State of Oregon
Department of Environmental Quality Memorandum

Date: Sept. 9, 2024

To: Environmental Quality Commission

From: Leah Feldon, Director

Subject: Agenda item I, Informational item: Total Dissolved Gas Modification Order on the Mainstem Columbia River

Why this is important

This item will provide an overview of the U.S. Army Corps of Engineers' July 2024 request to DEQ to renew the total dissolved gas water quality standard modification on the lower Columbia River mainstem by January 2025 to allow for voluntary spill operations to benefit migrating salmonids at the four lower Columbia River U.S. Army Corps operated dams. DEQ will present background on this topic and summarize the EQC's role associated with this modification request.

Prior EQC involvement

The commission has granted modifications for total dissolved gas water quality standard on the Columbia River since 1994. The most recent modification order, which expired on Aug. 31, 2024, was approved by the commission in 2019. The commission granted the modifications based on the effectiveness of voluntary spill for fish passage compared to other in-river migration options (i.e., powerhouse passage) and the low incidence of gas bubble trauma.

Background

There are 13 evolutionarily significant/distinct population segments units of Columbia River Basin salmon or steelhead species listed as threatened or endangered under the Endangered Species Act. Migrating salmonids pass the lower mainstem Columbia River dams through turbines and over the spillways. Fish experience increased incidence of mortality from turbine passage as compared to spillway passage. Releasing water over a dam's spillway is an anadromous salmonid fishery-management tool used to reduce mortality and assist migrating salmonids on the Columbia River. However, spilling water over the dams increases the level of total dissolved gas in the river. Water plunging from a spillway traps air and carries it to a depth where the pressure forces the gas to dissolve into water. Total dissolved gas levels above 110 percent of saturation can cause gas bubble trauma in fish, which can cause adverse health impacts, including mortality.

Oregon adopted the U.S. Environmental Protection Agency's recommended total dissolved gas criteria of 110 percent of saturation. The 110 percent total dissolved gas standard protects beneficial uses of the Columbia River and protects aquatic life, such as endangered and threatened salmon and trout salmonid species. In 2002, Oregon and Washington issued the *Total Maximum Daily Load for Lower Columbia River Total Dissolved Gas* (TMDL) that was approved by EPA. The U.S. Army Corps of Engineers

(Corps) operates the four dams – Bonneville, The Dalles, John Day, and McNary – on the lower Columbia River and is responsible for implementing the operational and structural modifications identified in the TMDL. The goal of the TMDL is to meet the 110 percent total dissolved gas criteria while allowing for voluntary fish passage spill.

The Endangered Species Act requires the agencies that operate the Federal Columbia River Power System ensure their actions are not likely to jeopardize the continued existence of a listed species, nor destroy or adversely modify designated critical habitat. In the 2020 Biological Opinion for the operation and maintenance of the Federal Columbia River Power System, the U.S. National Oceanic and Atmospheric Administration National Marine Fisheries Service has identified voluntary spill as the safest, most effective tool available for improving downstream smolt survivorship for salmonids listed under the Endangered Species Act. The Corps operates in accordance with the 2020 Columbia River System Supplemental Biological Opinion reasonable and prudent alternative actions.

Under Oregon Administrative Rules, the commission may modify the total dissolved gas criteria on the mainstem Columbia River for the purpose of allowing increased spill for salmonid migration (OAR 340-041-0104(3)). In 2019, the commission approved a five-year modification to the total dissolved gas water quality standard to allow for voluntary fish passage spill from April 1 through August 31 at the four lower Columbia River dams.

The 2019 modification order allowed for daily average total dissolved gas levels, measured as the average concentration of the 12 highest hours each day, to be up to 125 percent of atmospheric saturation during spring spill (April 1 – June 15) and up to 120 percent of atmospheric saturation during summer spill (June 16 – Aug. 31). In approving the modification, the commission required the Corps to monitor total dissolved gas levels in the dam tailraces, conduct biological monitoring of juvenile salmonids and resident non-salmonid aquatic species to evaluate the incidence and severity of gas bubble trauma, and provide annual reporting. The modification order also includes a provision that allows for the DEQ Director to approve additional periods of application beyond the April 1 to Aug. 31, subject to prior written notification from the Corps. The agreement expired at midnight on Aug. 31, 2024 and the total dissolved gas criterion reverted to 110 percent of atmospheric pressure. The Oregon Administrative Rule related to the total dissolved gas water quality standard and the 2019 *Order Approving a Modification to the Oregon's Water Quality Standard for Total Dissolved Gas in the Columbia River Mainstem* are included as Attachments A and B, respectively.

As allowed in the 2019 modification order approved by the commission, the Corps has operated the voluntary spring spill operations for juvenile salmonid passage up to 125 percent daily total dissolved gas levels and summer spill operations up to 120 percent daily total dissolved gas since 2020.

Routine monitoring of hydrosystem operation impacts include direct measurements of total dissolved gas levels, and associated gas bubble trauma observed in aquatic fish communities (see annual total dissolved gas report and appendices https://www.nwd.usace.army.mil/CRWM/Water-Quality/). The current network of water quality monitors has effectively provided information required to adjust spill operations to manage system gas at desired levels. Adaptive management processes have performed as expected and to date have demonstrated effective early warning with adequate off-ramps to remain within established criterion. In the last 28 years, Endangered Species Act listed salmonids have exhibited manageable level of risk and low incidence of gas bubble trauma in bypass collection facilities. Over the last five spill seasons covered by the previous modification agreement, there were no exceedances of the biological monitoring criteria that would have required a curtailment to spill levels. New monitoring below McNary and Bonneville dams have reinforced predicted relationships for other aquatic fish communities while remaining below standard gas bubble trauma criterion levels in Oregon waters. Overall, monitoring results indicate there is a low risk of gas bubble trauma to out-migrating juvenile salmonids and non-salmonid resident species when the Corps conducts spill in accordance with the spring 125 percent and summer 120 percent total dissolved gas levels.

In July 2024, the Corps sent a letter to DEQ requesting a renewal of Oregon's total dissolved gas modification order by January 2025 to allow for the planned Spring spill operations to proceed in a manner consistent with Oregon's water quality standards and the Clean Water Act. The Corps expects to continue implementation of spill operations for fish passage as outlined in Appendix B of the U.S. Government Commitments in support of the Columbia Basin Restoration Initiative of the Resilient Columbia Basin Agreement (Agreement). The Agreement – signed by the whole of the U.S. Government and the Nez Perce Tribe, the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Indian Reservation of Oregon, the States of Oregon and Washington, and environmental advocacy groups led by the National Wildlife Federation – specifies that spill up to 125 percent total dissolved gas will continue to be used as a tool for juvenile fish passage.

Proposed 2024 Total Dissolved Gas Modification Order

There is broad scientific consensus that increased spill proportion is expected to increase Endangered Species Act listed salmonid survival through decreased rate of powerhouse passage, with improvements in other associated fish passage metrics (e.g. water transit time, forebay residence time). Although increasing spill proportion is expected to increase total dissolved gas exposure and potential associated risks to aquatic life, since implementing modified standards, with sufficient data and in-season management flexibility, impacts have remained within established criteria levels. Recent expansion of gas bubble trauma monitoring has largely verified risk levels remain within established criteria levels in affected Oregon waters. Therefore, DEQ is preparing a renewed modification to maintain expected levels of risk while providing hydrosystem operators with actions that address enhancing hydrosystem passage for ESA listed salmonids while mitigating for other authorized purposes of the hydrosystem.

Voluntary spill reduces negative impacts to out migrating salmon associated with travel through the Columbia River hydrosystem. Planned spill that meets without exceeding the spill cap 24 hours per day/seven days per week is expected to reduce effects associated with hydrosystem operations such that life cycle survival improves to more regularly meeting Northwest Power and Conservation Council's smolt-to-adult return goal of 4% (2-6%). As predicted, powerhouse passage rate has decreased under the current modification order.

In 2020, the Federal Government released the Record of Decision for continued operations of the Columbia River System dams. Multiple parties, including the State of Oregon, Nez Perce Tribe, and National Wildlife Federation subsequently filed suit due to the Record of Decision's lack of compliance with the National Environmental Policy Act and Endangered Species Act. In 2021, the Biden Administration offered to negotiate a Stay of Litigation, resulting in the December 2023 Resilient Columbia Basin Agreement. The Agreement stays the litigation for up to 10 years in exchange for a list of federal commitments to increase fish and wildlife funding for the Columbia River Basin and to assess the viability of breaching the four Lower Snake River dams (i.e., replace the services those dams currently provide). The agreed-to operations in Appendix B of the Agreement (included as Attachment C) are substantially similar to the 2019-2021 Spill Operation Agreement that formed the basis for the most recent modification order. Additional action may be required to address the long-term operations identified in the 2023 Resilient Columbia Basin Agreement and Columbia River Basin Initiative.

Based on this information and these developments, on Sept. 6, 2024, DEQ released for public comment a draft five-year order modifying the total dissolved gas water quality standard in the Columbia River mainstem. If approved by the EQC, the new proposed order would be in effect for spill seasons 2025-2029. The draft document for public comment retains the structure and many requirements of the 2019 order. The proposed modification order would allow daily average total dissolved gas levels in dam tailraces, measured as the average concentration of the 12 highest hours each day, to be up to 125 percent of atmospheric saturation during spring spill (April 1 – June 15) and up to 120 percent of atmospheric saturation during summer spill (June 16 – Aug. 31).

The Corps would be required to conduct monitoring of total dissolved gas levels in the water column and biological monitoring to evaluate the incidence and severity of gas bubble trauma in resident aquatic species. The Corps works to manage voluntary spill levels to meet, but not exceed, the allowable total dissolved gas levels. In the spring, spill would have to be curtailed to 120 percent total dissolved gas if gas bubble trauma incidence rates in juvenile salmonids or non-salmonid resident aquatic species exceed either biological benchmark: 15 percent of the fish examined have signs of gas bubble trauma in non-paired ins or if five percent of the fish examined have signs of gas bubble trauma over more than 25 percent of the surface area of their fins (a sign of severe gas bubble trauma). The total dissolved gas limits do not apply when stream flows exceed the seven-day, ten-year frequency flood.

The proposed 2024 modification order provides greater flexibility during the fall-winter months (Sept. 1 – March 31) to allow for the agreed-to operations in the 2023 Resilient

Columbia Basin Agreement including the short-term operations in Appendix B to be implemented as planned.

Key issues

A new modification is needed in order to implement the December 2023 Resilient Columbia Basin Agreement, of which Oregon is a party, in addition to the Biological Opinions issued by the National Marine Fisheries Services and the U.S. Fish and Wildlife Service. If voluntary fish passage spill operations are not implemented, it is expected that powerhouse fish passage rates would substantially increase, causing increased mortality to out-migrating fish traveling past the four lower Columbia River dams.

On Sept. 6, 2024, 2024 DEQ released a draft five-year total dissolved gas modification order for the mainstem Columbia River. The public comment period will be open for 30 days. DEQ will consider and respond to all written comments received by 4:00 p.m. on Oct. 6, 2024.

EQC involvement

DEQ intends to bring a proposed total dissolved gas standard modification order for the mainstem Columbia River for commission action at the Nov. 21-22, 2024 EQC meeting. DEQ will share the results of the public comment period and present the standard modification request in the staff report.

Supporting materials

A. Oregon Administrative Rules for total dissolved gas on the mainstem Columbia River
B. Order Approving a Modification to the Oregon's Water Quality Standard for Total Dissolved Gas in the Columbia River Mainstem (2020)
C. Appendix B of the U.S. Government Commitments in Support of the Columbia River Restoration Initiative of the Resilient Columbia Basin Agreement
D. Public Notice of Proposed Modification to the Total Dissolved Gas Standard on the Mainstem Columbia River

Report prepared by David Gruen
Water Quality Division, Columbia River Coordinator

Translation or other formats

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800-452-4011 | TTY: 711 | deqinfo@deq.oregon.gov

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