025). Project discharge monitoring site co-located with USGS stream gauge 14092500.

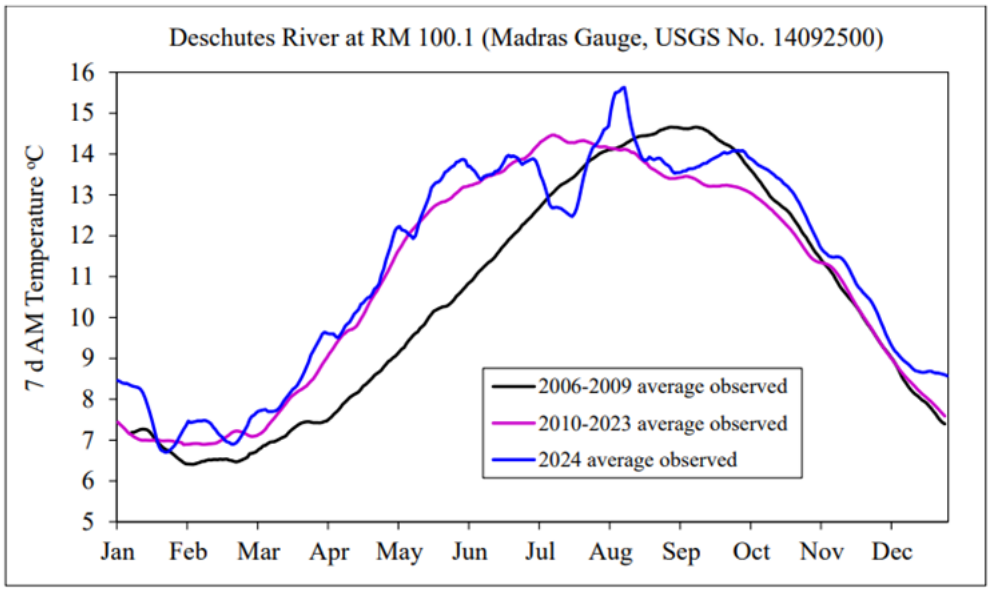

Figure 6. The pre-SWW three-year average 7dAM (2006-2009) for the Pelton Round Butte Project, compared to the average 2010- 2023, and 2024 7dAM discharge temperatures (from Campbell, 2025).

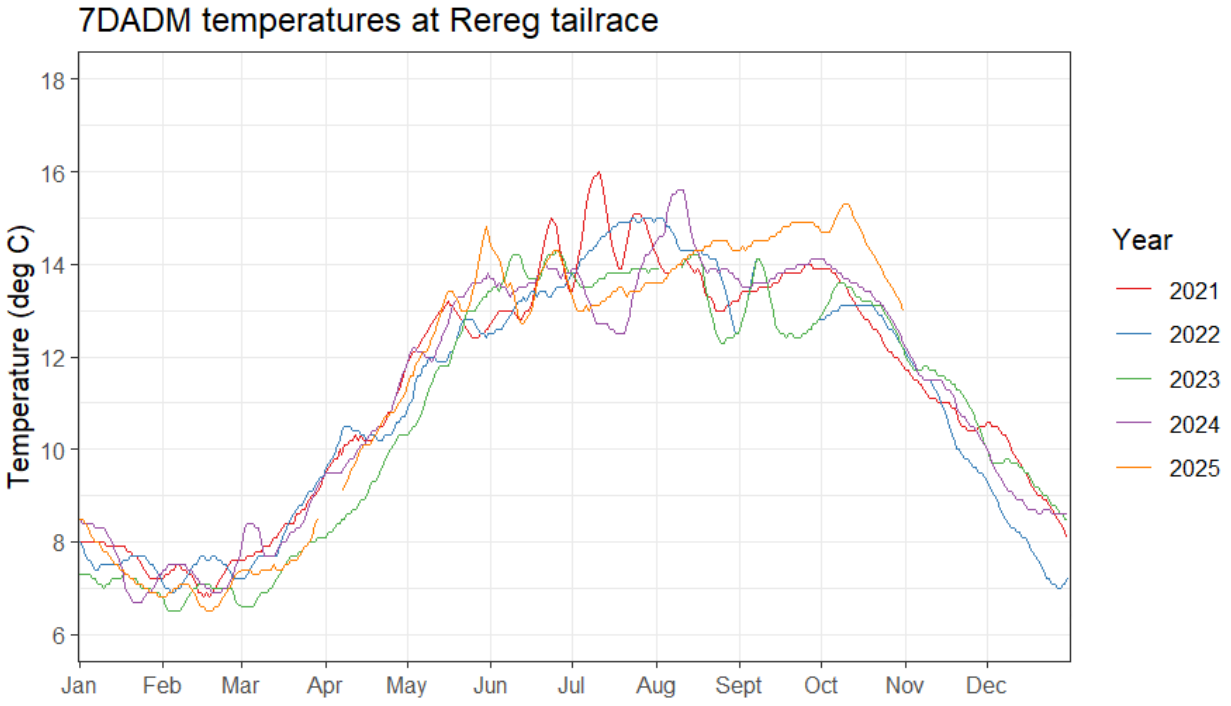

Figure 7. The 7 day average daily maximum temperatures reported below the Reregulating Tailrace from Jan 2021 to Oct 2025.

Water temperatures in Project discharge are strongly influenced by water withdrawal from Lake Billy Chinook by the SWW. The Licensees collect profiles of temperature in the forebays of Round Butte and Pelton Dams. In 2024, profile data suggests the reservoir is stratified much of the year, particularly from May – October before water column mixing late in the fall (**Figure 8**). Warmest surface water temperature was reported in July (24° C). Progressional warming of the hypolimnion was evident throughout the summer, with warmest temperatures reported in the fall.

The Licensees monitored water temperature downstream of the Project, spanning from below the Reregulating tailrace to the confluence with the Columbia (**Figure 9**). Monitoring sites below the Reregulating tailrace were reported in river kilometers (rkm) and included the Lower Deschutes River at Dry Creek (rkm 149, Sandy Beach (rkm 72), Macks Canyon (rkm 32), and Moody (rkm 2). Data reports generally show that water temperatures increase from upstream to downstream locations, with greatest variability between sites reported in July and August.

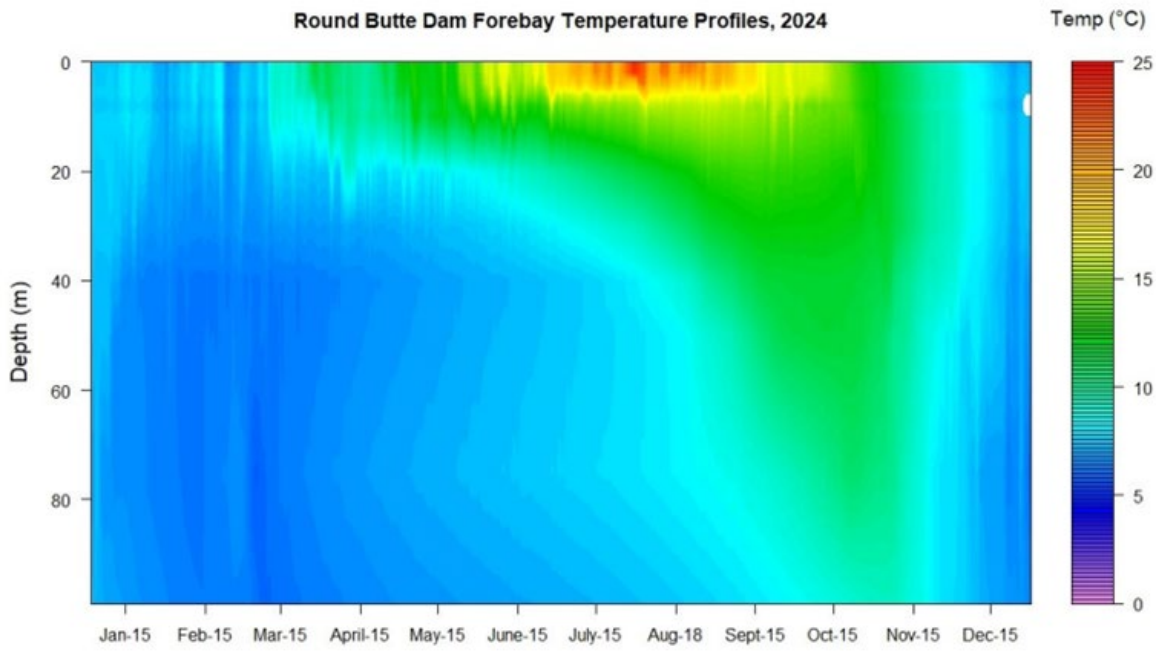

Figure 8. Round Butte Dam forebay temperature (daily average) profiles in 2024. Gaps in color represent periods when temperature wasn't recorded (from Campbell, 2025).

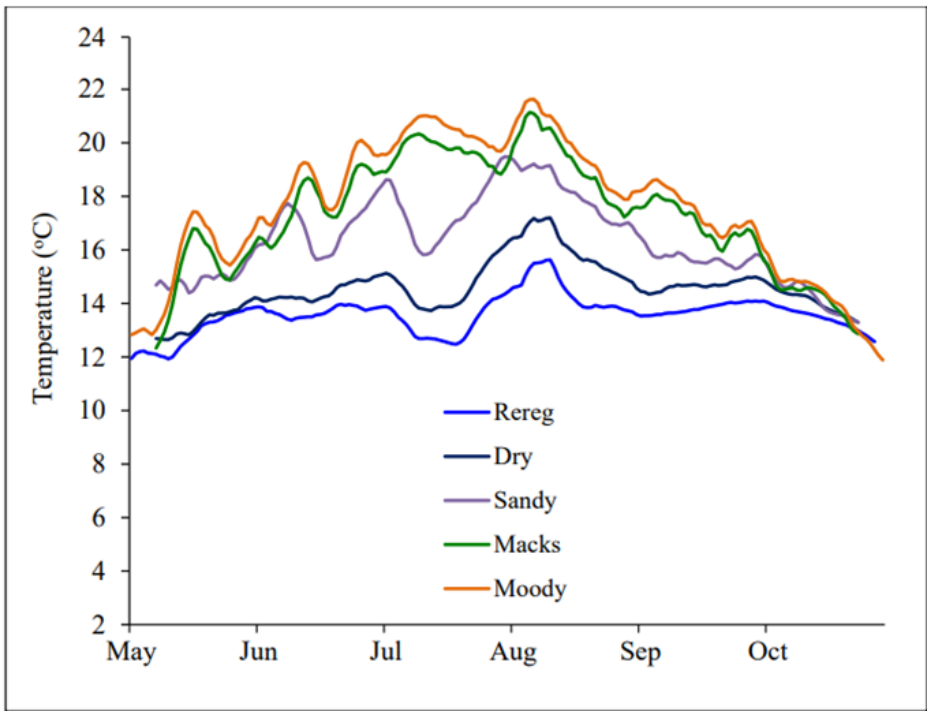

Figure 9. 7d AM temperature (May - October) for the Deschutes River at Madras (Rereg), Dry Creek (Site 28), Sandy Beach (Site 31), Macks Canyon (Site 32), and Moody (Site 33) in 2024. (Campbell, 2025).

Dissolved Oxygen

DO levels may vary dramatically over 24-hour cycles, particularly in the presence of high algal growth. The Licensees measured DO profiles at monthly intervals in the forebays of Round Butte and Pelton Dams. Monthly samples do not provide information about diel variation but help clarify the difference between DO levels in surface and deep waters. At the Round Butte forebay, DO levels decreased from the surface to bottom water during stratification from late spring through fall 2024, and most markedly from July – October (**Figure 10**). Supersaturation of DO in Round Butte forebay through the warm season indicates high algal growth in surface waters (**Figure 11**). Supersaturation was also noted in the epilimnion of Pelton forebay (figure not shown). The minimum DO level recorded in the hypolimnion of Round Butte forebay was 2.8 mg/l in October (99m) and 6.1 mg/l (below 10m) in Pelton forebay in August of 2024 (Campbell, 2025).

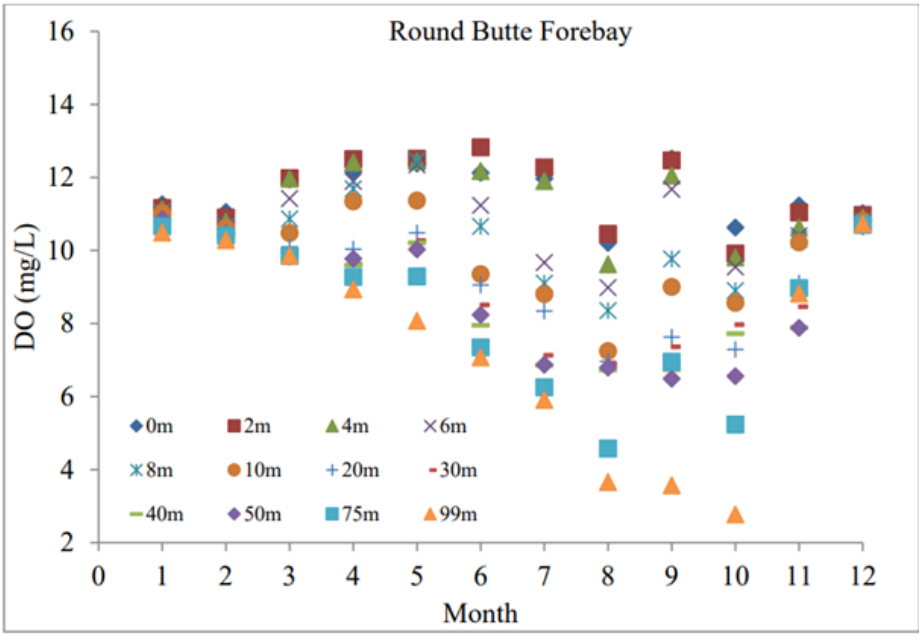

Figure 10. Monthly values of DO (mg/L) in Round Butte Dam forebay, Lake Billy Chinook, 2024. Note that results represent once per month sample points and, thus, do not reflect diurnal variations (Campbell, 2025)

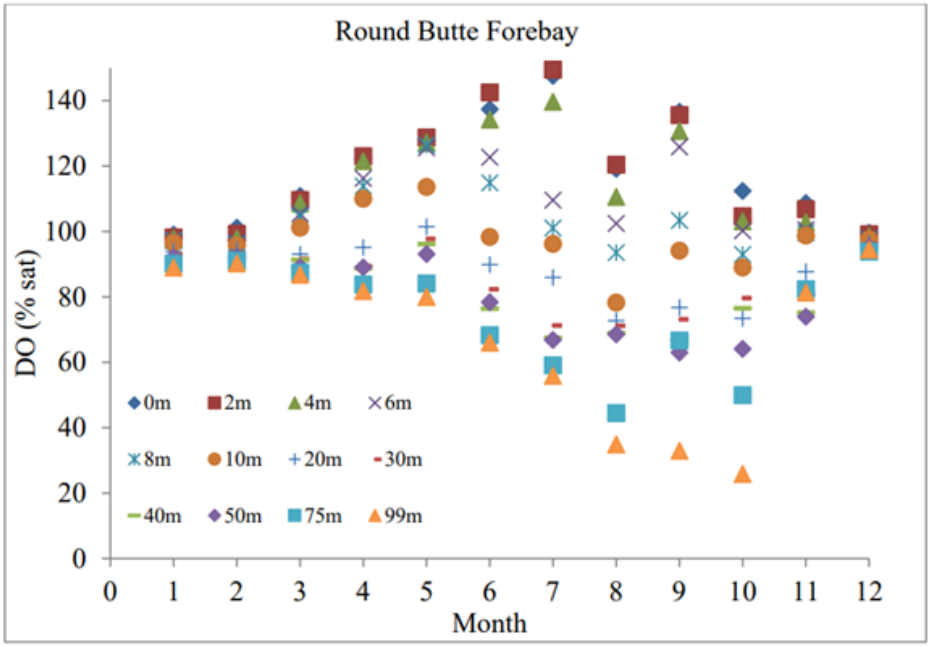

Figure 11. Monthly values of DO (% saturation) in Round Butte Dam forebay, Lake Billy Chinook, 2024. Note that results represent once per month sample points and, thus, do not reflect diurnal variations (from Campbell, 2025).

The Licensees recorded continuous DO data below the tailrace of the Reregulating Dam. Daily minimum DO concentration and saturation are presented in **Figure 12**. When DO levels are low in Project discharge, the Licensees use controlled spills at the Reregulating Dam to meet water quality targets. Initiation of spill is indicated on the figure with arrows. Annual patterns in DO were similar to those measured in recent years (**Figure 13**); minimum DO levels in 2024 were greater than averages of data collected between 2011 – 2016. Maintaining DO levels is challenging during the late summer and early fall, when a greater percentage of bottom water low in dissolved oxygen is released from the SWW to meet temperature targets.

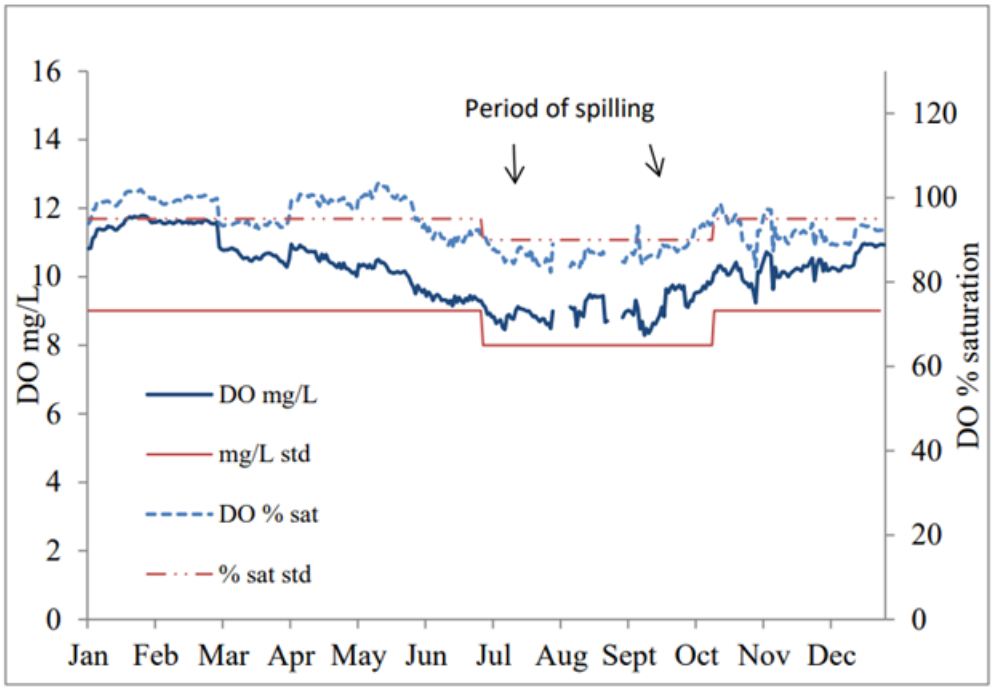

Figure 12. Daily minimum of dissolved oxygen (mg/L and percent saturation) for Reregulating Dam tailrace in 2024. Spill events are shown by arrows. The dissolved oxygen concentration targets are shown in red (from Campbell, 2025).

The Licensees collected IGDO and ambient DO data below the tailrace of the Reregulating dam via grab sampling and continuous monitoring (~2-3 day periods) in late June/July and October, to coincide with the beginning and end of the spawning period. The 2024 daily minimum ambient river DO concentration was 8.8 mg/L in July, and 10.2 mg/L in October; the daily median IGDO concentration was 8.4 mg/L in July and 9.8 mg/L in October (Campbell, 2025). IGDO concentrations remained above the ODEQ 8.0 mg/L requirement for application of the 9.0 mg/l IGDO criteria throughout sampling events.

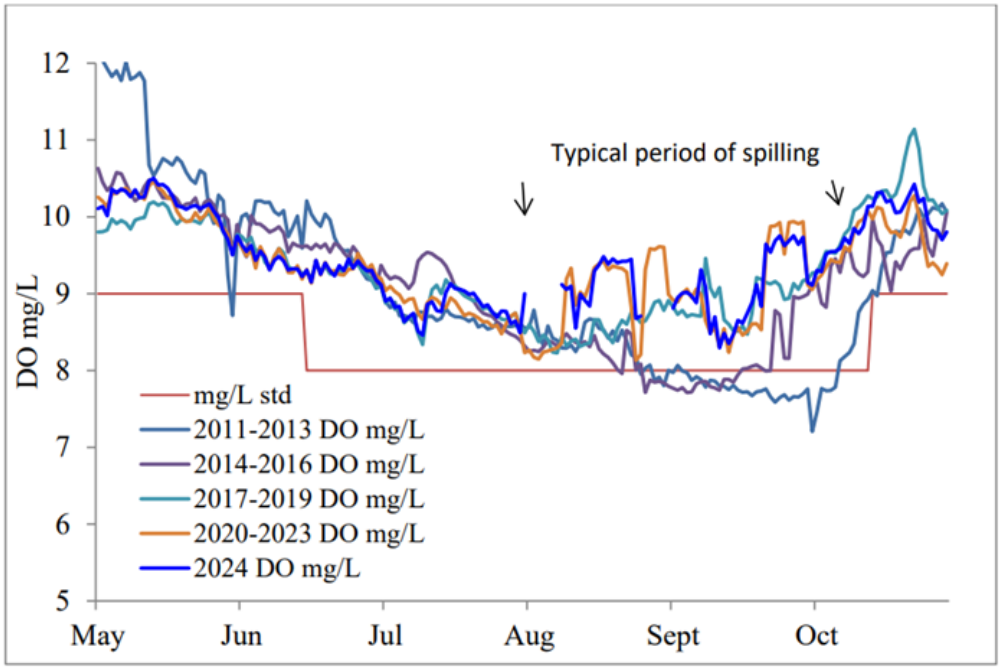

Figure 13. May to October daily minimum of dissolved oxygen values at the Reregulating Dam tailrace, averaged for three years from 2011-2023, compared to 2024. Dissolved oxygen concentration targets are shown in red (from Campbell, 2025).

pH

The Licensees collected monthly profiles of pH in each of the 3 major tributaries to Lake Billy Chinook in 2024. The Crooked River arm, pH ranged from 9.5 to 7.9 in surface layers (0 m - 6 m), and 8.7 to 7.9 at depth (below 10 m); In the Deschutes River arm pH ranged from 9.4 to 8.0 at the surface and from 8.9 to 7.7 at depth; Metolius River profiles ranged from 9.2 to 8.0 at the surface and from 9.2 to 7.9 at depth (Campbell, 2025). Higher values were measured in late summer months (July, August) in the Deschutes and Crooked River inflows but occurred earlier in the year in the Metolius (April). Monthly values do not represent daily variation in pH and cannot be used to fully assess seasonal maximum and minimum values.

Monthly pH profiles were also measured in Round Butte and Pelton forebays (**Figures 14 and 15**) and showed a high degree of difference between surface and bottom waters while the reservoirs were stratified, similar to patterns in DO. Generally, pH was higher in surface waters and lower at depth from spring to late fall in both reservoirs. Photosynthetic activity influences both DO and pH levels in the water column, and both Lake Billy Chinook and Lake Simtustus are known to be highly productive through the growing season.

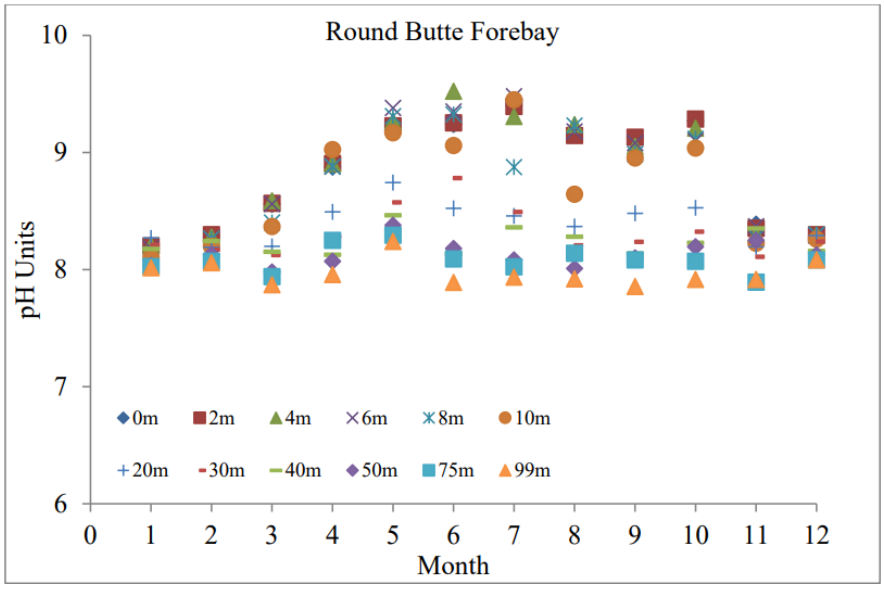

Figure 14. Monthly values of pH (standard units) in Round Butte Dam forebay, Lake Billy Chinook, 2024. Note that results represent once per month sample points and, thus, do not reflect diurnal variations (from Campbell, 2025).

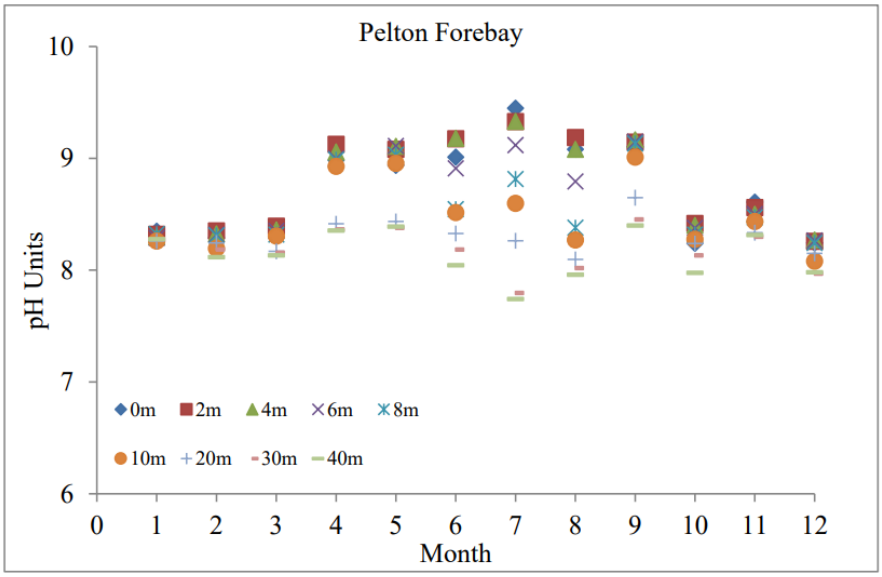

Figure 15. Monthly values of pH (standard units) in Pelton Dam forebay, Lake Simtustus, 2024. Note that results represent monthly sample points and do not reflect diurnal variations (from Campbell, 2025).

Continuous pH data is measured by the Licensees below the Reregulating Dam. Daily minimum and maximum values measured in 2024 are presented in **Figure 16**. The Licensees reported a maximum pH of 8.9 in June and a low value of 7.9 in August below the Project. Annually, pH in Project discharge decreases in early fall and remains lower through the winter before an increase

in the spring to a midsummer high, coincident with phytoplankton growing season in surface waters. This pattern is relatively consistent between years (**Figure 17**).

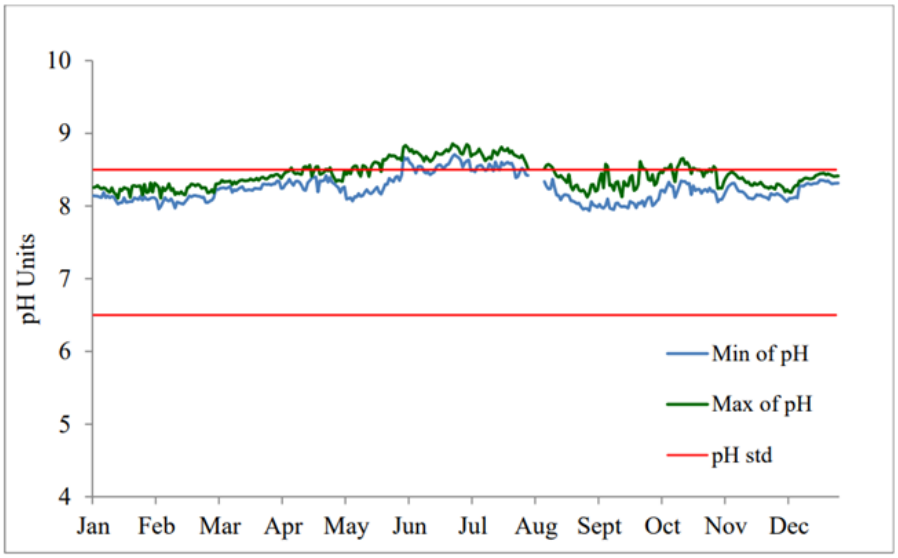

Figure 16. Daily minimum and maximum pH taken from continuous measurements below the Reregulating Tailrace in 2024 (from Campbell, 2025).

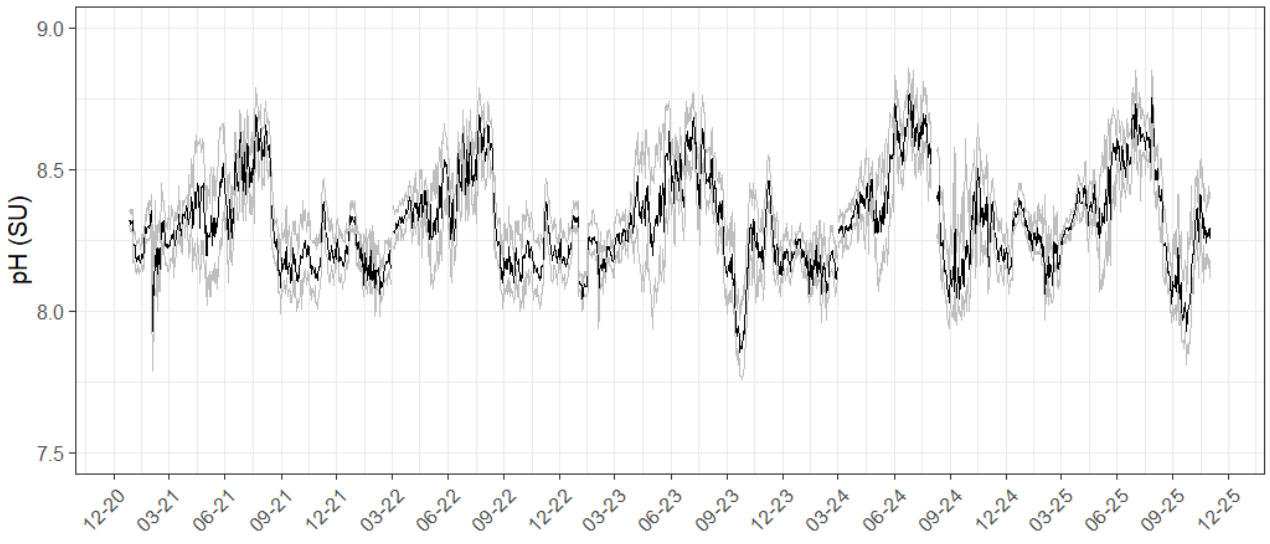

Figure 17. Daily mean pH (black line), maximum and minimum (gray lines) below Reregulating Tailrace from Jan 2021 through Oct 2025. Data compiled from annual reports and presented by DEQ.

Water Quality Studies

PGE and CTWS conducted numerous water quality studies during development of the license application for the Project. After the SWW became operational, PGE and the CTWS funded a multi-year study to better understand water quality within and downstream of Project waters and evaluate potential impacts from SWW operation. The study was completed and a report produced by Joseph Eilers and Kellie Vache in 2019, entitled *Water Quality Study for the Pelton Round Butte Project and the Lower Deschutes River: Monitoring & Modeling*. The study was revised in 2021 to include corrections related to analyses of the periphyton community and additional discussion about phytoplankton communities in Project reservoirs. The study included monitoring from 2015 to 2017 at sites within the three upstream tributaries, Lake Billy Chinook and Lake Simtustus, and along the Lower Deschutes River and tributaries. The authors examined continuous water conditions for temperature, pH, and dissolved oxygen, and discrete sampling data for nutrients (total phosphorus, phosphate, total nitrogen, nitrate and ammonia), periphyton, and algae in the water column (Eilers & Vache, 2021). The reported findings are relevant to temperature, DO, pH, and chlorophyll management at the Project and, as these are the focus of this evaluation, portions of the results are summarized below. DEQ's evaluation of water quality management under the WQC is ongoing and this report may be revised to include additional studies or reports in the future, should they become available.

Temperature

The study noted that the SWW was designed to provide warmer river temperatures during the spring and cooler river temperatures in the late summer and fall, mimicking a temperature regime in the Lower Deschutes River that may be expected if the Project dams were not present; Warmer spring temperatures were intended to support optimal emergence timing and growth conditions for fall Chinook and trout (Eilers & Vache, 2021). The study authors used long term river temperature data from the Madras gauge (river mile 100.1), located immediately downstream of the Reregulating Dam, to examine thermal patterns before and after SWW operation. Findings confirmed that peak annual temperatures were occurring earlier in the summer (June or July) after SWW installation, rather than the fall (September) peaks experienced prior to 2010 (**Figure 18**; Eilers & Vache, 2021). Temperature in water released from the Project exhibited greater variability after SWW operation, likely because of the blended source water instead of a more consistent discharge from the hypolimnion of Lake Billy Chinook (Eilers & Vache, 2021).

The study also included examination of temperature data collected between 2006-2017 from USGS gauging stations at each of the three major tributaries to Lake Billy Chinook. Water temperatures were found to be increasing in each of the tributaries and most apparently in the

Middle Deschutes River. Highlighted as a major finding of the study, the authors note that "Possible increases in water temperature are the major concern for the tributaries to the Project. Forecasts for the region indicate that these increases in water temperature are likely to continue into the foreseeable future" (Eilers & Vache, 2021).

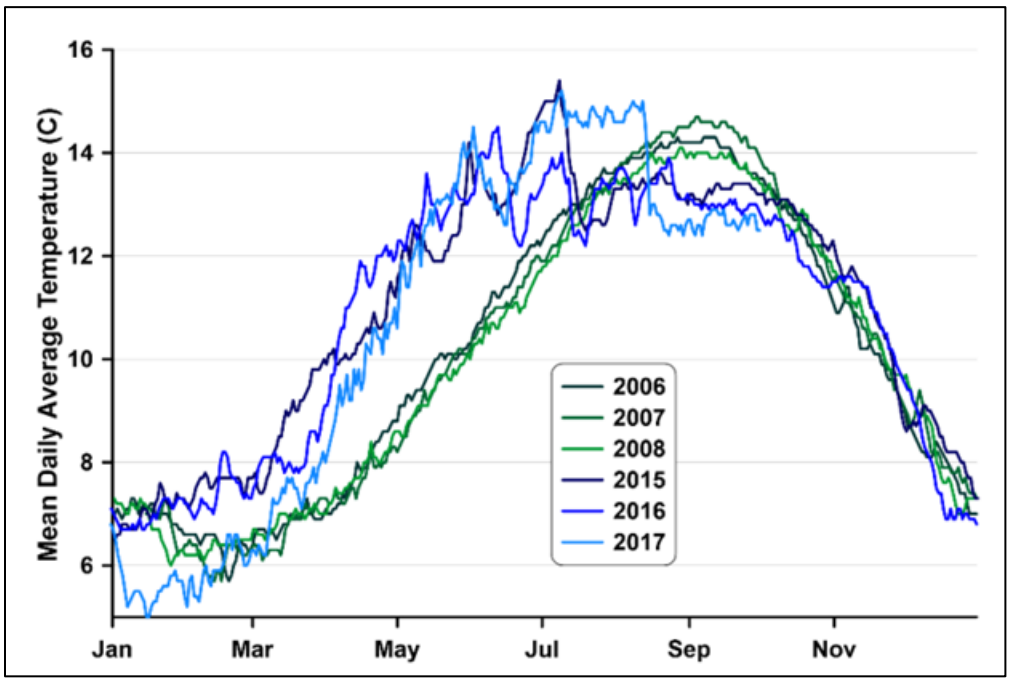

Figure 18. Daily average temperature of the LDR at the USGS Madras gage (RM 100.1) for the periods 2006–2008 and 2015–2017 (from Eilers and Vache, 2021).

Dissolved Oxygen

Eilers and Vache (2021) presented DO data collected by DEQ at the Highway 26 bridge, below the Project, and near the river mouth to examine long-term trends in DO (**Figure 19**). There have been increasing and decreasing trends at both locations since the late 1950s, although the change in DO at the river mouth rarely exceeded 3%–4% (Eilers & Vache, 2021). The authors found that DO saturation increased below the Project and at the river mouth beginning around 2010. DEQ notes that these data are from grab samples and there is no analysis of the time of day the samples were collected. Thus, results should be interpreted with caution. If there are systematic biases for collection in the morning or afternoon, or a shift in timing of sample collection (or multiple shifts during the period of record), long-term patterns may be a false signal. Additionally, analyzing annual data together may obscure critical seasonal patterns tied to changes in management regimes or long-term climate patterns.

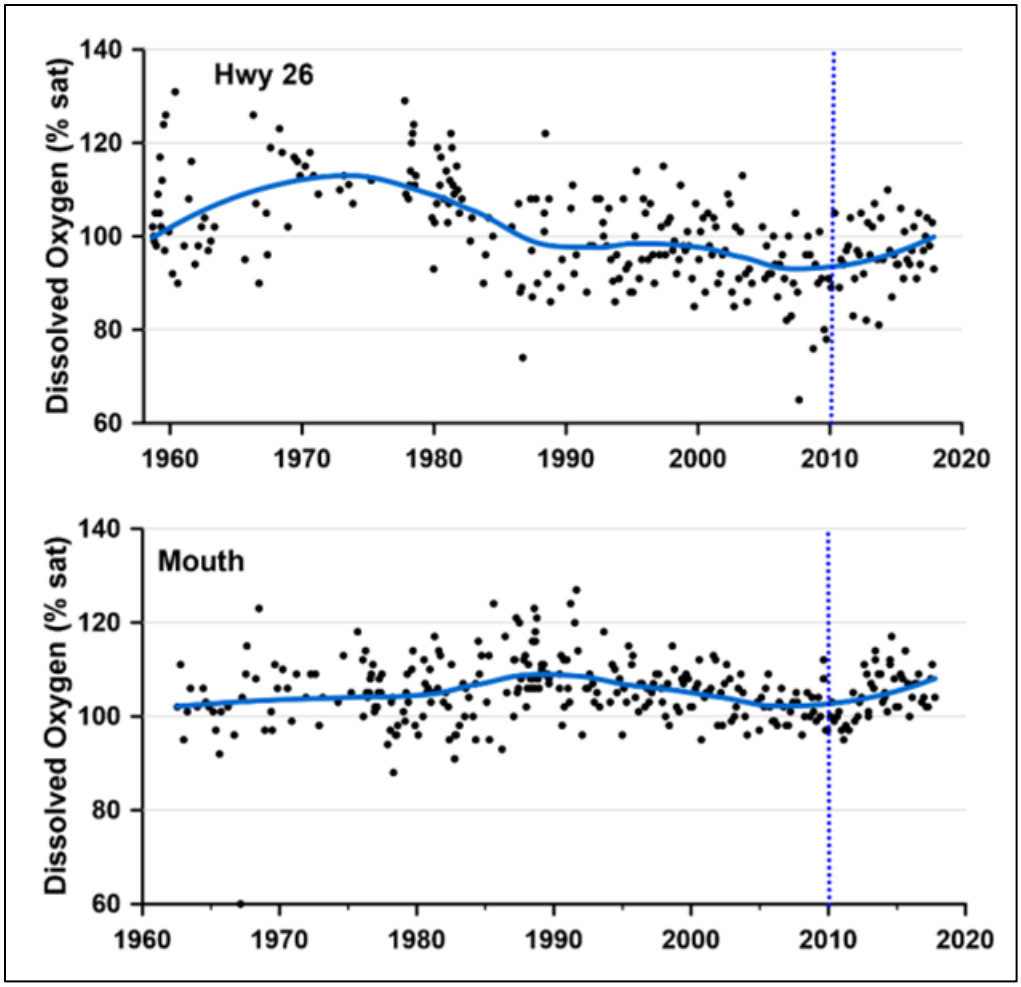

Figure 19.ODEQ AWQMP DO results at the Hwy 26 bridge site (RM 97.6) (top) and the LDR Mouth (RM 0.1) (bottom). The solid blue line is the LOESS fit of the observed data. The dashed vertical line denotes the start of operation of the SWW (from Eilers & Vache, 2021).

Eilers and Vache (2021) also examined continuous data collected for a 72-hour period at four sites along the Lower Deschutes River including Trout Creek campground (RM 88.5), Harpham Flats (RM 55.8), Buckhollow Creek (RM 42.7), and near the mouth of the LDR (RM 0.5). The 72-hr monitoring was conducted in July and August of 2016, when ambient air temperatures and primary production within and downstream of the Project was expected to be high (Eilers & Vache, 2021). Lower DO concentrations occurred in close proximity to the Regregulating Dam tailrace, but rapidly equilibrated downstream (Eilers & Vache, 2021). Large diel changes in DO are evident at locations below the Project, with the exception of the Buckhollow Creek site (**Figure 20**). The authors suggest that the Buckhollow Creek site is located downstream of Sherars Falls and that aeration from turbulence below the falls likely stabilized DO concentration (Eilers & Vache, 2021).

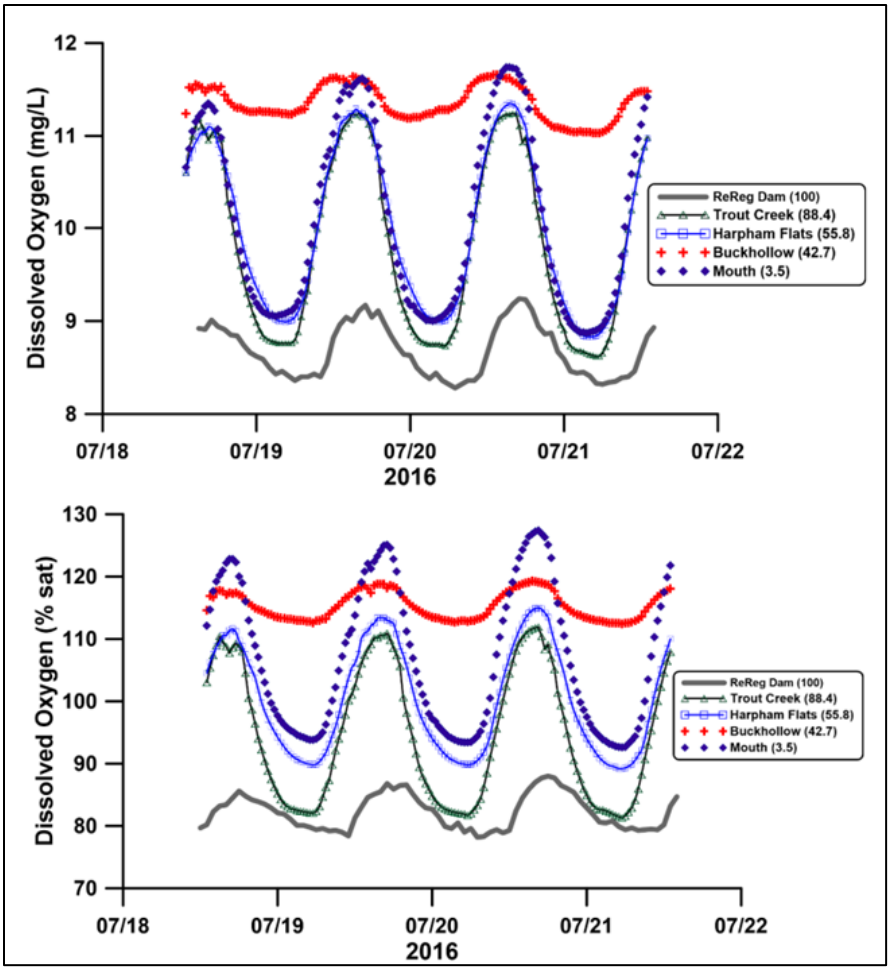

Figure 20. Dissolved oxygen concentration and percent saturation collected from multiple locations in the Lower Deschutes River in 2016 (from Eilers & Vache, 2021).

pH

Similar to DO, long-term pH data collected by DEQ at the Highway 26 bridge and near the river mouth indicate variation in pH over time (**Figure 21**). Eilers and Vache (2021) reported that pH at the Hwy 26 site steadily increased from 1958 to 1990, with slight changes thereafter; at the river mouth, pH decreased 1962 to 1980, increased by 1990, and again increased slightly in 2010 after a period of stability. DEQ notes that the analysis does not consider enough of the temporal aspects (both daily and seasonal) to reach conclusions on long-term patterns in pH at these two sites.

The continuous data showed higher variability in diel pH at locations below the Project, increasing from upstream to downstream in the Lower Deschutes River (**Figure 22**). Daily variation in pH (peak-to-peak amplitude) was only about 0.2 pH units below the Reregulating Dam, while variation at the mouth was about 1.5 pH units (Eilers & Vache, 2021).

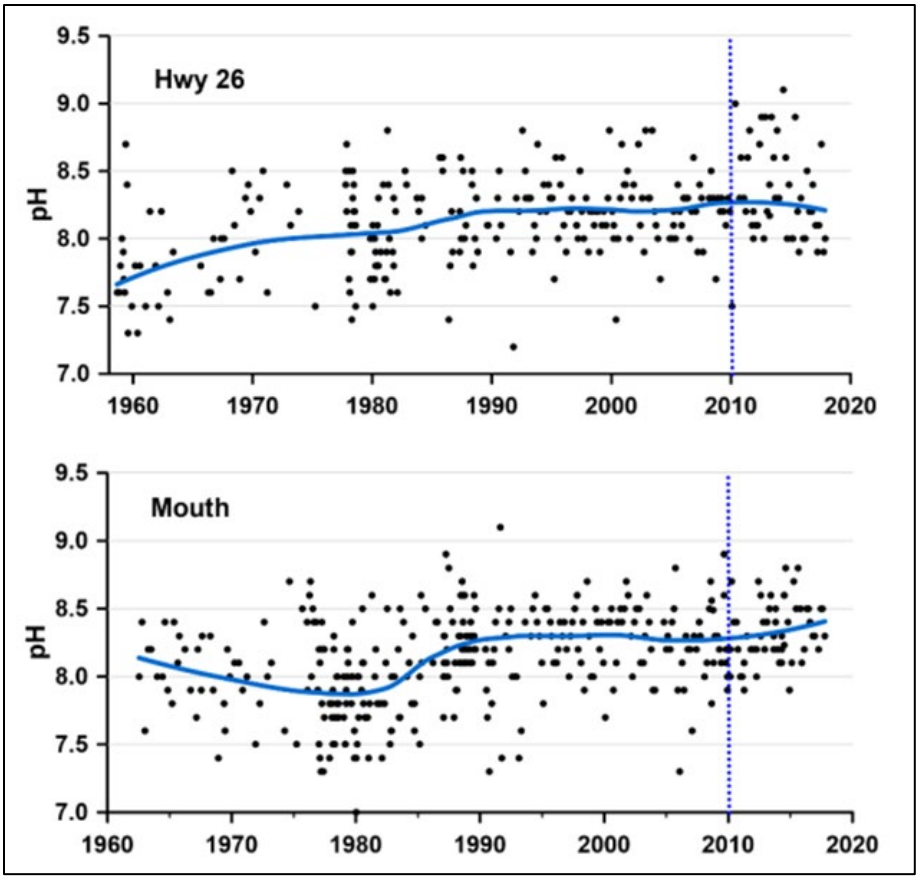

Figure 21. ODEQ AWQMP pH results at the Hwy 26 bridge site (RM 97.6) (top) and the LDR Mouth (RM 0.1) (bottom). The solid blue line is the LOESS fit of the observed data. The dashed vertical line denotes the start of operation of the SWW.

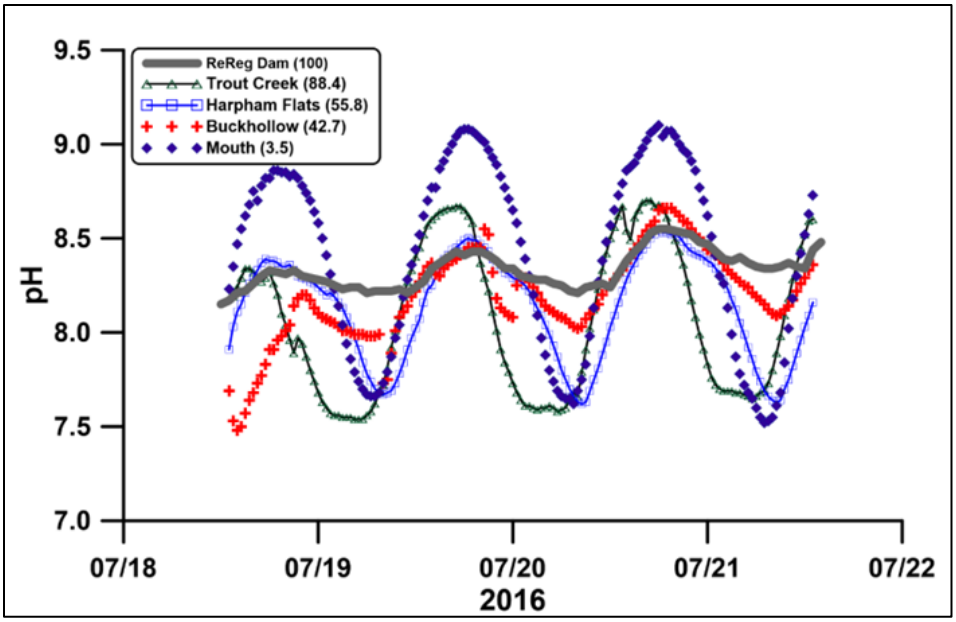

Figure 22. pH measured in Deschutes River in 2016 (from Eilers and Vache 2021).

The study reported that the relatively high levels of pH and DO, and high degree of diel variation, indicates high primary production in the river. Lake Billy Chinook and Lake Simtustus and known to be highly productive, and the three major tributaries all provide high levels of phosphorus to the system (Eilers & Vache, 2021). The authors also note that phytoplankton may more readily be transported downstream of the Project due to new surface water release from the SWW.

Chlorophyll *a*

The 2021 report made comparisons of chlorophyll a collected in surface waters of Lake Billy Chinook between 2015 – 2017 and 1994 – 1996, during a previous water quality study of the Project (Raymond et al. 1997). Eilers and Vache (2021) reported the mean chlorophyll between 1994-1996 was 17.1 µg/L (n = 23; se 2.97) compared to the 2015-2017 mean of 25.3 µg/L (n = 17; se 3.43), which is a 48% increase between the two periods. The greatest increase in chlorophyll in recent years was measured between June – August (**Figure 23**). The authors also reported a 54% decline in chlorophyll in Lake Simtustus between the two periods. In Lake Simtustus, average chlorophyll measured in 1994–1996 was 33.4 µg/L (se = 4.58, n = 23) compared to 15.4 µg/L in 2015–2017 (se = 5.35, n = 17) (Eilers & Vache, 2021).

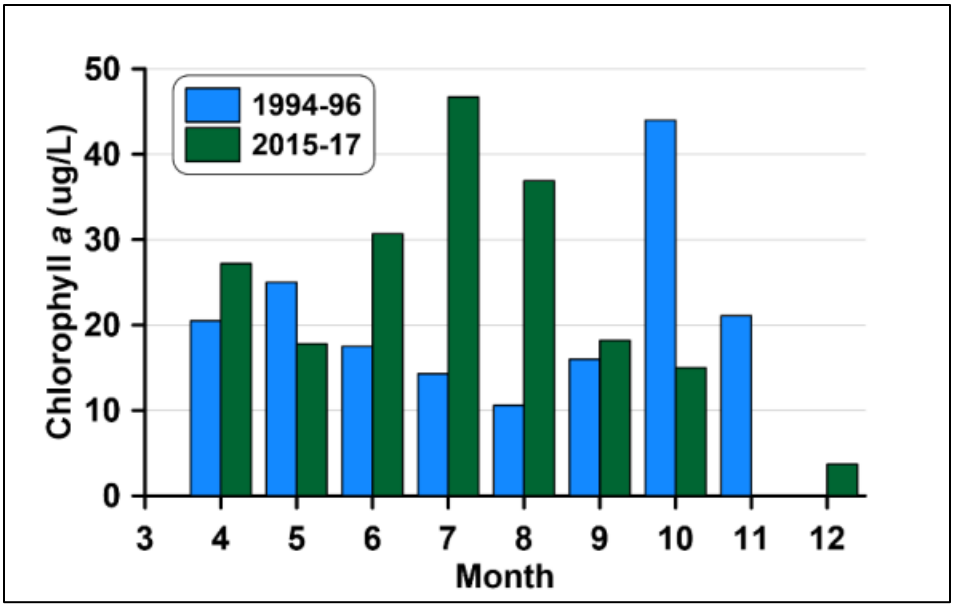

Figure 23. Monthly average chlorophyll a concentrations measured at Round Butte forebay in 1994–96 and 2015–17 (Eilers and Vache, 2021).

Longterm data collected by DEQ at Highway 26 and at the mouth of the Deschutes River, presented in the 2021 report, showed that chl *a* concentration has varied substantially over time in the Lower Deschutes (**Figure 24**). Determining causes for apparent trends is challenging in a dynamic riverine system. Based on the available data, Eilers and Vache reported an apparent increase in chl *a* levels at the mouth of the Deschutes in recent years, although there is insufficient data and analyses to determine cause or exact timing of that increase.

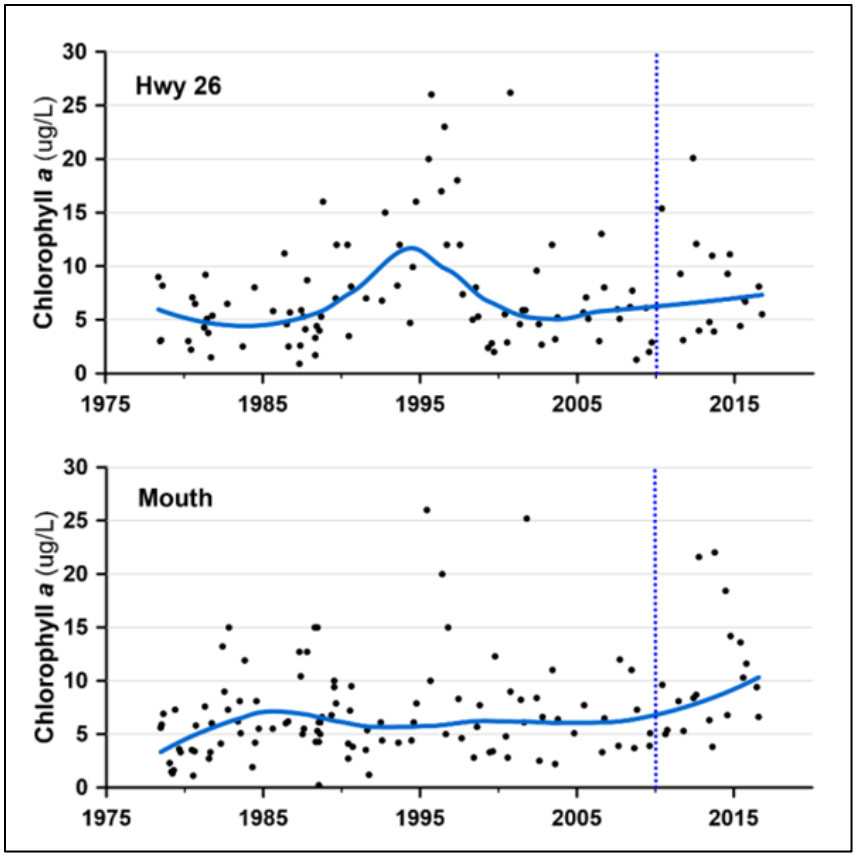

Figure 24. Chlorophyll a data collected at the Hwy 26 bridge site (RM 97.6) (top) and the LDR Mouth (RM 0.1) (bottom), presented with a blue line showing the LOESS fit of the observations and a dashed vertical line indicating the start of SWW operation (Figure from Eilers & Vache, 2021).

DEQ Preliminary Evaluation and Findings

Temperature and Fish Passage

Stated in DEQ's 2002 WQC Evaluation and Findings Report for the PRB Project, prior to construction and operation of the SWW, consistent bottom water withdrawal from the Project's deep-water outlets created artificial cooling in the Lower Deschutes River, relative to conditions that existed prior to the Project's construction, and caused a delay in seasonal warming and occurrence of peak annual temperatures. Also critically, presence of the Project blocked anadromous fish from portions of their historic spawning areas and led to population fragmentation of resident species and was a key focus of the multi-party process that led to

development of requirements included in the WQC, SA and FERC license (Oregon Department of Environmental Quality, 2002). As required by the FERC license, SA, and WQCs, to mitigate environmental impacts, the SWW was proposed, constructed, and operated to address the summer to late fall warming, provide additional control over water quality in discharge from the Project, and facilitate fish passage.

Construction and operation of the SWW has resulted in an intended shift in peak annual temperatures, on average resulting in cooler water temperatures downstream of the Project in the late summer and fall and warmer temperatures in the spring (Campbell, 2025; Eilers & Vache, 2021). The Licensees currently operate the SWW to follow the predicted "without project temperature", based on inflowing conditions to the Project. The SWW, adaptively managed as described in the WQMMP, reduces the Project's contributions to exceedances of applicable temperature criteria and strives to match the seasonal pattern of temperatures in the river that would be experienced if the dams were not present.

To meet fish passage goals, and therefore protect beneficial uses for fish habitat, the Licensees must, at times, balance releases of cold water for temperature compliance with production of surface flows to maximize attraction and collection of fish. Satisfying objectives for fish passage and temperature are more likely to be challenging when springtime water temperatures in Project inflows are above the long-term average. Maintaining high surface flow during the critical time period from March 15 to June 15 has allowed for a high percentage of downstream migrating fish to be captured for transport downstream (Portland General Electric Company and Confederated Tribes of the Warm Springs Reservation, 2025). The Licensees strive to balance blending at the SWW by maintaining surface attraction flows at times when sockeye, Chinook, and steelhead smolts are most likely to migrate downstream during the critical period. To continue increasing the number of smolts collected, nighttime generation was shifted to 11 pm through 6 am in 2022 and has continued through 2024 (Portland General Electric Company and Confederated Tribes of the Warm Springs Reservation, 2025). DEQ agrees with the Licensees and Fish Agencies that are party to the SA that maintaining surface flows during springtime smolt migration is necessary for fish collection and passage. DEQ is not the regulatory agency with expertise regarding fish passage, but relies on information provided by PGE, CTWS, and validated by ODFW to confirm that fish passage is facilitated by surface flows.

ODFW conducted studies in 2014 and 2015 on native redband trout in the Lower Deschutes River to examine the effect of the change in water releases from SWW operation on health of redband trout and aquatic resources in portions of the Deschutes below the Project. Methods were conducted in a way that allowed for comparison between recent and historical data. ODFW's report suggested that growth rate and condition of trout sampled in 2015 were similar to historic rates and noted that the spawning period for trout in the Lower Deschutes River has

shifted earlier in the year and matches the pre-Project timing of March – May, rather than the later timing of April – July observed after the Project was constructed. The report also suggests that earlier spawning and fry emergence would be beneficial to trout, allowing for an increase in juvenile's first year growth and condition (Seals et al., 2016).

The Temperature Management Plan within the WQMMP states "To meet the temperature standards, the amount of colder, hypolimnic water will be increased to ensure that the Project does not measurably increase the temperature over what would occur naturally at the Madras USGS Gauge (RM 100) if the Project were not present" (Confederated Tribes of Warm Springs Reservation of Oregon and Portland General Electric Company, 2004). Initially, the Licensees implemented a range of modeled blends that were predicted to meet water quality objectives, and over time have learned about the effectiveness of blending and ideal timing to direct changes in intake of surface and bottom water. This adaptive management approach to SWW operation allows the Licensees to adjust the blend of cold bottom water and surface water to best balance water quality needs with fish passage. Adaptive management also allows for the Licensees to adapt SWW operations to meet unanticipated environmental circumstances, which may include consultation with state and federal agencies, as needed.

Monthly and annual reports provide DEQ the opportunity to review SWW management and progress in supporting multiple beneficial uses, including temperature and fish passage goals. Additional communication between the Licensees, DEQ, and other state and federal fisheries management agencies may also be requested to guide blending at times when a potential conflict between water quality and fishery needs arises. Conditions of the WQMMP allow DEQ to request updated blends if determined necessary, providing that any such changes be reviewed in coordination with the Licensees and Fisheries Technical Subcommittee. This adaptive management approach also allows for refinement of blending as new research becomes available. For example, at this time it is DEQ's understanding that additional modeling is underway to examine effects of increased bottom water blending outside of the critical period on Lower Deschutes River temperatures. Further research is being considered by the Licensees to understand the limitations of the cold water reserves in Lake Billy Chinook, and what effect using more bottom water early in the year would have on availability of cold water for late summer/fall release.

As noted above, the shift to warmer springtime and earlier peak temperatures below the Project was an intentional effect of SWW operation. A recent publication suggested that the SWW has also had numerous unintended consequences on water quality and fisheries in the Lower Deschutes River (Eilers et al., 2025). DEQ is interested in engaging in efforts to better understand potential changes to water quality in the Lower Deschutes River and in working with the Licensees on mitigation efforts where applicable. Evaluations and implementation of the WQC

are an ongoing process and new studies or information may be used to guide future management decisions.

This draft report included a preliminary review of long-term temperature data, from the date the Round Butte dam was constructed to the present, collected below the Project in Madras (Hwy 26) and near the mouth of the Lower Deschutes River at the Columbia (at Deschutes River Park). The data were separated according to season, selecting March 15 – June 15 to examine springtime temperatures, coincident with surface flows for collection of migrating smolts, and June 16 – September 20 to evaluate summer temperatures. Samples were also sorted by time of collection (morning vs afternoon), to avoid potential patterns that may be mistakenly caused by comparing grab samples collected at different times of the day.

Based on the preliminary review, the data for morning and afternoon Spring temperatures do not suggest a clear pattern or change before and after 2010 (initiation of SWW operation) at either location in the spring (**Figures 25 and 26**) or summer months (**Figures 27 and 28**).

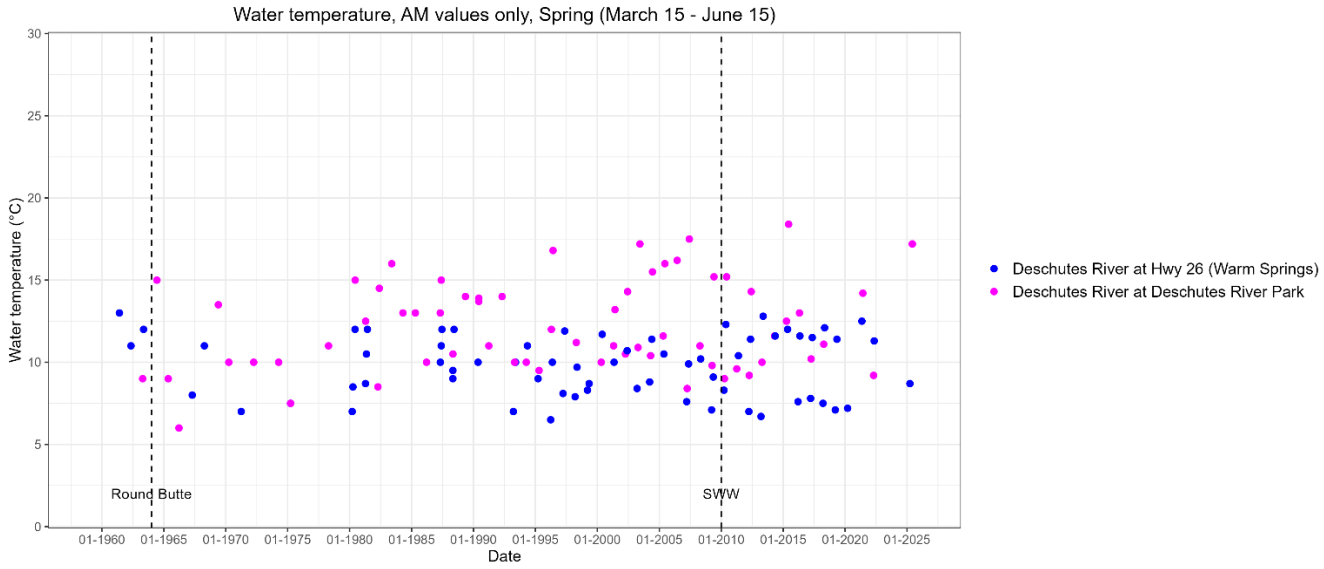

Figure 25. Spring water temperatures in the Lower Deschutes River collected in the morning from locations in Madras at Hwy 26 and near the river mouth at Deschutes River Park.

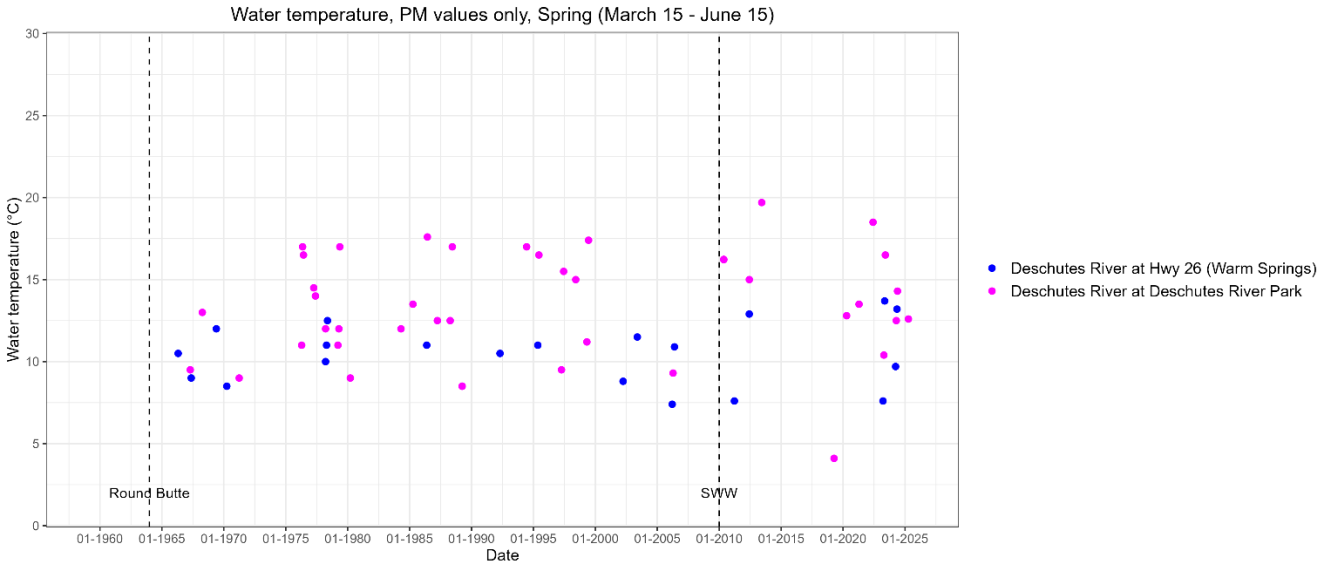

Figure 26. Spring water temperatures in the Lower Deschutes River collected in the afternoon from locations in Madras at Hwy 26 and near the river mouth at Deschutes River Park.

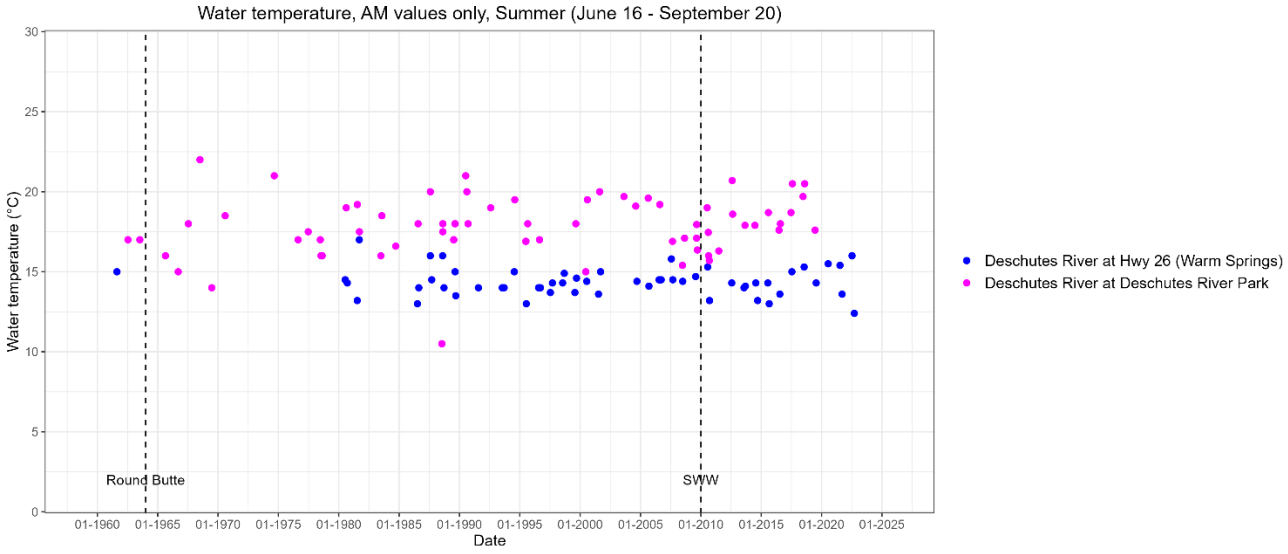

Figure 27. Summer water temperatures in the Lower Deschutes River collected in the morning from locations in Madras at Hwy 26 and near the river mouth at Deschutes River Park.

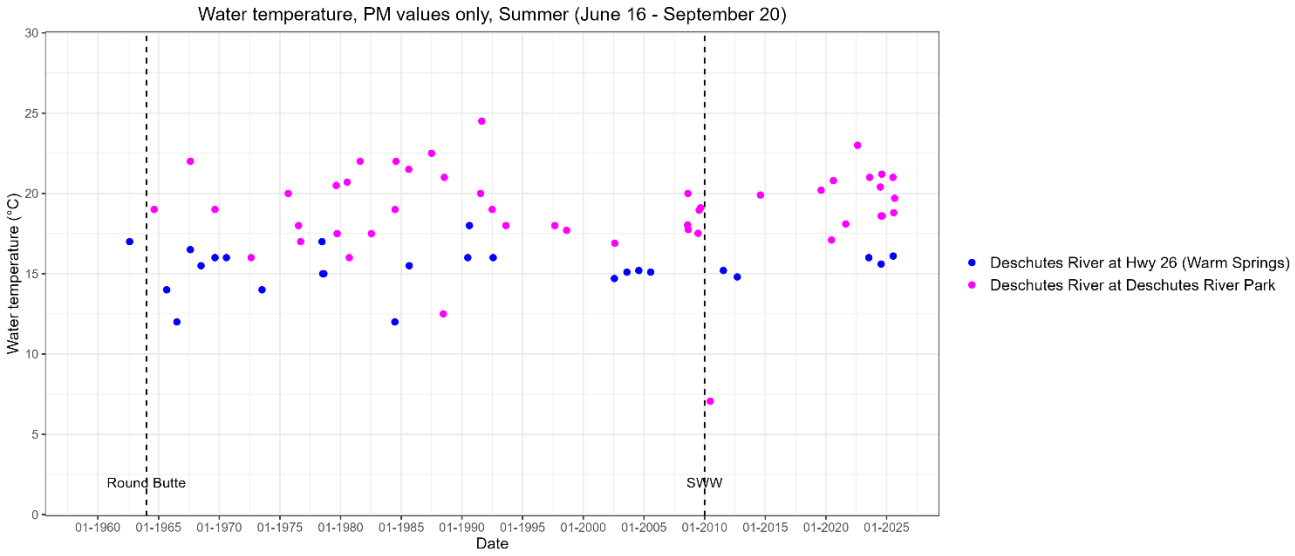

Figure 28. Summer water temperatures in the Lower Deschutes River collected in the afternoon from locations in Madras at Hwy 26 and near the river mouth at Deschutes River Park.

Water temperatures from the tributaries coming into the Project, ambient air temperatures, and precipitation patterns are changing over time, creating additional challenges for managing water temperature and water quality impairments that are regionally influenced (Heeter et al., 2023; Tohver et al., 2014). Surface waters upstream of Lake Billy Chinook are included in Oregon's 2024 impaired waters list due to temperature criteria exceedances, including Wychus Creek, the Metolius River, the Deschutes River, and the Crooked River. Eilers and Vache (2021) found increasing temperature trends in the major tributaries of Lake Billy Chinook over the period examined (2006-2017), noting these trends were consistent with regional trends in water temperature. Tributaries within and below the Project, Willow Creek and Trout Creek, respectively, are also on DEQ's impaired waters list due to elevated temperature and may affect thermal loading to the Lower Deschutes. DEQ may assign additional responsibility to mitigate thermal loading to multiple natural resource managers based on development of a future TMDL for temperature in the Deschutes Basin.

Dissolved Oxygen

At times it is challenging for the Licensees to meet applicable dissolved oxygen criteria downstream of the Reregulating Dam while balancing operations of the SWW to remain in compliance with temperature standards. As described above, during stratification of Lake Billy Chinook and Lake Simtustus, dissolved oxygen levels decline dramatically with depth. Particularly in the summer and fall, surface waters have high oxygen levels, but also high temperatures, that decline dramatically with depth. At times this may cause lower levels of DO in

discharge from the Project as the SWW is operated to increase the amount of cooler bottom water taken in to meet the temperature targets.

Data from recent years shows that the dissolved oxygen criteria are generally attained in the Lower Deschutes River. Shown above in Figure 20, continuous data collected in July 2016 at several sites in the Lower Deschutes River by Eilers and Vache (2021), indicate waters below the Project met Oregon DEQ's 8 mg/L dissolved oxygen criteria applicable in the non-spawning period (Eilers and Vache 2021). The Lower Deschutes River from the Reregulating Dam to the Warm Springs River is listed as impaired for dissolved oxygen standards on DEQ's state-approved 2024 Integrated Report. Below the Warm Springs River however, the Lower Deschutes River is listed as attaining state water quality standards for DO, as of this draft report.

In the Dissolved Oxygen Management Plan component of the WQMMP, the licensees state that controlled spills at the Reregulating dam will be utilized to increase dissolved oxygen levels when they appear to fall below the criteria. In balancing the competing needs of temperature, dissolved oxygen, and fish passage, DEQ is reasonably assured that that dissolved oxygen is sufficiently managed under operations outlined in the 2004 WQMMP with the adaptive measure of utilizing controlled spill when non-compliance with the standard is identified in waters discharged from the Project.

DEQ also conducted a preliminary review of long term dissolved oxygen saturation data collected below the Project in Madras (Hwy 26) and near the mouth of the Lower Deschutes River at the Columbia (at Deschutes River Park). The data were sorted as described above for temperature – seasonally (spring vs summer) and according to morning or afternoon collection time. Based on the preliminary review, DEQ does not find clear indication of a change in DO saturation before and after 2010 (initiation of SWW operation) in the spring (**Figures 29 and 30**) or summer months at either location (**Figures 31 and 32**).

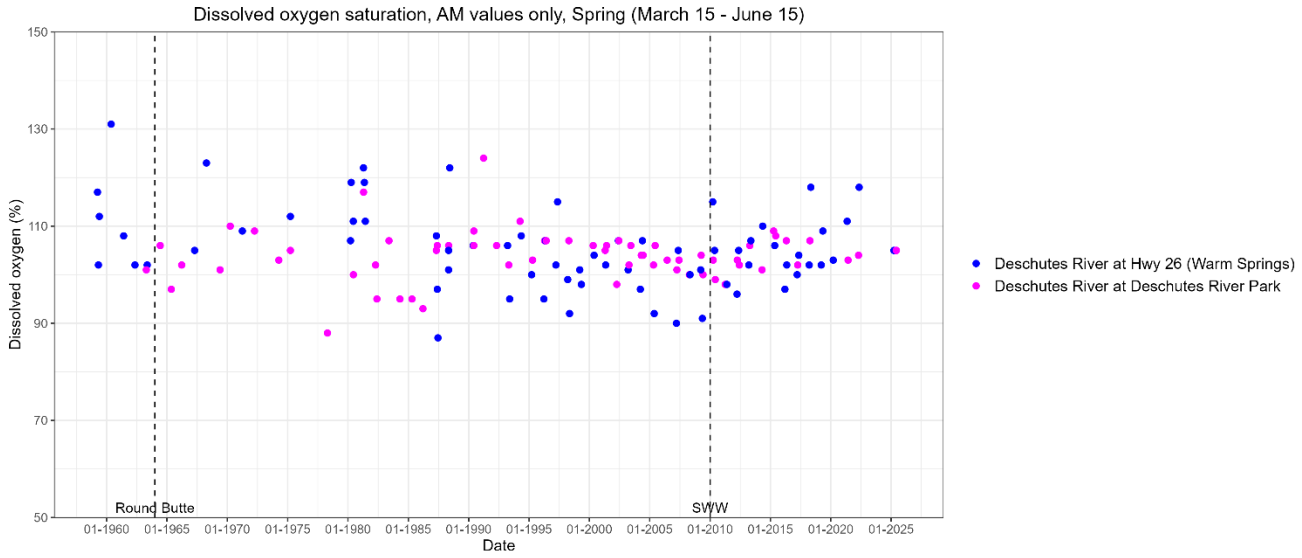

Figure 29. Spring dissolved oxygen levels, measured as percent saturation, in the Lower Deschutes River collected in the morning at Hwy 26 and near the river mouth at Deschutes River Park.

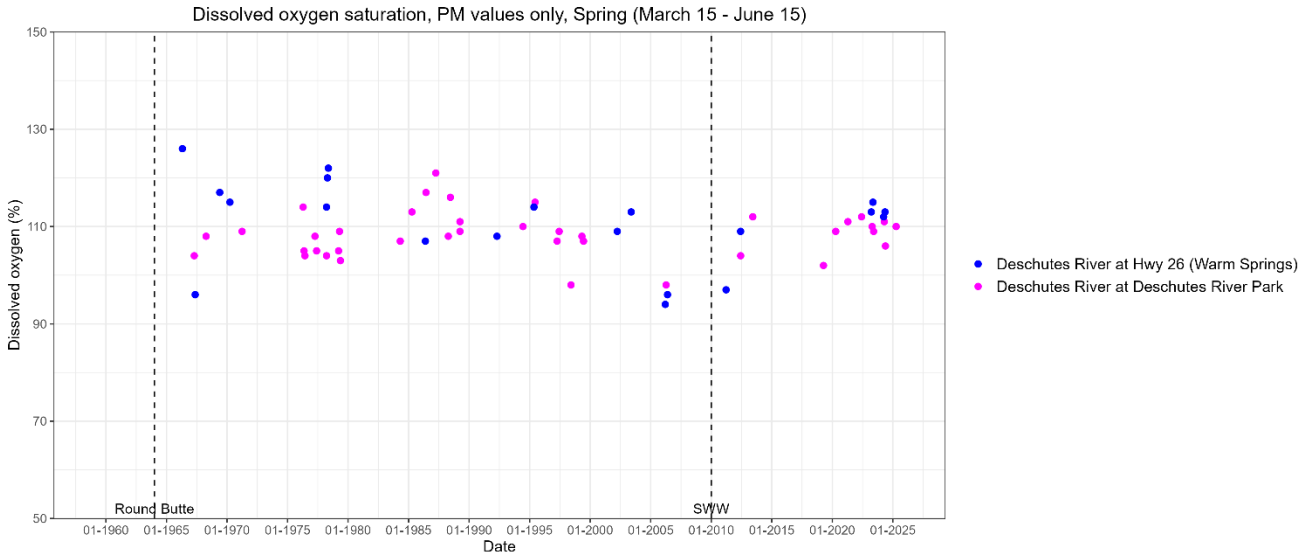

Figure 30. Spring dissolved oxygen levels, measured as percent saturation, in the Lower Deschutes River collected in the afternoon at Hwy 26 and near the river mouth at Deschutes River Park.

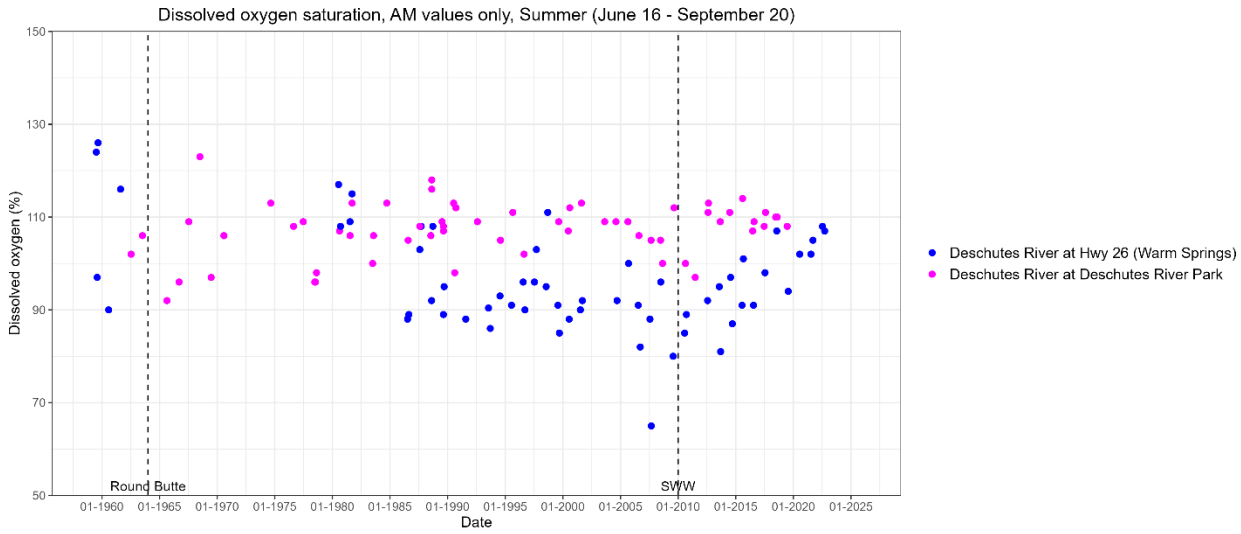

Figure 31. Summer dissolved oxygen levels, measured as percent saturation, in the Lower Deschutes River collected in the afternoon at Hwy 26 and near the river mouth at Deschutes River Park.

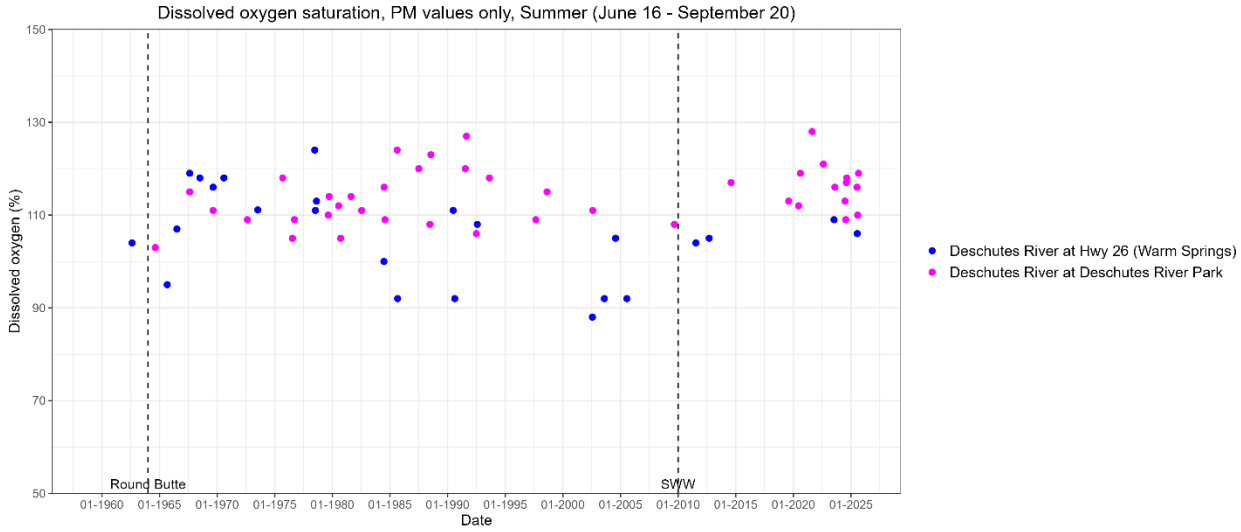

Figure 32. Summer dissolved oxygen levels, measured as percent saturation, in the Lower Deschutes River collected in the afternoon at Hwy 26 and near the river mouth at Deschutes River Park.

pH

Before and after operation of the SWW, pH concentrations have at times exceeded DEQ's water quality standards upstream, within, and below the Project. In 2024, the Licensees reported pH

values that exceeded criteria within inflowing waters from each arm of Lake Billy Chinook (Campbell, 2025). Eilers and Vache (2021) reported that pH showed a similar pattern to that of DO saturation in Lake Billy Chinook, with high levels in surface waters and low levels in bottom water, indicating high rates of primary production near the surface and respiration lower in the water column. Surface water intake, prioritized at times for fish passage, likely results in higher pH waters passing downstream of the Project. Intake of bottom water, with lower pH and colder water, has the limitation of lower dissolved oxygen levels and does not allow for collection of fish.

If determined necessary to reduce exceedances of pH, the 2004 WQMMP includes provisions for the Licensees to contact and work with the ODEQ and to develop an approach to reduce pH that is consistent with maintaining compliant temperature and DO values and surface withdrawal volumes necessary to facilitate smolt movement in Lake Billy Chinook. Further monitoring and analyses of pH at depth within Lake Billy Chinook may be needed to help determine the relationship between SWW water blends and downstream pH. At this time, there is no known operational procedure that can lower pH without adversely affecting temperature or dissolved oxygen, because bottom water in Lake Billy Chinook that has a lower pH also has lower dissolved oxygen. Additionally, releasing cooler bottom water when not needed for temperature management may reduce the available volume of cold water that will be needed to manage temperature in late summer and fall.

At the time DEQ was developing a 401 WQC for the Project, it was apparent that balancing operational targets for the SWW may at times adversely affect the Licensees ability to meet pH standards. Modeling conducted by the Licensees (at the time, the Applicants) indicated 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; modeling also showed that any increase in pH would be temporary, significantly reduced by RM 88 and virtually undetectable below RM 57 due to attenuation in the river (Oregon Department of Environmental Quality, 2002). These assessments were included in DEQ's 2002 Evaluation and Findings Report and made available for public comment with the draft WQC. Based on recent water quality reports, discharge below the Project is below 8.5 Standard Units (SU) for most of the year, with the exception of dates in late summer months where daily maximum pH at times exceeds this value. The modeling analysis related to pH attenuation indicated that below ~ RM 57 influences from the Project are likely negligible, and other sources may be contributing to exceedances of water quality criteria in lower sections of the river. When DEQ develops a TMDL for the Deschutes River Basin, additional responsibilities for the Licensees and other resource managers in the Deschutes River Basin may be assigned, as determined necessary, to meet water quality standards.

Water quality grab sample data collected at Hwy 26 and the mouth of the Lower Deschutes River from the 1960s to the present are shown below as a preliminary review of potential changes since the SWW became operational in 2010. The data were collected as grab samples, not continuous monitoring, and therefore cannot be used to evaluate maximum or minimum values or diel variation. It is evident that pH has at times exceeded 8.5 below the Project and at the river mouth both before and after SWW operation throughout the spring and summer months. Samples collected in the morning hours at Hwy 26 during the spring and summer months may have a higher incidence of samples above a pH of 8.5 after 2010, although the same pattern is not obvious in the afternoon samples or at the mouth of the Deschutes River (Figures 33 – 36).

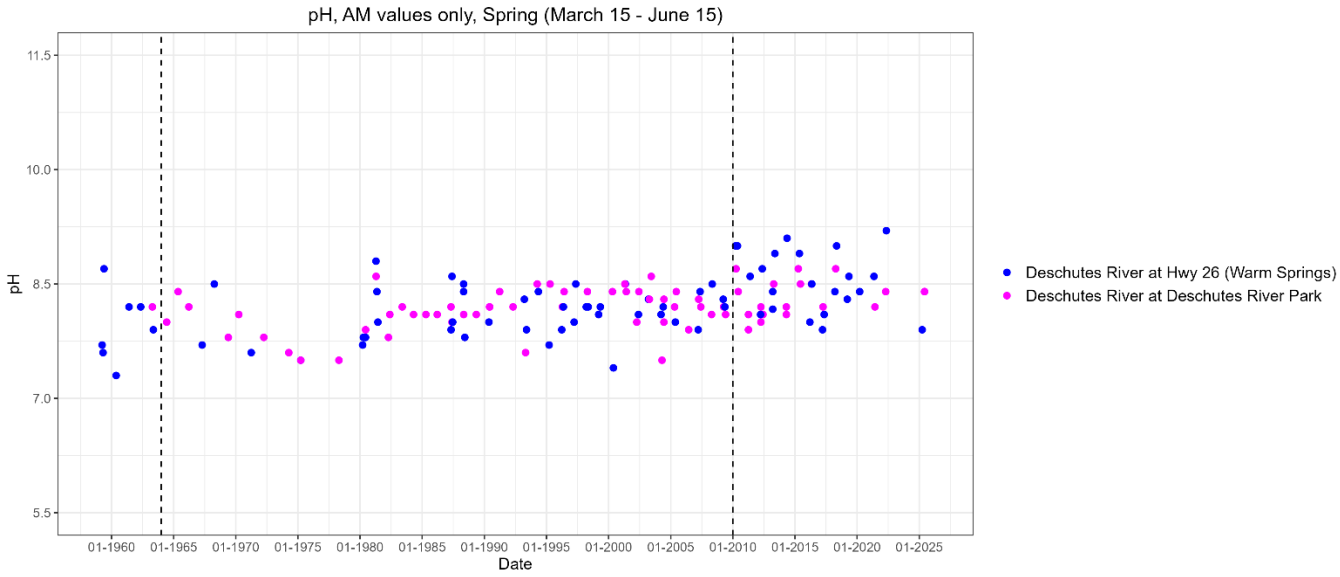

Figure 33. Spring pH levels in the Lower Deschutes River collected in the morning at Hwy 26 and near the river mouth at Deschutes River Park.

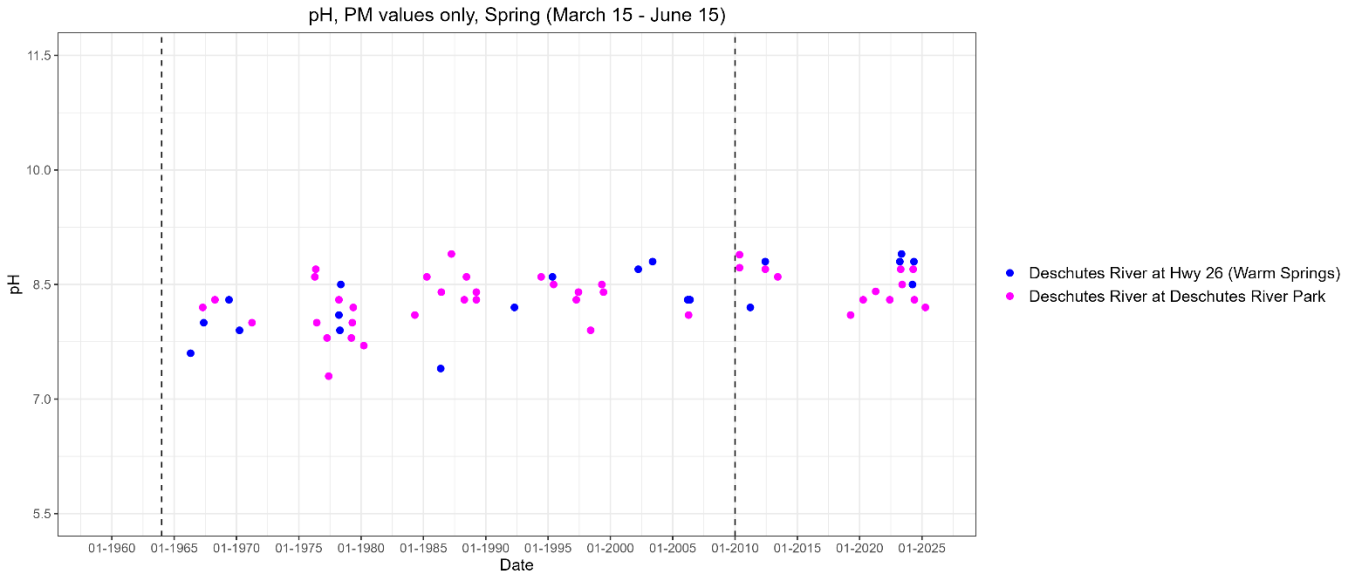

Figure 34. Spring pH levels in the Lower Deschutes River collected in the afternoon at Hwy 26 and near the river mouth at Deschutes River Park.

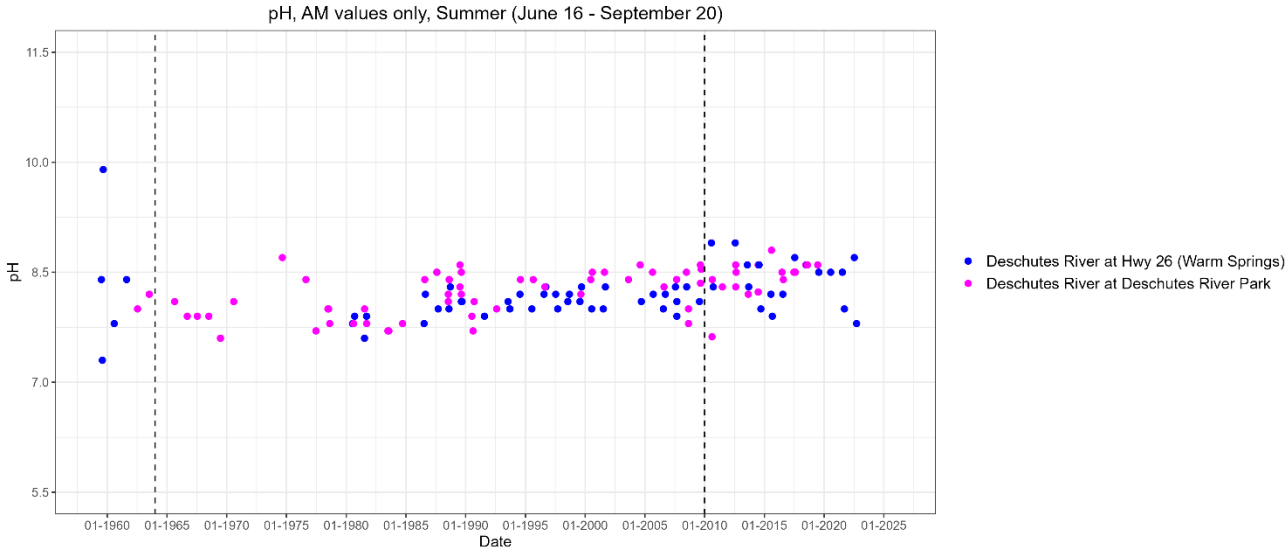

Figure 35. Summer pH levels in the Lower Deschutes River collected in the afternoon at Hwy 26 and near the river mouth at Deschutes River Park.

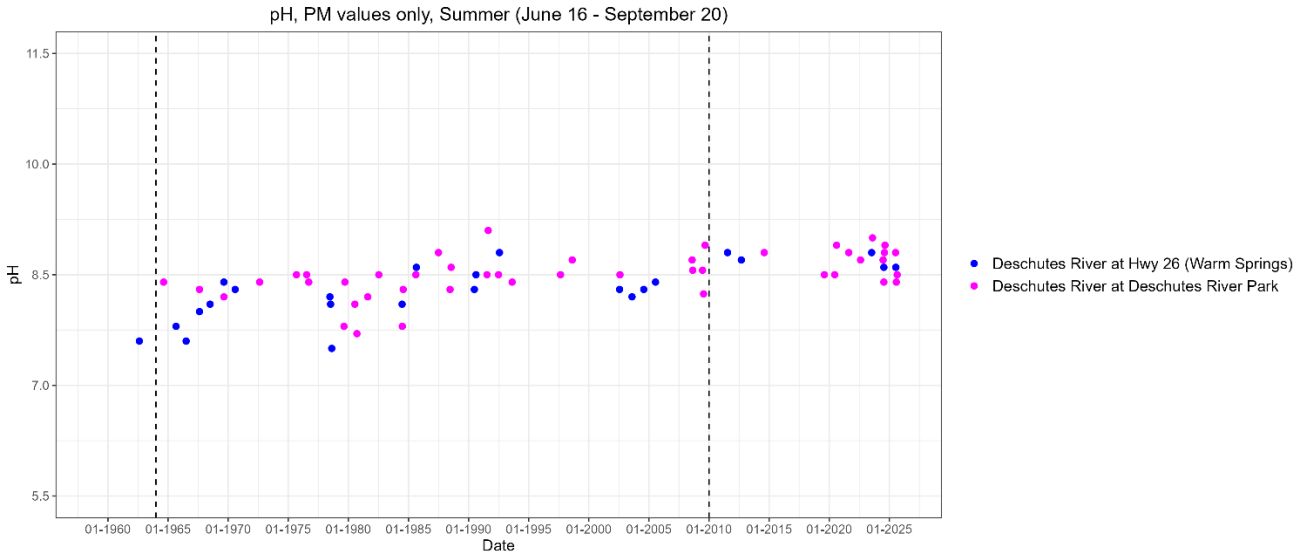

Figure 36. Summer pH levels in the Lower Deschutes River collected in the afternoon at Hwy 26 and near the river mouth at Deschutes River Park.

Chlorophyll *a*

The water quality study funded by the Licensees suggested that primary production increased in the surface waters of Lake Billy Chinook at the Round Butte forebay and declined in the epilimnion of Lake Simtustus, based on a comparison of data collected from 1994-1996 and 2015-2017 (Eilers & Vache, 2021). In their 2025 publication, Eilers et al. inferred that there has likely been an increase in algae in the Lower Deschutes River since the SWW became operational based on changes in caddisflies, although no similar change was evident in chlorophyll a concentrations at that time (Eilers et al., 2025). In this report draft, DEQ did not find evidence of a trend in chlorophyll a data collected downstream of the Project as a result of SWW operations in 2010, either at Hwy 26 or at the river mouth (**Figure 37**). Data presented in Figure 35 was limited to 1978 to present due to changes in analytical methods and was further limited to data only collected in the growing season.

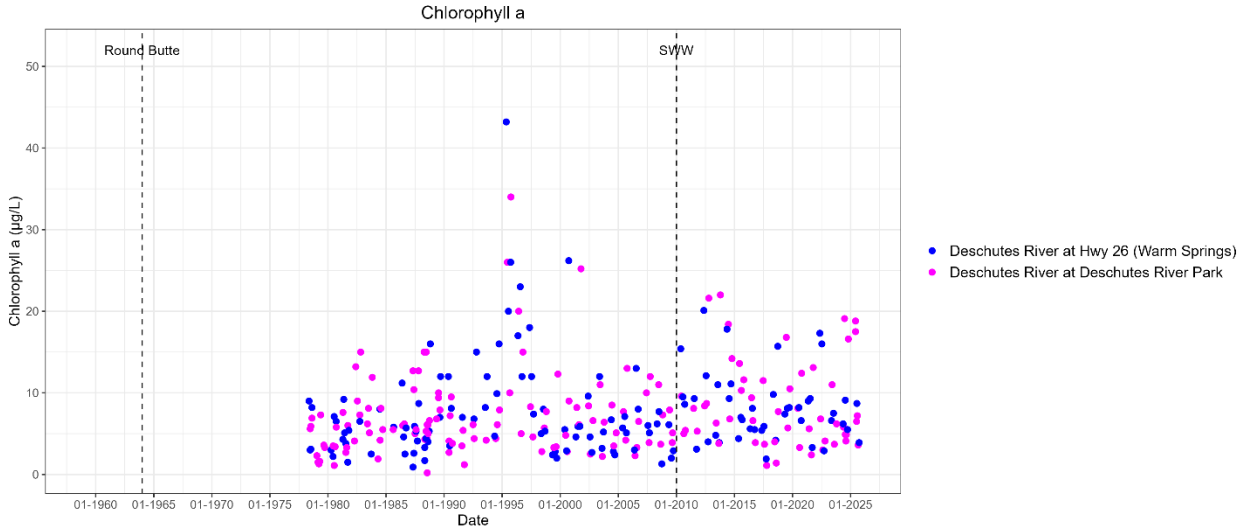

Figure 37. Chlorophyll a collected at Hwy 26 and near the mouth of the Deschutes River.

Since 2000, the Oregon Health Authority (OHA) has issued public health advisories for more than 40 waterbodies in Oregon, which include lakes, reservoirs, ponds and portions of rivers, due to the presence of Harmful Algal Blooms (HABs). OHA issued public health advisories for HABs based on concentrations of cyanobacteria toxins that can be harmful to humans and animals. In 2010, DEQ began including waters with HAB health advisories on its 303(d) list of impaired waters. The negative impacts of the HABs on beneficial uses of the waterbodies constitute a violation of state water quality standards. In recent years, LBC and Lake Simtustus have been included on the OHA's advisory list due to high levels of cyanotoxins. DEQ developed a HAB strategy in 2011 in coordination with OHA and is working on additional tools, such as satellite monitoring, to help identify locations where toxins may be present in high amounts and to develop monitoring and reporting plans. DEQ started regular HAB monitoring in Lake Billy Chinook in summer of 2025 to support future TMDL development.

The WQMMP includes a Nuisance Phytoplankton Growth Management Plan to protect beneficial uses of waters affected by the Project. The plan includes an adaptive management provision that allows for the Licensees to work with DEQ and the CTWS to continue assessing whether beneficial uses of Project reservoirs are affected by nuisance phytoplankton, and the opportunity to develop and implement a control strategy that is technically and economically practicable. This provision also allows the Licensees to take advantage of agency tools that have been recently developed for HABs monitoring, prediction, and coordination among state agencies in protecting beneficial uses.

Water Quality Workgroup

Many parties have expressed interest in Lower Deschutes River water quality over the years, especially since the SWW began operations. As a result of shared interests and recent concerns, PGE and the CTWS convened a water quality working group (WQWG) from May 2022 – May 2023. Participants included representatives for the Licensees, non-governmental organizations, and state and federal agencies, including the Native Fish Society, Trout Unlimited, Deschutes River Alliance, The Freshwater Trust, The Conservation Angler, Pacific Rivers, Central Oregon Informed Angler, Wild Steelhead Coalition, Western Fishing Adventures, Fish the Swing, Belozer's Whitewater Fishing Agency, ODFW, ODEQ, and BLM. As described in the Process Overview document prepared after conclusion of the working group, workgroup objectives included hearing shared interests and issues in the lower river, sharing science and information that has shaped Project operations, discussing desired outcomes for temperature management, exploring SWW blending scenarios that meet regulatory needs and the group's desired outcomes, and building trust among the watershed partners. Six meetings were held from 2022-2023 and were facilitated by an outside group; materials were provided for review, presentation, and meeting notes were summarized.

Over the course of the meetings, participants had multiple opportunities to share in discussions and present their perspectives, to learn about regulatory requirements and technical limitations on Project operations, and to learn about modeling that was used to direct optimal blends proposed in the WQMMP. Substantial time was spent in discussion of possible blend scenarios but ultimately none of the scenarios were found that could satisfy all the group's desired outcomes and meet project operational constraints. Remaining meetings focused on developing recommended actions and next steps to improve habitat and meet temperature objectives in the Lower Deschutes River by alternate means.

The selected final action steps included riparian revegetation and restoration, developing a Lower Deschutes River shared study/data repository, and pursuit of restoring instream water rights that would increase flows in the Deschutes River system. As of the drafting of this report, it is DEQ's understanding that current progress on any of these actions has been limited. Additional engagement opportunities could be beneficial in the future if parties express continued interest and commitment, and with specific outcomes and intentions defined prior to convening a workgroup.

Next Steps for Water Quality Management

DEQ is aware of the history of water quality impairments in the Lower Deschutes River and maintains strong interest in understanding changes in water quality, both intended and unintended, before and after operations of the SWW began. At this time, however, uncertainty remains about the relative responsibility of the Project and other watershed and climate effects on water quality in the Lower Deschutes River. The SWW was partly intended to minimize the effect of the dams on downstream waters by releasing a blend of surface and bottom water, using a flow weighted mix of incoming tributary waters as a water quality target. It was not intended to also offset the impact of multiple impoundments in the upper watershed and incoming pollutant loads on water quality coming into Lake Billy Chinook. The SWW caused a return of surface flows to the Lower Deschutes for the first time in more than 50 years. During settlement discussions and FERC licensing, it was understood that a return of surface flows would cause changes to the lower system, some anticipated and some not. DEQ looks forward to continued involvement and discussion with watershed partners about ongoing research and modeling in the Deschutes Basin to help further direct important management actions and support future TMDL development. DEQ may update evaluations and findings in this draft report as new studies and reports on water quality within and downstream of the Project become available.

As of this report draft, the Licensees are also planning upgrades to the fish hatching and rearing facilities at the Reregulating Dam. Improvements to these facilities are not intended to increase the number of fish produced at the facility or move the facilities to a different location, but to improve the function and purpose of structures in use at the Project. DEQ and the Fish Committee have been involved with the Licensees in early review stages for preliminary designs and in communication about possible permitting needs to complete the work. The Licensees will be seeking required state permits for the construction and facility upgrades. While the Licensees will be applying for a FERC license amendment because of the changes to Project facilities, any temporary or modified discharges are expected to be covered under permits other than the Project's WQC. For example, this may include updates to their NPDES (300-J) permit for the hatchery, a 401 WQC for dredge and fill activity, and construction stormwater permit. Any activities related to the facility upgrades will not result in changes to the operation of the SWW or Project-related impacts covered under the WQC for the hydropower project. DEQ will continue discussing these modifications with the Licensees. As of this report draft, DEQ does not anticipate that the fish facility upgrades will impact activities covered under the Project's WQC in a way that would necessitate or warrant modification.

DEQ evaluates compliance with a 401 WQC based on continued progress in meeting or implementing conditions of the WQC. The Licensees for PRB have developed a WQMMP, with input from members of the Settlement Working Group, to manage objectives for temperature, DO, pH, and nuisance phytoplankton in Project waters. The SWW was constructed and has been operated in accordance with measures and adaptive management outlined in the WQMMP to meet DEQ and Tribal water quality standards and fish passage goals of the FERC license. The Licensees continue to work with regulatory agencies and the Fish Committee, as representatives of the parties of the SA, in making decisions about the facility and operations. DEQ continues to receive water quality reports monthly and annually from the Licensees, and more frequent communication when unanticipated environmental conditions arise. Water quality reports show that discharge from the Project has largely met DEQ's currently applicable water quality standards for temperature and DO in recent years. Managing pH in summer months continues to be a challenge because there is no operation that can reduce pH without adversely affecting DO and temperature. Based on current understanding of reservoir dynamics, releasing colder bottom water when it is not necessary to meet temperature targets early in the year depletes the supply of cold-water that will be available in the late summer and fall. Additional modeling may prove helpful in better understanding these dynamics.

Oregon DEQ, in accordance with OAR Chapter 340, Division 048, and, as applicable, 33 USC §1341, may modify a Certification to add, delete, or modify Certification Conditions as necessary and feasible to address conditions listed in OAR 340-048-0050(1). On March 31 and April 30, 2020, PGE submitted to ODEQ a proposal for revisions to the temperature and DO sections of the WQMMP for the PRB on behalf of itself and the CTWS. As the WQMMP is a component of the WQC and FERC license, any revisions to the plans would necessitate modification of the WQC. Proposed modifications to the WQC would clarify DEQ's current water quality standards. However, the WQMMP is a requirement of both DEQ and the CTWS certifications and provides operational management that will be implemented to meet both state and Tribal standards. In the past, DEQ has coordinated with the CTWS about differences between several of our respective water quality standards. DEQ's most recent standards updates for the Deschutes Basin were completed in 2023 and await EPA approval. The CTWS is currently in the process of adopting revised criteria for the Deschutes River, and this process is not yet complete. DEQ maintains its previous position that addressing changes to water quality standards is best addressed through a coordinated modification of the certifications, including the WQMMP, once both regulatory entities have finalized revisions to respective water quality standards.

Further, DEQ's certification and previous evaluations noted that a TMDL would be developed to help determine responsibilities for further management of water quality pollutants in the Deschutes River Basin. Many of the questions and concerns from interested parties relate to nutrient, temperature, and other pollutant loading that requires a watershed-scale analysis and

plan for water quality management. Noted above in this report, waters upstream, within, and downstream of the Project are currently included on DEQ's impaired waters list and require TMDL development. DEQ may also determine that a modification of the WQC is appropriate based on load allocation assignments in a future TMDL; timing of any future modification to the WQC would also ideally coincide with TMDL issuance due to the complexity of process for WQC and FERC license modification requirements.

DEQ's assessment of WQC conditions and applicable WQ standards compliance is ongoing. Based on information available at this time, DEQ intends to continue overseeing implementation of the WQC and working with the Licensees and the Fish Committee to protect water quality standards through adaptive management measures provided by the existing WQC. Current adaptive management provisions allow the Licensees to adjust blending to meet and balance competing needs in supporting all beneficial uses. This provision also allows for consideration of new blending protocols at the SWW based on lessons learned from 15 years operating the SWW and from results of updated or new modeling and research. At the time of this draft report, at least one study is in progress evaluating the effects of a modified blending scenario and further research examining the finite limits on cold reservoir bottom water is also being considered. These results may further be considered by the Fish Committee and Licensees, according to procedures outlined in the SA, and used to refine ongoing management of the Project.

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