King County
Department of Natural Resources and Parks

August 27, 2025

Jeremy Reiman
Washington State Department of Ecology
Water Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

King County Comments on Draft Puget Sound Nutrient Reduction Plan

Dear Mr. Reiman,

On behalf of the King County Department of Natural Resources and Parks (DNRP), thank you for the opportunity to provide comments on the draft Puget Sound Nutrient Reduction Plan (NRP). We appreciate the work conducted by the Department of Ecology staff to develop the draft NRP. King County is committed to the goal of protecting and restoring Puget Sound. Areas with low dissolved oxygen are influenced by a variety of factors, human-caused and natural, and an effective strategy will be guided by science and include multiple measures, an adaptive strategy, and strong partnerships. We support an approach using a general permit and an advanced restoration plan as workable mechanisms to address human impacts on Puget Sound dissolved oxygen.

Upgrading the dozens of wastewater treatment plants that discharge to Puget Sound for nutrient treatment will be one of the largest investments in water quality in state history, affecting communities and agencies large and small. Based on our preliminary planning, upgrading King County's wastewater treatment system may cost on the order of $10 to 20 billion or more in today's dollars, will require even higher rates imposed on communities, households, and businesses, and could take decades to implement.

There are also numerous areas where continued science is needed to resolve uncertainties and gaps, and where more consensus is needed, to ensure public dollars will result in tangible benefits. Regulators, utilities, Tribes, and interested parties have been in costly litigation for years, and this pattern could continue without establishing a regulatory framework that we can be confident will result in clear outcomes to cost-effectively address human impacts on dissolved oxygen in Puget Sound. We support a regulatory framework that will meaningfully address human impacts on dissolved oxygen in Puget Sound. With such high stakes, we must get this right.

Our comments on the draft Puget Sound Nutrient Reduction Plan (NRP) and Salish Sea Model Report, along with comments on the draft voluntary Puget Sound Nutrient General Permit (PSNGP, sent under separate cover and attached for reference), identify questions, concerns, and recommendations for improving the nutrient management framework. We respectfully ask that Ecology:

- Work collaboratively with regulated agencies and interested parties to find more consensus and reduce the chance for additional costly litigation.
- Reevaluate the marine dissolved oxygen standards to determine what standards are needed to protect aquatic life in the Sound and to what extent those standards are reasonably attainable.
- Acknowledge and consider scientific uncertainties in the nutrient reduction actions and adaptative management framework.
- Reconcile any differences between the proposed NRP treatment requirements and the PSNGP's Nutrient Reduction Evaluation planning targets through thorough discussion, analysis, and collaboration with the proposed Technical Advisory Committee.
- Take the time to ensure documents, materials, and regulations reflect areas of broad scientific consensus and support collaborative mechanisms to resolve areas where consensus is still needed.

Water quality standards review

The draft NRP outlines actions to meet the currently applicable water quality standards, including the numeric dissolved oxygen criteria. Those standards, however, are over a half century old with limited documentation on how the standards support specific dissolved oxygen needs of aquatic life native to Puget Sound.[1] Attaining these standards will require many years and tens of billions of dollars to address and could ultimately be unachievable in many portions of the Sound because of natural conditions and other conditions outside of the state's reasonable control.

As the state develops the NRP and PSNGP frameworks that will drive public investments for decades, it is essential to ensure that the underlying scientific foundation is valid and will result in the desired protections for Puget Sound aquatic species. A reevaluation should determine what standards are needed to protect aquatic life in the Sound and whether and to what extent the standards needed to protect aquatic life are reasonably attainable given natural conditions,

[1] Dunagan, C. (2025), *'Natural conditions' are at the center of disputes over dissolved oxygen standards*. Salish Sea Currents, University of Washington Puget Sound Institute. March 25, 2025. Available at: https://www.eopugetsound.org/magazine/natural-conditions-at-center-of-disputes-over-dissolved-oxygen-standards

other conditions outside the reasonable control of Washington or utilities, and the economic sustainability of our region.

Scientific gaps and uncertainties

Dissolved oxygen in Puget Sound is influenced by a variety of factors, many of which cannot be directly managed by humans (e.g., ocean conditions and temperature). Climate-related effects in Puget Sound, including warming waters, can negatively impact dissolved oxygen by decreasing the water's ability to hold dissolved oxygen. Recent research from the University of Washington suggests that climate change is responsible for 40-100% of the decreases in dissolved oxygen in Central Puget Sound.[2] The NRP must develop a science-based plan to contend with climate change and develop evaluation frameworks to determine the best human nitrogen reduction actions and how to measure their effectiveness.

If the human sources of nitrogen reduction proposed in the draft NRP are entirely successful, the dissolved oxygen change in Puget Sound from these actions will be difficult to detect with confidence. Most of the average predicted change will be virtually impossible to distinguish from natural variability and will be observable only in modeled values. This places great importance on the accuracy of the Salish Sea Model as the model will be used to determine water quality compliance. Recent analysis from the University of Washington Puget Sound Institute indicates that errors in embayments remain several times higher than the 0.2 mg/L human use allowance, challenging whether the model has the skill and granularity needed for the regulatory precision[3].

It is imperative to discuss within the NRP the strengths and weaknesses of the model and how those factors work with the regulatory framework. Additionally, the NRP should develop a plan for how modeling updates and enhancements will be used within the adaptive management framework. As has been done in other regions, such as Chesapeake Bay, the NRP should recognize that additional marine water quality models could enhance scientific understanding of marine dissolved oxygen in Puget Sound. Linked environmental models and ensemble

[2] Mascarenas, D., Leeson, A., Horner-Devine, A., MacCready, P (2025). *Century-Scale Changes in Temperature, Salinity, and Dissolved Oxygen in Puget Sound*. Geophysical Research Letters, Submitted April 14, 2025, 43 p. Mascarenas_etal_01_submitted_20250403.docx Available at https://authorea.com/users/909699/articles/1283646-century-scale-changes-in-temperature-salinity-and-dissolved-oxygen-in-puget-sound

[3] Baker, J., Kanojia, M., Mazzilli, S. (2025) *Technical Memorandum Review of 2025 Salish Sea Model Updates and Application to Nutrient Management*. University of Washington Puget Sound Institute, pg. 3, 2025.08.22-Review-of-2025-Salish-Sea-Model-Updates-and-Application-to-Nutrient-Management.pdf

modeling has improved accuracy for climate change modeling. We believe a similar multiple model approach may be beneficial for modeling Puget Sound dissolved oxygen.

Economic, technical, and programmatic feasibility

The stated goal of the NRP is to develop a means of distributing nutrient reductions that meets water quality standards and is also equitable and reasonable between marine point sources and watershed sources. To achieve this goal, there needs to be greater consideration of the economic and technical feasibility of point and nonpoint source implementation prior to setting basin-wide load targets and finalizing the advanced restoration plan.

Marine point source load targets challenges

The methodology for calculating the marine point source load targets is unclear and requires more description. The PSNGP requires utilities to submit a NRE that identifies the All Known, Available, and Reasonable Treatment (AKART) alternative and the 3 mg/L Total Inorganic Nitrogen (TIN) seasonal treatment alternative. The NRE is intended to support treatment optimization, assess feasibility of additional treatment upgrades at each facility, and estimate impacts on rates and affordability to build the next phase of nutrient reduction.

We are concerned that the draft NRP seems to 'move the goal post' for wastewater treatment, proposing wastewater nitrogen loading targets beyond those required under the original PSNGP and that we are currently evaluating in the NRE. Most significantly, the marine point source nitrogen load targets are based on flows and loads from 2014 and therefore ignores the growth over the past eleven years and the impact on a utility's ability to meet future growth. This means that as flows increase, the concentration limit continually ratchets down to achieve the load reduction. King County estimates that as soon as 2030, the concentration limit will go beyond Ecology's definition of the limit of technology for our facilities.

Additionally, the NRP's change of effluent load targets based on Total Nitrogen (inclusive of organic nitrogen) instead of TIN also could result in a treatment plant needing to achieve *negative* effluent TIN concentrations if an allowance for organic nitrogen is not afforded, especially as growth occurs. Early findings show that meeting the original NRE targets will be highly costly, technically difficult to implement, and likely will take at least 30-40 years to implement. With the NRP's more aggressive treatment targets, it is unknown if these can be technically achieved at all.

Reconciling these inconsistencies will require significant discussion to understand how the proposed basin targets were developed and what analysis beyond the NRE planning is needed

to determine treatment feasibility for individual facilities. As a starting point, King County recommends that NREs be submitted based on the original PSNGP treatment planning targets and that Ecology and the proposed Technical Advisory Committee determine if supplemental planning and additional Salish Sea modeling is needed to understand the technical and economic limits on attaining the proposed load reductions and the scientific impact on Puget Sound dissolved oxygen.

Watershed Load Targets

For the non-point and point sources in Puget Sound's freshwater watersheds, the proposed watershed targets are likely not reasonable or achievable. The NRP watershed targets are based on modeling that assumes, on average, a 53-67% reduction in anthropogenic loading in most watershed basins. Modeling and analysis in King County's Water Quality Benefits Evaluation Toolkit indicate stormwater best management practices only achieve a 50% reduction in nitrogen. Even with treatment of all urban stormwater, it's unlikely that the Puget Sound region would be able to achieve the target reductions.[4] Moreover, the proposed watershed reductions exceed what has been achieved even in the best cases in Denmark and the Chesapeake Bay, regions which have been working for decades to reduce human nitrogen loading.[5] The NRP requires additional analysis to develop reasonable targets and greater dialogue on how this influences the goal of equitable distribution of load targets.

The proposed targets in the NRP present enormous technical and economic challenges. The wastewater treatment upgrades necessary to achieve the proposed load targets will raise wastewater rates and exacerbate affordability concerns in the Puget Sound region. Additionally, nitrogen removal technologies have the potential to greatly increase greenhouse gas emissions and energy use from wastewater treatment facilities, increasing regional strain on the electrical grid and challenging goals to address climate change. The NRP must consider future planned growth, regional impacts to climate and energy goals, and provide opportunities to assess tradeoffs of nutrient control with regional economic and environmental values.

Getting this right requires collaboration

Meeting the proposed nutrient reduction framework in the NRP would represent one of the largest investments in water quality improvement ever in our state. The scale of this investment

[4] Herrera Environmental Consultants (2024), *WQBE Phase 3 Water Quality Performance Parameter Data Compilation* (Appendix D to 439- TM1). Prepared for King County Water and Land Resources Division by Paradigm Environmental and Herrera Environmental Consultants. October.
[5] Baker et al., *Technical Memorandum Review of 2025 Salish Sea Model Updates and Application to Nutrient Management,* p.3

will require significant increases in regional and local utility rates on top of those already required to meet other regulatory obligations and ensure system reliability with population growth. As the state develops a framework for nutrient reduction, it is essential that both regulators and utilities fairly and transparently communicate the outcomes and costs.

King County is committed to working with Ecology and others to improve the advanced restoration plan and the draft nutrient general permit as a part of a sustainable regulatory framework for nutrient management. If you have questions or need more information, please contact Jacque Klug, the Wastewater Treatment Division's Nutrient Management Coordinator, at jacque.klug@kingcounty.org or 206-477-4474.

Sincerely,

Signed by:
John Taylor
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John Taylor, Director
King County Department of Natural Resources and Parks

Attachments

- Appendix A - King County Comments on the Draft Puget Sound Nutrient Reduction Plan
- Appendix B – King County Comments on the Volume 2: Model Updates and Optimization Scenarios, Phase 2

cc: Rachel McCrea, Water Quality Section Manager, Washington State Department of Ecology (Ecology)
Jon Kenning, Water Quality Program Manager, Ecology
William Weaver, Puget Sound Nutrient General Permit Writer, Ecology
Jeff Killelea, Permit and Technical Services Section Manager, Ecology
Chad Brown, Watershed Unit Supervisor, Ecology
Sean McKone, Municipal Wastewater Permits Unit Supervisor, Ecology
Sean Wilson, Senior Facility Management Engineer, Ecology