State of Oregon
Department of Environmental Quality Memorandum

Date: May 1, 2019

To: Environmental Quality Commission

From: Richard Whitman, Director

Subject: Agenda Item K, Information Item: Columbia River fish passage and total dissolved gas standards
May 16-17, 2019, EQC meeting

Purpose

This item will inform the commission about:

- Fish passage activities at four dams along the lower Columbia River
- The U.S. Army Corps of Engineers' annual report on total dissolved gas levels at these dams during the 2018 fish passage spill season
- A 2019 request for modification to the total dissolved gas standard applicable at these same dams, under a multi-entity agreement

Why this is important

Out-migrating juvenile salmonids pass Columbia River dams through turbines, fish by-pass structures, and over the spillways. Mortality increases when fish pass through turbines instead of a dam's spillways. Releasing water over a dam's spillway is a fishery-management tool used to reduce mortality and assist out-migrating juvenile salmonids on the Columbia River. However, spilling water over 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.

Oregon adopted the US Environmental Protection Agency's total dissolved gas standard 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 species.

The commission has previously approved modifications to the standard allowing up to 120 percent total dissolved gas for voluntary spilling of water at Bonneville, The Dalles, John Day and McNary federal hydropower dams on the Columbia River, which enables additional spill to assist fish passage of out-migrating juvenile salmon and trout salmonids balanced against the increased risk of gas bubble disease. In late 2018, state and federal entities and the Nez Perce Tribe entered into an agreement that relies on 125 percent total dissolved gas modification in 2020-2021 for increasing spring spill during times of low hydropower demand. The commission will be asked to take action later in 2019 on a request to modify the total dissolved gas standard to be 125 percent for the April 1, 2020, start of the fish passage spill season.

Background

The U.S. Army Corps of Engineers operates the voluntary spill program at the four lower Columbia River dams to improve juvenile salmonid migration past the dams while minimizing risk from total dissolved gas.

Fish migration

In order to survive, juvenile fish must be able to migrate downstream past the Columbia River hydropower dams. Turbines at these hydroelectric dams increase the incidence of mortality and hinder out-migration of juvenile salmonids. The Corps deliberately releases water over spillways at McNary, John Day, The Dalles, and Bonneville Columbia River dams to improve fish passage by passing fish over the spillway instead of through the turbines. This is commonly referred to as voluntary fish passage spill. These spills, however, increase total dissolved gas to levels greater than the water quality standard of 110 percent. Elevated total dissolved gas levels can harm migrating juvenile and adult salmonids by causing gas bubble trauma, similar to the bends in humans.

Historic choice of voluntary spills

The commission has granted standard modifications to the Corps for total dissolved gas since 1994 for the purposes of fish passage. The commission granted the modifications because the Corps has demonstrated low incidence of gas bubble trauma and the effectiveness of voluntary spill for fish passage. 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.

Voluntary and involuntary spills

The Corps differentiates spill activities as voluntary or involuntary. Voluntary spill occurs for the purpose of juvenile salmonid migration. Involuntary spill results from factors outside the Corps' control and is often related to the dams' hydrologic capacity.

Factors affecting involuntary spill include:

- High flows that exceed the capacity of a dam to either temporarily store water upstream of the dam or pass the water through its turbines
- Power load requirements that are lower than actual powerhouse capacity
- Turbine unit outages, transmission outages and required operational and maintenance activities

Biological Opinion

The National Marine Fisheries Service publishes a Biological Opinion, which states whether a federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat. The Federal Columbia River Power System Biological Opinion requires voluntary fish passage spill at Columbia River dams to support fish migration even when it results in total dissolved gas saturation above Oregon's 110 percent standard. The Corps operates its spill program in accordance with the 2014 Federal Columbia River Power System Supplemental Biological Opinion reasonable and prudent alternative actions.

Total Maximum Daily Load Allows Spills

In 2002, Oregon and Washington issued a Lower Columbia River Total Maximum Daily Load for total dissolved gas that was approved by EPA. The TMDL allows fish passage spills until 2020 with a provision that operational and structural modifications that reduce total dissolved gas generated during spill must be in place by that time. The goal of the TMDL is to meet the 110 percent total dissolved gas state standard while allowing for voluntary fish passage spill.

Terms of current standard modification

The current modification allows for voluntary fish passage spill April 1 through August 31 at the lower four Columbia River dams. The modification requires physical monitoring of total dissolved gas below the dam, in the tailrace, with a limit of 120 percent average of the 12 hours in a day with the highest measurements, biological monitoring of gas bubble trauma in fish during the spill period and annual reporting to DEQ. The modification also has a provision allowing DEQ to approve the total dissolved gas standard modification outside the fish passage season for purposes such as maintenance activities and studies of prototype fish passage devices. The Oregon Administrative Rule related to the total dissolved gas water quality standard and the current total dissolved gas standard modification are Attachments B and C of this report, respectively.

The commission approved the current total dissolved gas standard modification for the purpose of juvenile salmonid migration in 2015 for a five-year period. The modification expires at midnight on Aug. 31, 2019.

2019-2021 Spill Operation Agreement

On Dec. 14, 2018, the States of Oregon and Washington, the Nez Perce Tribe, Bonneville Power Administration, Bureau of Reclamation and the Corps entered into a 2019-2021 Spill Operation Agreement. A main component of the Agreement is that the Corps will increase spill to improve juvenile salmonid migration during times of low hydropower demand. For the 2020-2021 spring spill, the Agreement relies on a 125 percent total dissolved gas standard for Oregon's and Washington's water quality standards, which requires changes to the standards for both states. The Agreement is included as Attachment D of this report.

On March 29, 2019, in support of the Agreement, Washington Department of Ecology issued an Administrative Order approving a short-term modification removing Washington's 115 percent total dissolved gas criteria adjustment for the forebay, the area upstream of the spilling dam. The Order applies to the 2019-2021 spring spill seasons and Washington Ecology will begin a water quality standards change process to allow 125 percent total dissolved gas in the tailrace as specified in the Agreement.

Next steps

DEQ will work with the Corps to obtain information regarding its pending request for 125 percent total dissolved gas standard modification in accordance with the 2019-2021 Spill Operation Agreement. DEQ will provide informational updates to the commission about the request, and intends to present the final request for commission action at the November 2019 EQC regular meeting.

DEQ will also coordinate with Washington Department of Ecology and collaborate with Oregon Department of Fish and Wildlife and other Columbia River partners to assess physical and biological monitoring that should occur if the 125 percent modification is in effect.

Attachments

- **A.** 2018 Annual Report on Columbia River Total Dissolved Gas and Spill for Fish Passage
- **B.** Oregon Administrative Rule Relating to the Total Dissolved Gas Water Quality Standard
- **C.** Order Approving the U.S. Army Corp of Engineers' Request for a Modification to the State's Total Dissolved Gas Water Quality Standard
- **D.** 2019-2021 Spill Operation Agreement

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