State of Oregon
Department of Environmental Quality Memorandum

Date: Oct. 22, 2014

To: Environmental Quality Commission

From: Dick Pedersen, Director

Subject: Agenda item B, Action item: Request from U.S. Army Corps of Engineers for a modification to the total dissolved gas water quality standard on the Columbia River for fish passage

Why this is important

This is an action item for total dissolved gas water quality standard modification from 110 percent to 120 percent to allow voluntary spill that will aid fish passage at mainstem Columbia River dams. Releasing water over a dam's spillway is a fishery-management tool 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 into solution. Total dissolved gas levels above 110 percent of saturation can cause gas bubble trauma in fish.

Oregon adopted the U.S. Environmental Protection Agency's 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.

The U.S. Army Corps of Engineers is requesting a modification to Oregon's 110 percent total dissolved gas water quality standard. The standard modification will allow the voluntary spilling of water at the Bonneville Dam, The Dalles Dam, John Day Dam and McNary Dam along the Columbia River to assist fish passage of out-migrating salmon and trout salmonids.

Background

The voluntary spill program is designed to improve fish passage past the dams while minimizing the risk from total dissolved gas.

In order to survive, juvenile fish must be able to migrate downstream past the Columbia River dams. Turbines at these hydro electric dams hinder migration, so water is deliberately spilled from McNary, John Day, The Dalles and Bonneville Columbia River dams to improve fish passage. This is commonly referred to as voluntary fish passage spill. These spills, however, increase total dissolved gas in the river to levels greater than the water quality standard of 110 percent.

When total dissolved gas levels are too high it can harm migrating juvenile and adult salmonids by causing gas bubble trauma, similar to the bends in humans.

The incidence of gas bubble trauma in salmon smolts due to fish passage spill is estimated at 1.1 percent when total dissolved gas levels are managed to 120 percent. This estimate is based on smolt monitoring data collected from 1995 through the 2014 seasonal spill period.

Historically, fish passage spill has been managed to a total dissolved gas limit of 115 percent in the forebay upstream of the dam and 120 percent downstream of the dam in the tailrace. DEQ removed the forebay upstream limit in 2009 by a departmental order based on the findings of the adaptive management team and expects this to be protective of migrating salmonids during voluntary fish passage spill (http://www.ecy.wa.gov/pubs/0910002.pdf). Washington Department of Ecology retained the 115 percent requirement for the forebay. In bi-state waters the stricter regulation takes precedent. Therefore, the Army Corps of Engineers has continued to operate spill to comply with both the 120 percent tailrace limit and the 115 percent forebay limit.

When the in-river total dissolved gas levels are below 120 percent, few, and in some cases no, migrating fish display signs of gas bubble trauma. Since 1.1 percent is a low incidence of gas bubble trauma and because spills result in increased salmon survival, a modification from strict adherence to the 110 percent standard allows for the benefits of spill, which outweigh the risk from total dissolved gas.

Historical choice of voluntary spills

EQC has granted standard modifications to the U.S. Army Corps of Engineers for total dissolved gas since 1994. EQC has granted the modifications because of the low incidence of gas bubble trauma and the effectiveness of voluntary spill for fish passage. The NOAA Fisheries has identified voluntary spill as the safest, most effective tool available for improving downstream smolt survivorship.

2014 Supplemental Federal Columbia River Power System Biological Opinion (2014 Biological Opinion)

National Oceanic and Atmospheric Administration National Marine Fisheries Service issued its 2014 Biological Opinion Jan. 17, 2014. The opinion 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 opinion requires voluntary fish passage spill at Columbia River dams to support fish migration even when it results in total dissolved gas super-saturation above the state's 110 percent standard.

The Corps is currently operating in accordance with the 2014 Biological Opinion Reasonable and Prudent Alternative actions. The previous 2008 Biological Opinion concluded that the risk associated with a managed voluntary fish spill up to the 120 percent total dissolved gas level is warranted by the projected increase in system survival of juvenile salmonids. The 2014 Supplemental Biological Opinion relies

on DEQ to make the determination of what the range of total dissolved gas would be for the modified standard.

Alternatives to voluntary spills

Voluntary fish passage spill is a low-risk method of improving downstream fish passage at mainstem Columbia River dams. Depending on the dam and species, spill passes approximately 55 to 80 percent of juvenile salmonids. Although structural and operational modifications have improved survivorship through turbines, spill has greater survivorship of approximately 95 percent compared to turbine passage at approximately 90 percent survivorship.

The goal of barge and truck transport of juvenile salmonids is to increase the portion of fish returning as adults to spawn. The Independent Science Advisory Board and NOAA Fisheries continue to support transport in conjunction with spill to spread the risk of negative outcomes due the different types of passage. However, transportation is associated with greater likelihood of adult straying, in which adults do not return to spawn in their natal streams. Straying inhibits recovery of endangered and threatened salmonid species. The experience of in-river migration contributes to genetic adaptation of the species to altered conditions.

The Biological Opinion incorporates hatcheries as a means of supplementing salmonid numbers until the species can sustain itself. The presence of in-stream migrating hatchery smolts reduces the amount of wild smolts subject to predation and mitigates a portion of wild smolts lost to turbines or other causes during dam passage. However, hatchery fish can compete with wild fish for food and habitat and interfere with the wild fish's genetic adaptation to its environment.

Terms of current EQC order

The current EQC order allows for fish passage spill April 1 through August 31 at Bonneville, The Dalles, John Day and McNary dams. The order requires physical monitoring of total dissolved gas below the dam in the tailrace with a limit of 120 percent measured as the 12 highest hours in a day, biological monitoring of gas bubble trauma in fish during the spill period and annual reporting to DEQ.

Total Maximum Daily Load allows spills

In 2002, Oregon and Washington issued a Lower Columbia River total dissolved gas total maximum daily load that was approved by EPA. The total maximum daily load 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 total maximum daily load is to meet the 110 percent total dissolved gas state criteria while allowing for voluntary fish passage spill.

The Corps operates the dams and is responsible for implementing the operational and structural modifications identified in the total maximum daily load.

Renewal request

On April 4, 2014, DEQ received a request from the U.S. Army Corps of Engineers, with support from NOAA Fisheries, to renew the modification to the state's total dissolved gas standard. The current EQC order, which modifies the total dissolved gas standard, was issued in 2009 for a five-year period and will expire at midnight Dec. 31, 2014. The last day the modification was in continuous effect for spill assisting juvenile salmonid passage was Aug. 31, 2014. The requested modification must be in place by April 1, 2015, to provide spill for the next fish passage season.

The U.S. Army Corps of Engineers requests a means by which the modification can be in effect outside the spill season to facilitate activities that may cause exceedances of the 110 percent water quality standard. Examples of these activities include maintenance of spillway structures in the fall or winter and operations to improve passage of kelts or Spring Creek hatchery releases in March. Kelts are adult steelhead that migrate back downstream after spawning.

The U.S. Army Corps of Engineers also requests shifting the annual report deadline one month from December 31 to January 31. Moving back the deadline will allow the Corps' staff sufficient time to quality check data, which is provided to them in early November, and prepare the annual report.

The request summary and supporting information, including DEQ's findings, are presented in attachment B.

Public input

Public comment received

DEQ issued a public notice Sept. 10, 2014, opening a 30-day public comment period.

DEQ received six comment letters from:

1. U.S. Environmental Protection Agency
2. Bonneville Power Administration
3. Northwest RiverPartners
4. Pacific Northwest Generating Cooperative Power
5. Oregon Department of Fish and Wildlife
6. State, Federal and Tribal Fishery Agencies Joint Technical Staff Memo, signed by:
    - Columbia River Inter-Tribal Fish Commission
    - Oregon Department of Fish and Wildlife
    - Washington Department of Fish and Wildlife
    - U.S. Fish and Wildlife Service
    - Colville Tribe

Each of the six comment letters received stated that they support approval of an EQC order for total dissolved gas standard modification.

Specific comments include:

- Extend the continuous effective period of the standard modification to include March to assist kelt and Spring Creek Hatchery outmigration and September to assist adult migration.
- Increase limit in the tailrace from the proposed 120 percent to 125 percent.

DEQ asserts that the requirement of advance notification and approval provides the U.S. Army Corps of Engineers with adequate flexibility to access the modified total dissolved gas standard outside the April through August seasonal spill period. However, DEQ will work with the Corps to develop a standard notification procedure and identify monitoring expectations to reduce the administrative burden of the notification process.

DEQ does not agree that the 125 percent limit should be considered at this time. To consider a higher modification, DEQ must conduct a thorough evaluation of information supporting 125 percent, consider information from various stakeholders and seek input from other agencies to contribute to the scientific evaluation of 125 percent. The evaluation must consider risks to salmonids in addition to resident biological communities. Detailed physical and biological monitoring plans must also be submitted for review by DEQ.

The response to comments document is presented in attachment C.

Future management of total dissolved gas

Implementation of the Lower Columbia River Total Dissolved Gas TMDL will continue. Oregon and Washington may request further studies to determine additional structural and operational gas abatement actions that can be feasibly implemented to reduce total dissolved gas. Implementation of the TMDL will expire in 2020. The TMDL stakeholders will meet regularly to evaluate post-2020 regulatory options.

DEQ recommendation and EQC action

DEQ recommends that EQC grant the total dissolved gas standard modification as requested by the U.S. Army Corps of Engineers with the following changes:

1. Include an adaptive management component as specified in the 2002 Lower Columbia River Total Dissolved Gas Total Maximum Daily Load. Adaptive management will be used in the long-term implementation of the total maximum daily load. The adaptive management team may request further studies, and redirect or accelerate structural and operational gas abatement activities. The goal of the total maximum daily load is to meet the 110 percent total dissolved gas criterion while allowing for voluntary fish passage spill.

The draft recommended EQC order for total dissolved gas standard modification is presented in attachment D.

EQC action alternatives

The commission has two action alternatives:

1. Approve the request with or without DEQ's recommended modifications.
2. Decline the request.

To approve DEQ's recommendation, EQC must make the four affirmative findings detailed in attachment A, as specified in OAR 340-041-0104(3). These findings are:

(a) Failure to act would result in greater harm to salmonid stock survival through in-river migration than would occur by increased spill;

(b) The modified total dissolved gas criteria associated with the increased spill provides a reasonable balance of the risk of impairment due to elevated total dissolved gas to both resident biological communities and other migrating fish and to migrating adult and juvenile salmonids when compared to other options for in-river migration of salmon;

(c) Adequate data will exist to determine compliance with the standards; and

(d) Biological monitoring is occurring to document that the migratory salmonid and resident biological communities are being protected.

Attachments

A. Oregon Administrative Rule relating to the Total Dissolved Gas Water Quality Standard
B. Summary of U.S. Army Corps of Engineers' request to renew the total dissolved gas standard modification and DEQ findings
C. Response to public comments
D. Draft recommended EQC Order for Total Dissolved Gas Standard Modification

Available upon request

- U.S. Army Corps of Engineers' request and summary of information relative to the total dissolved gas waiver
- 2002 Lower Columbia River total dissolved gas total maximum daily load

Approved:

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Wendy Wiles
Environmental Solutions Division administrator

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Jennifer Wigal
Water Quality Program manager

Report prepared by Paula Calvert