PUBLIC POWER COUNCIL
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650 NE Holladay St, Suite 810
Portland, OR 97232
(503) 595-9770
www.ppcpdx.org

July 28, 2020

US Environmental Protection Agency, Region 10
Dan Opalski

Submitted electronically

RE: TMDL for Temperature in the Columbia and Lower Snake Rivers

The Public Power Council (PPC) appreciates the opportunity to comment on EPA's Total Maximum Daily Load (TMDL) for temperature in the Columbia and Lower Snake Rivers. The TMDL addresses waters in the Columbia and Lower Snake Rivers that are designated as impaired for temperature water quality criteria in Oregon and Washington.

Introduction

PPC represents the non-profit, community-owned public utility customers that have statutory priority to purchase the output of the Federal Columbia River Power System (FCRPS) from the Bonneville Power Administration (BPA). BPA's wholesale power customers depend on hydropower from the federal system to serve the residents of the Northwest with affordable, reliable, carbon-free power at cost. The wholesale power rates paid by Northwest public power recover the costs of the FCRPS, including extensive fish and wildlife mitigation programs throughout the region.

PPC and its members are committed to these fish and wildlife mitigation responsibilities and recognize that river temperature is an important water quality criterion for fish survival and spawning. Actions and investments by the U.S. Army Corps of Engineers (Corps) and the Bureau of Reclamation (Bureau), supported by public power and paid for through their power rates, have resulted in improved water temperature management along the Lower Snake and Columbia Rivers. These efforts have improved fish survival and enhanced fish habitat throughout the region. PPC is supportive of mitigation work that effectively and cost-effectively addresses the impacts of the FCRPS.

PPC is concerned, however, that as it is currently written, the temperature TMDL is not practicable, sets unattainable goals, and will create an undue and unequitable financial burden because it sets unrealistic allocations for the dams and could result in prolonged litigation given the history of the TMDL. These unrealistic allocations are an outcome of

the inherent limitations of the TMDL's boundary, its inability to consider temperature impacts holistically on a basin-wide scale, as well as specific modeling assumptions.

Water entering the Columbia and Snake Rivers from Idaho and Canada frequently exceeds the numeric temperature standards used by EPA in the TMDL, making attainment of the water quality criteria within the TMDL's boundary impossible. The TMDL does not provide a solution to this problem. Additionally, these standards are likely unattainable because they are based on generic fish biology considerations and are not representative of water temperatures in free-flowing Columbia or Lower Snake rivers, which could frequently exceed twenty degrees Celsius. Compounding these issues is the impact of climate change on river temperatures, which is one of the largest contributors to water quality temperature exceedances but has not been incorporated into the TMDL due to its scope.

EPA acknowledges that these issues all present challenges to creating the TMDL. Given the flaws noted above, EPA should consider re-working the TMDL. If the TMDL moves forward, policymakers in the region should be aware of these limitations as they create an Implementation Plan and should avoid assigning mitigation actions and responsibilities that are unduly burdensome, not cost effective or are not substantiated. Notwithstanding these broader issues and objections, EPA needs to rework specific parts of the TMDL documentation to resolve incorrect assumptions, modeling errors, and data limitations. Several of these are listed below, and others are enumerated in comments submitted by the Bonneville Power Administration, the US Army Corps of Engineers, and the Bureau of Reclamation.

- EPA should incorporate uncertainty and error ranges into its allocations, as these allocations are based on modeling assumptions and likely do not accurately reflect real-world conditions.
- EPA should remove cooling water impacts of Dworshak from the free-flowing scenario used to calculate allocations. This cooling water impact is not representative of water temperatures in a free-flowing river without dams and is inappropriate.
- EPA should correct calculations for allocations below BON for the October 15 to March 31 timeframe. River temperatures were calculated based on averaging the month of October, when the water quality criterion changes mid-month. Using the monthly average over-estimates river temperatures for days after October 15.

Limitations of TMDL Scope

EPA's documentation clearly describes the incomplete scope of the TMDL and the resulting limitations. For example, the TMDL is limited to the geography and water quality standards in Washington and Oregon, but the Columbia and Snake River basins

extend deep into Idaho and Canada. Incoming water from these upstream locations frequently exceeds Oregon and Washington temperature standards, but the TMDL takes these upstream conditions as given. To this point, TMDL documentation acknowledges that,

> Even if all the allocations in this TMDL are implemented and the temperature reductions envisioned are fully realized, it is unlikely that the numeric criteria portion of the WQS will be met at all times and all places. Sources outside the allocation structure of this TMDL contribute to warmer temperatures.[1]

These temperature sources outside the TMDL's geographic scope are material. During the summer and early fall, incoming water temperatures regularly exceed Washington water quality standards by two to three degrees Celsius.[2] These exceedances are higher than any single source identified in the TMDL and are frequently greater than the impact of the entire FCRPS.[3]

Not only is the physical temperature of incoming boundary waters higher than Washington's water quality standards, but the upstream water temperature *standards* are higher as well. Both Canada and Idaho have set water quality standards that are several degrees higher than those in Washington. This means that even if Canada and Idaho develop TMDLs for the Columbia and Snake Rivers, those waters would not necessarily be managed to reach Washington's standards. This jurisdictional disconnect creates an additional barrier to generating a practicable TMDL. Taking these boundary conditions as a "given" and assigning pollution allocations and mitigation responsibilities to a subset of the region is unreasonable and unequitable.

Climate Change

In addition to boundary conditions, EPA also recognizes that climate change has impacted river temperatures in the Columbia and Snake. EPA's analysis estimates that since 1960, increases in air temperature have led to water temperature increases between one and two degrees Celsius.[4] Even though climate change is one of the largest drivers of water temperature increases, it is essentially treated as "out of scope," because EPA does not have jurisdiction to enforce a broad climate policy to mitigate for this. This puts the burden of mitigating the impacts of climate change on river temperatures on specific subsets of regional stakeholders, particularly dams and dam operators.

Hydropower is an extremely flexible and valuable carbon-free resource. It is the primary driver of the low carbon content of the Northwest grid and can help to integrate additional renewable energy resources in the future. Rather than acknowledging

[1] EPA TMDL for Temperature in the Columbia and Lower Snake Rivers, p. 2
[2] EPA TMDL for Temperature in the Columbia and Lower Snake Rivers, Table 6-2 and 6-3
[3] EPA TMDL for Temperature in the Columbia and Lower Snake Rivers, Table 6-6
[4] EPA TMDL for Temperature in the Columbia and Lower Snake Rivers, p.30

hydropower's contribution to combatting climate change, the TMDL places the burden for mitigating the impacts of climate change on river temperature squarely on hydro facilities. As air temperatures continue to warm, dams will increasingly be called upon to mitigate rising river temperatures. This feedback loop is intrinsic to the limited scope and nature of the TMDL and will result in unequitable and unreasonable obligations as hydro facilities are tasked with mitigating the impacts of a global issue to which they do not contribute.

Limitations of Using Designated Water Quality Criteria

In comparison to numerous TMDLs which were developed using "natural condition" provisions for water temperature, EPA chose to base this TMDL on the existing numeric criteria from Washington and Oregon's water quality standards. While this decision is understandable given the limitations of scope addressed above and the limits of the RBM10 model, it results in the use of water quality criteria which are disconnected from reality and are often unachievable.

The relevant Oregon and Washington water quality standards are largely based on fish biology and are not representative of the natural state of the Columbia and Lower Snake Rivers. For example, Washington has set a water quality criterion of twenty degrees Celsius for the Lower Snake River, but natural conditions would likely often exceed this limit. There is no leeway in this criterion, and it is taken as given. As the TMDL is currently written, dams will be tasked with meeting water quality standards over which they do not have control and cannot meet, because the standards are unattainable and disconnected from actual river temperatures.

Free-flowing rivers are experiencing increases in warm water temperatures and frequently exceed standards that are based on fish biology. Recently, the Fraser River, a major free-flowing river on the West Coast of Canada, has experienced numerous days above the twenty-degree Celsius threshold.[5] As with the Columbia River, these high water temperatures have increased in frequency and severity as air temperatures have increased. Increases in water temperatures in the Fraser River, and other free-flowing rivers in Alaska, point to the fact that climate change, not dams, is the leading cause of increasing river temperatures.[6]

There is a balance between protecting fish and other wildlife and setting standards which are unreasonable and unattainable. Failing to consider natural conditions when forming the TMDL creates standards that are unreasonable and unattainable. Exemplifying another approach, Idaho DEQ has rejected EPA's more stringent and protective

[5] See, for example: CBC News, 8/3/18, https://www.cbc.ca/news/canada/british-columbia/sockeye-salmon-water-temperature-1.4771607

[6] CNN, 8/17/19, https://www.cnn.com/2019/08/16/us/alaska-salmon-hot-water-trnd/index.html

temperature criteria because DEQ is concerned that these criteria are unattainable.[7] DEQ's opinion reflects the fact that the approach that EPA has chosen is not universally accepted.

EPA points to the possibility of Washington and Oregon conducting a Use Attainability Analysis (UAA) to change their relevant water quality standards. The UAA process would allow Oregon and Washington to revise their standards based on attainability as well as cost considerations. PPC believes that UAAs may be useful in specific parts of the TMDL, such as revising water temperature standards below Bonneville dam (see *Temperature Calculations at Bonneville* below), and PPC is supportive of pursuing UAAs to amend unattainable standards.

Limitations of Modeling Approach

Because there is no way to measure river temperatures in a free-flowing Columbia or Lower Snake River, EPA is relying on a mathematical model to inform its TMDL documentation. Basing the TMDL on a model presents significant challenges, as allocations and mitigation responsibility can be significantly impacted by model assumptions and design. The RBM10 model used in this TMDL analysis is a simple, one-dimensional thermal model of the Columbia and Lower Snake rivers.

RBM10 does not include dam operations, account for changes in water temperature at different depths, or look at maximum daily temperatures. Its simplicity gives it a fast-run time and provides the ability to look at long time periods. However, this simplicity, especially when combined with gaps in data availability, means that the model cannot reflect real-world conditions with a high degree of accuracy or certainty.

As in other areas, EPA provides documentation acknowledging the limitations of the TMDL modeling and the uncertainty inherent in its analysis. EPA confirms a mean error of roughly one half a degree Celsius when comparing the RBM10 model's outputs to actual measured water temperatures.[8] This error calculation is for the current conditions scenario and has been calibrated with measured data. It is likely that average error and uncertainty for the free-flowing river scenario is even greater, given that there is no current data from which to calibrate the model, and assumptions must be made about river flows and bathymetry.

Although there is uncertainty and error in its modeling outputs, EPA has not included any error or uncertainty in the calculated allocation exceedances. Instead, EPA has opted to be "conservative" with its assumptions to "ensure that impacts are not underestimated."[9] This approach results in allocation exceedances which appear to be definite and clear, but

[7] Idaho DEQ, 7/15/20, https://www.deq.idaho.gov/water-quality/surface-water/temperature/
[8] EPA TMDL for Temperature in the Columbia and Lower Snake Rivers Appendix D, p.10
[9] EPA TMDL for Temperature in the Columbia and Lower Snake Rivers Appendix D, p.8

are in fact uncertain and may exaggerate and provide an incomplete view of dam impacts on river temperatures. As with other areas of the TMDL, this approach can also lead to unequitable and unreasonable mitigation responsibilities.

Other research into dam impacts on river temperatures has highlighted both similar takeaways as well as potential flaws in EPA's analysis. For example, a study of the Lower Snake River using the MASS1 model concurred with EPA's conclusion that dams impact seasonal river temperatures because they increase thermal mass and cause rivers to heat up and cool down more slowly.[10] However, that same analysis found that dams decreased water temperature variability and did not necessarily increase overall warming. There is enough uncertainty about the impacts of dams on river temperatures that models and simulations must be used very carefully in forming policy decisions.

EPA should rework its TMDL documentation to bring forward uncertainty and modeling error into its results. The current format of the TMDL creates a false sense of certainty about dam impacts when there is in fact substantial modeling uncertainty to bring into question some of the TMDL's findings. Policymakers need to be aware of these limitations in the TMDL, especially when developing the Implementation Plan and considering mitigation responsibilities.

Specific Modeling Assumptions and Calculations

Among other issues, there are two specific modeling assumptions and calculations in the TMDL that PPC believes are unreasonable or incorrect and should be changed. The first is the inclusion of cool water discharges from Dworshak in the free-flowing river scenario. The second is the calculation for river temperatures at Bonneville dam for October. These are discussed in greater detail below.

Dworshak Cool Water Discharges

Cool water releases from Dworshak should not be included in the free-flowing scenario used to determine dam impacts. In both the current and free-flowing RBM10 scenarios used to calculate the allocation exceedance for dams on the Lower Snake, Dworshak operations are modeled as providing a cooling effect on river temperatures at the Clearwater Confluence. For the current scenario this is perfectly reasonable, as it represents current operations and river temperatures. However, including cooling water from Dworshak in the free-flowing scenario, which should not include *any* dams, is unreasonable and creates a false comparison or standard.

Water will tend towards equilibrium with the air temperature around it and assumptions about incoming water temperatures can create an artificial impact downstream as water

[10] Regional Scale Simulation of Water Temperature in the Columbia River Basin, Richmond et. all

cools or warms to reach equilibrium with the surrounding air temperature. By including cool water from Dworshak in the free-flowing scenario, EPA creates a false comparison between temperatures in a free-flowing river and an impounded river. As shown in Figure 3-22 from Appendix D below, if the Lower Snake River were not being cooled by Dworshak, the Lower Snake dams would not raise river temperatures in July.

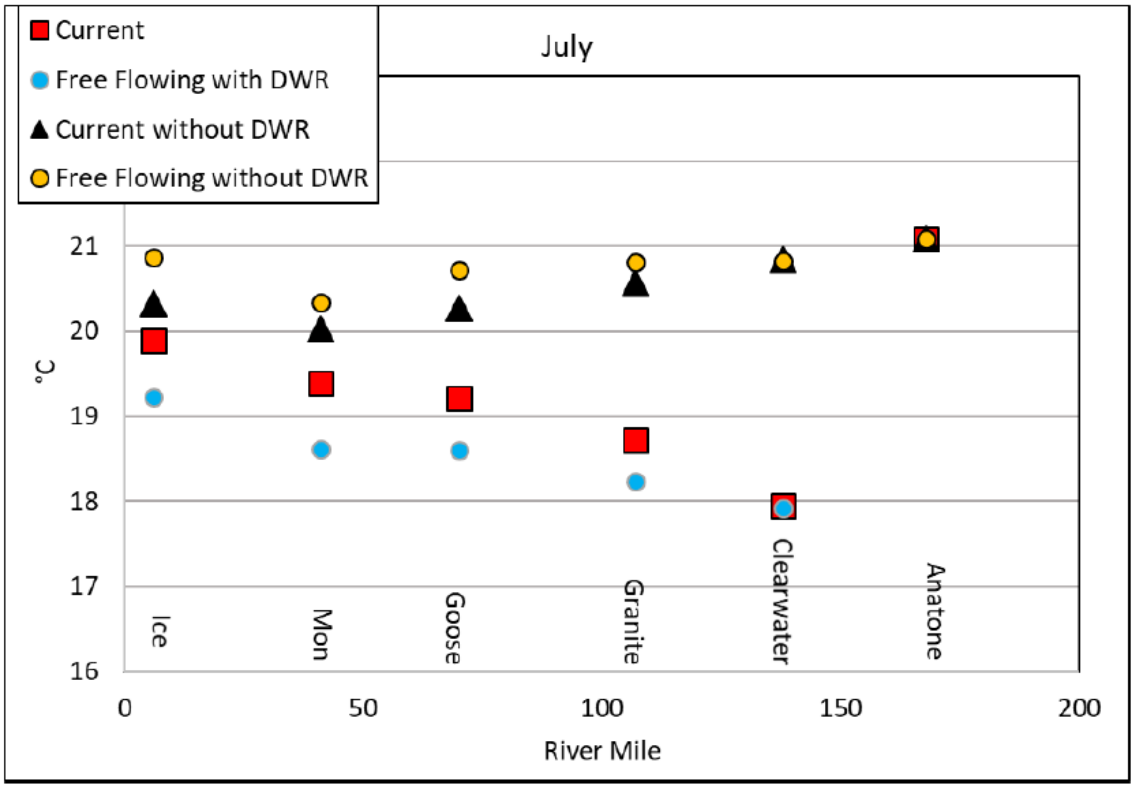

Figure 3-22 Comparison of Dworshak Dam impact scenarios (2011 – 2016; July)

Boundary conditions at Idaho and Canada serve as a limit to EPA's model and the overall scope of the TMDL, and we do not know and cannot measure boundary temperatures of a free-flowing Snake or Columbia River. For this reason, it is impossible to accurately determine the impacts of the dams within the current scope of the TMDL. If the TMDL moves forward, EPA should at the very least rework TMDL documentation for the Lower Snake and assign allocation exceedances based on a free-flowing Lower Snake River that has not been altered by cool water discharges from Dworshak.

Temperature Calculations at Bonneville

EPA has set load allocations below BON in October based on Oregon's water quality criteria intended to protect spawning salmon. Oregon's standard changes from twenty degrees Celsius to thirteen degrees Celsius on October 15th. Although the more stringent

standard only applies to half of the month, starting on October 15th, EPA has averaged the entire month of October in its calculations.

This treatment results in artificially raised temperatures for the more stringent compliance period because air and water temperatures in early October tend to be warmer than those in late October. EPA should rework the calculation for this segment of the river to include only the October 15th to March 31st period when the more stringent standard applies. This will correct a misapplication of the standard and lead to a more reasonable allocation.

Oregon should also monitor and consider modifying this specific water quality criterion. The more stringent thirteen-degree standard is intended to protect salmonid spawning, but fish passage data shows that these fish do not arrive until November 1. Maintaining the more stringent standard when there is no need is unreasonable and unwarranted.

Human Use Allowances

PPC does not object to EPA's incorporation and treatment of the .3-degree Celsius Human Use Allowance. While EPA's decision to split the .3 degrees between dams, point source discharges, and tributaries is not specifically supported, it is not unreasonable given the minor impacts of point sources and tributaries to river temperatures. Including additional mitigation and monitoring requirements for these would be unduly burdensome and would not materially impact river conditions.

Thank you for your consideration of the comments.