Puget Sound Nutrients General Permit Proposed by Ecology

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Way back in the mid to late 1980s, the WA Dept. of Ecology (Ecology) took a bold step: it proposed and then adopted a requirement for enhanced sewage treatment for every sewage treatment plant throughout the state. Under the new requirement, every sewage treatment plant had to meet "secondary wastewater treatment" standards. This was the first general treatment upgrade required since the early 1950's when "primary treatment" was first required (before the 1950's no treatment at all was required). And can you guess what happened then? Many local treatment plant operators filed appeals, first to then Governor Gardner and then to the courts, but thankfully all were eventually denied and all treatment plants were eventually upgraded across the state, albeit with very large grant and loan assistance from EPA and Ecology.

Fast forward almost 40 years to 2020: the statewide secondary treatment standards have not been updated even though the state population has increased at a phenomenal rate along with the amount of human sewage produced. Primary and secondary treatment of sewage are not specifically designed to remove nutrients; only a small portion of total nitrogen and phosphorus are removed during such treatment. A handful of treatment plants have been required to add additional treatment for nutrient removal due to specific localized concerns, including the LOTT treatment plant in Budd Inlet in 1994 and some treatment plants that discharge to rivers, including the Spokane County and City of Spokane treatment plants. Nationwide, many discharges to marine estuaries have been required to update their sewage treatment plants (STPs) to remove nutrients, generally nitrogen which contributes to excessive algae blooms in marine waters and can cause low oxygen levels that are harmful to fish and other marine life.

After years of urging and petitions by environmental groups, Ecology finally admitted last year that: "Excessive levels of nutrients from human sources, such as nitrogen and carbon, are negatively impacting water quality in Puget Sound. This can lead to low dissolved oxygen, which impacts the health of aquatic life. Too many nutrients, mainly nitrogen, result in excessive algal growth because nutrients act like fertilizer for algae and aquatic plants. When these algae and plants die, their decomposition uses up oxygen that marine animals need to survive. This can especially be a problem in shallow inlets or bays and throws the health of Puget Sound off balance."

In addition to low levels of oxygen, other effects of excess nutrients include:

- Acidification, which prevents shellfish and other organisms from forming shells.
- Shifts in the number and types or organisms that live on the seafloor, resulting in changes in the food chain.
- Increased nuisance macro-algae, which can impair the health of eelgrass and shellfish beds.
- Increased harmful algal blooms and other nuisance species, such as jellyfish.
- Changes in food web dynamics.

More than 25 years ago, I was a co-author on a report commissioned by the Marine Science Panel for the British Columbia/Washington Environmental Cooperation Council established by the BC Premier and Governor Booth Gardner. The report evaluated the effects of current and future loadings of wastewater to Puget Sound and the Georgia Basin (now collectively referred to as the Salish Sea). We found that within 20 years the benefits of the upgrades to secondary waste treatment would be overtaken by the projected population growth. Of course, today we know that population actually increased more than the projections. By 2020, the population in the Puget Sound basin served by STPs more than doubled to 5.3 million people (this number does not include homes using onsite septic systems).

About 12 years ago, Ecology initiated a water quality study of the Deschutes River, Capitol Lake and Budd Inlet. That study eventually found that significant portions of the river, lake and Budd Inlet do not meet water quality standards. Budd Inlet mainly suffers from excessive nutrients and low dissolved oxygen. The study also identified the sources of nutrients – in addition to local sources such as the LOTT STP and stormwater runoff, *a significant amount of nutrients enters Budd Inlet from contaminated marine waters entering Budd Inlet from the north carrying nutrients from treatment plants and other sources well beyond Budd Inlet*. The waters of Puget Sound have proven far more connected than most people imagined, which is why pollution released in one place contributes to problems miles and miles away.

About the same time, Ecology and Pacific Northwest National Laboratory, in cooperation with EPA, were developing a computer model for the Salish Sea to examine pollutants, water quality, hydrology and natural conditions. That model was subsequently used in 2014 to estimate the effects of climate change and future human sources of nitrogen on dissolved oxygen. Not surprisingly they found a direct connection between worsening water quality and increasing human wastewater loads of nitrogen.

After much prodding by environmental groups, the Dept. of Ecology initiated a "nutrient forum" in 2018 to evaluate the nitrogen issues and advise Ecology on next steps. As a result of those discussions, in early 2020 Ecology determined that nitrogen discharges from STPs must be capped at current levels now and reduced to lower levels in the future. Ecology has proposed to issue a **"Puget Sound nutrients general permit**" (PSNGP) covering all the 70+ sewage treatment plants that discharge directly to the marine waters of Puget Sound. This Nutrients General Permit will establish current caps on nitrogen loading and targets for reductions over a timeline of about 15 – 20 years, or 3 to 4 permit cycles of 5 years each. Unlike under the current individual discharge permits, STPs will not be allowed to increase their loads of nitrogen as their population increases; in fact they will have to eventually meet a new, lower limit which will not be able to be increased over time.

Nutrient-removal technology available today can reduce concentrations to about one quarter to one third of current concentrations, which is how treatment plants can meet the reductions while still accommodating growth. In addition, constructing satellite treatment plants that use tertiary nutrient removal technology can be used to produce reclaimed water that can be used for irrigation, ground water recharge, and other uses while reducing flows of sewage (and nutrients) to the larger main treatment plants. LOTT has built two reclaimed water facilities to help reduce their discharge of nutrients to Budd Inlet.

Ecology also established an **advisory committee** for development of the Nutrients General Permit. Mindy Roberts (WEC) and Bruce Wishart (Puget SoundKeeper) are the two members representing

environmental groups. In addition, there are seats on the committee for EPA, the WA Dept. of Commerce, two tribal representatives and eight treatment plant owners and operators.

Not surprisingly, this proposal is meeting with opposition from the entities that own and operate sewage treatment plants. For the most part, they are repeating the same arguments we heard 40 years ago when the last upgrade was required: it will cost too much, customer rates will be prohibitively high, the technology is uncertain, space at the treatment plant sites is not available, the science is uncertain, etc. Since these very same nutrient removal upgrades have already been required in at least three other large estuaries around the nation, we do not think these objections should slow or stop the proposal. However, these upgrades will no doubt be challenging and expensive for many treatment plants, and the recent federal tax cuts and the current economic conditions caused by the Covid-19 virus have significantly reduced tax revenues to local, state and national governments which will make it more difficult in the short term to find sources of state and federal funds to help communities install the required upgrades. The PSNGP sets up a process that will take some time to plan, which means investments would not be expected for several years to come. The advisory committee is expected to wrestle with these issues and make recommendations or at least provide options for Ecology to consider.

We will continue to monitor this issue and comment as appropriate to ensure that clean water is achieved and maintained in all of Puget Sound including Budd Inlet. Budd Inlet and the rest of South Puget Sound are downstream of the larger cities to the north that produce the most sewage, and we will all benefit from improved water quality.

Notes on the effects of population increase on water quality:

Absent changes to treatment technology and efficiency, increases in population lead to proportionate increases in pollution loading from human waste. Although secondary treatment removes slightly more nutrients than primary treatment does, neither level is primarily designed to remove nutrients -- removal is mostly a byproduct of the increased level of treatment. Secondary treatment requirements do not impose a certain level of nutrient removal or limit the amount of nutrients in the discharge; many dischargers are not even required to monitor the amount of nutrients in the wastewater they discharge to Puget Sound.

In 1994 we estimated the then 70 wastewater treatment plants in the Puget Sound area served 1.75 million people, most of which were served by secondary treatment plants or would soon be. We speculated that the reduced pollution loading achieved by upgrading from primary to secondary sewage treatment would be more than offset by increased population within 20 years. *(#1 above)*

In their 2014 report Ecology estimated the following populations were then or would be served by the 78 wastewater treatment plants in the Puget Sound area *(#4 below, Table 8, pg. 74)*. The numbers below are based on medium population estimates; the report contains low, medium and high estimates of population growth and resultant sewage treatment plant flows.

Year	Number of people served by Sewage Treatment Plants discharging directly to Puget Sound
1994	1.75 million people
2014	4.2 million people = 2.45 million increase since 1994 (140% increase)

2020 5.3 million people = 3.55 million increase since 1994 (203% increase) -- doubled

2040 6.6 million people = 4.85 million increase since 1994 (277% increase) -- tripled

2070 8.3 million people = 6.55 million increase since 1994 (374% increase) – quadrupled

Onsite Sewage Systems

The numbers above all exclude people served by onsite sewage systems ("OSS", or "septic systems"), which contribute nonpoint source pollution to both marine and freshwaters and are also growing rapidly in suburban and rural areas. Onsite systems, like secondary sewage treatment plants, are not designed to reduce nutrients and so remove only a small fraction of them. Local government records of onsite system approvals and installations are uneven and not uniformly accurate and available across all of Puget Sound. The approach generally taken to estimate the number of people served by onsite systems is to subtract the number of people served by sewage treatment plants from the total number of people living in the Puget Sound Basin; the remainder is assumed to be the number of people served by septic systems. It is estimated that in 2014 about 580,000 people were served by onsite systems.

Links to onsite system information:

Puget Sound Partnership: https://vitalsigns.pugetsoundinfo.wa.gov/VitalSign/Detail/5

WA Dept. of Health: https://www.doh.wa.gov/CommunityandEnvironment/WastewaterManagement

Links to Ecology's websites for Nutrients in Puget Sound and Nutrients General Permit:

https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Helping-Puget-Sound/Reducing-Puget-Sound-nutrients

https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Nutrients-Permit

Technical Reports Related to Nutrients in Puget Sound

1. Review of the Marine Environment and Biota of Strait of Georgia, Puget Sound and Juan de Fuca Strait: Proceedings of the BC/Washington Symposium on the Marine Environment, January 13 & 14, 1994, Chapter 1. The Effects of Human Activity on the Marine Environment of the Georgia Basin: Present Waste Loadings and Future Trends (P. West, T.M. Fyles, B. King and D.C. Peeler) (Canadian Technical Report of Fisheries and Aquatic Sciences No. 1948)
2. Deschutes River, Capitol Lake, and Budd Inlet Temperature, Fecal Coliform Bacteria, Dissolved Oxygen, pH, and Fine Sediment Total Daily Maximum Load Technical Report: Water Quality Findings (Washington Dept. of Ecology, June 2012, Publication No. 12-03-008)
3. South Puget Sound Dissolved Oxygen Study: Water Quality Model Calibration and Scenarios Washington Dept. of Ecology, March 2014, Publication No. 14-03-004
4. Puget Sound and Straits Dissolved Oxygen Assessment: Impacts of Current and Future Human Nitrogen Sources and Climate Change through 2070 Washington Dept. of Ecology, March 2014, Publication No. 14-03-007