

# City of Tacoma

The City of Tacoma Environmental Services thanks Ecology for the opportunity to comment on this draft permit. Please see the attached two documents, "Birch Bay and Big Lake NPDES Permit Review Comments on Optimization" and "City of Tacoma Birch Bay Draft Permit Comments\_7-14-2020".

**City of Tacoma Birch Bay Draft Permit Document Comments**

Commentor Names	Commentor Emails	Referenced Document	Page	Reference Section	Comment
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	4	I. Introduction (2nd bullet point)	(11) "Effluent concentrations consistently achievable through proper operation and maintenance" means: (a) For a given pollutant parameter, the 95th percentile value for the thirty-day average effluent quality achieved by a wastewater facility in a period of at least twenty-four consecutive months, excluding values attributable to equipment failures, operational errors, overloading, and other unusual conditions; and (b) A seven-day average value equal to 1.5 times the value derived under (a) of this subsection.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	10	B. (first paragraph)	Has Ecology monitored Terrel Creek for nutrients as well?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	10	Table 2 - Dissolved Oxygen	5.8 mg/L Dissolved Oxygen is nearly in the "Excellent" category for DO in WAC 173-201A-210(1)(d). Why is Ecology capping the plant if the water quality is nearly "excellent" for aquatic life? The 1968 Dept. of Interior also recommended DO levels between 5.3 - 8 mg/L DO are satisfactory for aquatic life.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	11	Table 3 - Total Suspended Solids (lbs/day) values	Did the average value get switched with the max. value?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	13	III. Proposed Limits (Introduction)	The nutrient cap is neither technology based nor Water Quality Based.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	18	Mixing Zones	The authorization of the mixing zone implies that AKART has been met.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	23	Table 9 - Dissolved Oxygen Criteria - Extraordinary	Earlier in this fact sheet it was stated that the ambient water quality for dissolved oxygen is 5.8 mg/L ("Good Quality" (5 mg/L and higher) and nearly "Excellent Quality" (6 mg/L and higher) per WAC 173-201A-210(1) (d). Why is Ecology requiring a higher DO criteria than the ambient conditions?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	24	Table 10 - Recreational Uses	Ecology has not included a permit limit for Enterococci - only fecal coliform?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	24	E. Water quality impairments	If there is an impairment this should trigger a 303(d) listing, a TMDL and a WLA. If this work has not been done there is no basis for a cap.  In addition, Salish Sea model runs have not been completed, to date, to evaluate near field and far field impacts from wastewater treatment plants throughout the Puget Sound.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	24		There is the briefest of text in the fact sheet as the basis for finding that discharges from this facility are causing or contributing to violations of the DO criteria. It appears from the fact sheet text that this is not an issue for Birch Bay but rather a far field concern. Looking at the Salish Model, <a href="https://waecy.maps.arcgis.com/apps/webappviewer/index.html?id=2a5d5e519a9d40df8a88f6910786c51f">https://waecy.maps.arcgis.com/apps/webappviewer/index.html?id=2a5d5e519a9d40df8a88f6910786c51f</a> , it does not look like there are any DO impairments in Rosario/Georgia Strait.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	27	First Paragraph	BOD is controlled through a technology based effluent limit. So calculating a Water Quality based Effluent limit for BOD is irrelevant.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	29	Nutrients - first paragraph	The paragraph states that the WWTPs have contribute to low dissolved oxygen below the state water quality criteria. Where? The ambient condition near Birch Bay is at 5.8 mg/L DO - this meets the DO criteria per the WAC.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	29	Nutrients - first paragraph	There are pending science questions and uncertainties about the use of the Salish Sea Model that have not been addressed to date. These science based concerns should be addressed before conclusions are made in a permit. Ecology has a meeting scheduled on July 23rd to begin to discuss addressing these issues.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	29		"Discharges in one basin can affect the water quality in other basins. Thus, all wastewater discharges to the Salish Sea containing inorganic nitrogen contribute to the D.O. impairment."  This statement does not follow. The model runs indicate that discharges can impact other basins but it did not show that they do. Specifically the model runs did not show an impairment attributable to the Birch Bay discharge.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	29		"Water quality based effluent limits (WQBELs) are required for wastewater treatment plants discharging to surface waters when the discharge has reasonable potential to cause or contribute to an in-stream excursion above a narrative or numeric State water quality criteria (40 CFR 122.44(d)(1)(iii))."  Then Ecology must develop WQBELs and then apply them to dischargers.

City of Tacoma Birch Bay Draft Permit Document Comments					
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Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	29		<p>"Ecology continues to work on refining inputs and outputs of the Salish Sea Model to determine water quality impacts from both discrete point sources and watersheds entering Puget Sound."</p> <p>Which in and of itself is an admission that Ecology does not have the data to calculate and apply a TIN effluent limit that is related to the potential water quality impairment.</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	29		<p>"In a receiving water as complex as the Salish Sea, the modeling work necessary to develop numeric WQBELS for each discharge is comprehensive and requires extensive internal and external review."</p> <p>Ecology must do this model work in order to determine appropriate WQBELS. Implementing a limit prior to doing this work is arbitrary.</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	29		<p>"The inorganic nitrogen in the Permittee's discharge has reasonable potential to contribute to far-field water quality impacts. For this permit cycle, implementing a numeric WQBEL for nitrogen is infeasible."</p> <p>Ecology has not completed the modeling effort to confirm this statement.</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	30		<p>"This is due to the additional modeling scenarios necessary to quantify both the Permittee's far-field water quality effect and the corresponding effluent limit necessary to prevent an exceedance of the D.O. standard."</p> <p>See previous comment. This statement is an admittance that Ecology does not know the WWTP's far-field effects.</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	30		<p>"Federal rule at 40 CFR 122.44 (d)(vi)(C) requires permits that use indicator parameters to: identify the pollutants intended to be controlled, require appropriate monitoring, and include a reopener clause. This permit meets those requirements. The rule also requires documentation here in the fact sheet on how limiting the indicator parameter will result in control of the pollutant of concern sufficiently to attain and maintain water quality standards."</p> <p>Ecology has not identified the water quality monitoring they will do to determine if the limit imposed in this permit is effective. Therefore the permit does not meet the requirements of 40 CFR 122,44(d)(vi)(C).</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	30		<p>"While Ecology actively pursues the necessary modeling to make development of numeric WQBELS feasible, 40 CFR 122.44(k) states that best management practices (BMPs) to control or abate the discharge of pollutants are acceptable when numeric effluent limitations are infeasible. Ecology believes that a combination of a nutrient load cap, and treatment efficiency optimization constitutes a suite of BMPs that meets the intent of 40 CFR 122.44(k). Ecology will reevaluate this limit during development of the next permit iteration, or sooner using the reopener clause if appropriate."</p> <p>Nutrient caps(Effluent limits) are not a practices. Ecology defines BMP in appendix C as "Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs are a suite of actions that an entity can take to minimize impacts. Actions would include optimizations (assuming we can define what that means). It does not include arbitrary limits which an entity may or may not be able to meet. This does not meet the intent of 40 CFR 122.44(k)."</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	30		<p>"Treatment efficiency optimization is an adaptive management strategy the Permittee must use to limit the discharge of TIN to the maximum extent practicable and stay below the annual average load cap. Ecology expects these facility specific operational efforts to be initiated following permit issuance."</p> <p>The utility will need time to evaluate this (monitoring data, modeling, testing, etc.). A compliance schedule is needed.</p>

**City of Tacoma Birch Bay Draft Permit Document Comments**

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Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	31	First Paragraph	<p>"The proposed permit requires the permittee to develop, implement, and maintain a Nutrient Optimization Plan due 12 months following the permit effective date."</p> <p>Where did this timeline come from? Additional time may be needed since the facility may not have adequate data to model the plant and evaluate its ability to optimize for nutrients.</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	31		<p>"The Permittee must use the Nutrient Optimizatin Plan to evaluate existing treatment processes for nutrient reduction. This must include identifying opportunities through operational adjustments designed to enhance nitrification and denitrification, <del>minor retrofits such as the incorporation of anoxic zones, review of septage receiving policies and procedures, side-stream management opportunities, and minor upgrades. Minor upgrades are those that have a cost for equipment not exceeding 5% if annual budget for equipment and supplies.</del>"</p> <p>All of the items in this list will take time to evaluate. A compliance schedule is needed if a load cap is issued with these requirements. Paragraph is also stricken through. The items listed may not be relevant to the facility. In addition, this is not an exhaustive list of optimization options. Last sentence strike through is due to this budget not being clear. The definitions for the facility budget are not clear.</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	31		Development of an Optimization Plan must occur prior to and inform the calculation of any cap.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	31		<p>"Ecology used effluent data collected during the previous permit cycle to develop the annual numeric nutrient-loading cap for total inorganic nitrogen (TIN). Sixty-seven months of loading data were available for Birch Bay for calculation of the TIN cap. The last 36 months were used as representative of existing loading. All of the data used is available at the end of Appendix D. The numeric cap was calculated so that there is no more than a one percent chance of exceedance when annual load remain similar to historic loads."</p> <p>One data point a month is hardly representative. It could have been a good or bad day for the plant. Another issue could be that the sample was taken on a Tuesday (only due to the sample schedule at the plant) and the largest loading day could be on the weekend. This area has quite a few vacation homes, so this very well could be true. In addition, holidays and weekends are likely the higher load events for the plant. In addition, this data set is not adequate to conduct a nutrient rating of the facility or an Optimization Study (modeling effort).</p> <p>If the facility is unable to optimize for nutrients, then it will violate 1% of the time (assuming there is no growth). How does Ecology intend on allowing for growth?</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	32	Second Paragraph	<p>"Future permitting actions, still under development, will address nutrient capping and planning conditions."</p> <p>This has been added?</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	36	First Paragraph	<p>"Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate a NOEC, LC50, EC50, IC25, etc."</p> <p>If these labs are accredited by Ecology for these tests one would assume they know how to conduct them. This paragraph seems unnecessary.</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	39	C. Operations and Maintenance	<p>"Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that Birch Bay takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment."</p> <p>If this is the case shouldn't this be where the optimization report requirement should be?</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	59	Appendix D	Appendix D – effluent calculation technical details, fact sheet, at 59, shows the calculations for the TIN cap. There is a hyperlink to "Below is the output" that leads to the Ecology 2016 WET testing guidance document. Did Ecology intend that link or something else?

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Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	59	Appendix D	The TIN is calculated using an online app: <a href="https://steve-hood.shinyapps.io/TINcap/">https://steve-hood.shinyapps.io/TINcap/</a> Has Ecology previously used this app/calculator? Are there any concerns about its use and applicability?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	59	Appendix D	Are there any concerns about the quantity and quality of data used in the developing the cap?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	59	Appendix D	Should the "average annual flow" used to calculate the cap include design capacity and/or future growth?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet	59	Appendix D	Are there any concerns that the calculation of what is a performance based effluent limit is consistent with the guidance in Chapter 4 of Ecology's Permit Writers Manual on calculating performance based limits?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	5	Table 1 - Nutrient Optimization Plan Frequency	"Annually" is spelled incorrectly.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	6	Table 2 - Total Inorganic Nitrogen	How should they calculate this? Based on average daily flow on the day the sample was taken? Or maximum monthly or average monthly?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	8	Table 4 - Wastewater Influent	No nutrients?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	10	Table 7 - Effluent Characterization - Nitrogen Components	This should be at least weekly. There is too much variation within a month for a single sample to be representative.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	19	S4B.b.3.	A nutrients cap based on historical data could cause this if the facility has no ability to remove nutrients to allow for grown through optimization without capital investment or until a capital project is completed.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	22	2.a.	If the by-pass is necessary isn't it essential?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	23	Second Bullet	This would appear to be the very definition of an essential by-pass
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	26	5	"5. Require sources of non-domestic wastewater, which do not qualify as SIUs but merit a degree of oversight, to apply for a SWDP and provide it a copy of the application and any Ecology responses. "  How is this determined?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	30	S11. Nutrient Optimization Plan	How did 12 months get decided on? This is not be enough time. More time is needed for gathering monitoring data for at least a year to get a truly representative data set. One data point a month is not representative of the variability of the data.  What is Ecology's approval process for this?  See comment above about removing examples.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	31		This looks like a facility plan. Is there an expectation that the permittee will make capital improvements for nutrient reductions every year? Is there a target effluent limit or just reduce every year?
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	35	G5. Plan Review Required	So the minor improvements to stay under the cap... why isn't there time to get approval, construct, etc. How quickly will Ecology respond? A compliance schedule is needed.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Draft Permit	35	G6. Compliance with other laws and statutes	Growth Management Act? If you cap using past data - the previously approved future flow and loads are no longer valid.

**City of Tacoma Birch Bay Draft Permit Document Comments**

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Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet and Draft Permit		General Comments	<p>1. Immediate Compliance with New Effluent Limits</p> <p>a. The draft NPDES permit proposes imposition of new Total Inorganic Nitrogen (TIN) effluent limits for the Birch Bay Water and Sewer District ("BBWSD"), an existing discharger, without provision of a compliance schedule. In other discussions, Ecology staff have stated that provision of a compliance schedule for the newly proposed TIN effluent limits is not warranted because Ecology has calculated limits based on historical effluent performance data. However, the data that Ecology has selected for use in calculating the proposed effluent TIN limits may not be representative, may not accurately portray actual effluent performance for a number of reasons. The historical TIN data is sparse and collected only on a monthly basis that may not capture the actual variability in effluent discharges which may change daily, weekly, and seasonally. Nutrient removal treatment technology studies are based upon much more intensive monitoring with more frequently collected effluent data that is needed to fully characterize treatment performance (e.g. daily, weekly, or multiple days per week). Since the historical data was not collected with the intent of informing effluent load limits, it may or may not be representative and could reflect over-loaded or under-loaded plant conditions, wastewater characteristic changes, variability in weather and precipitation conditions, treatment process changes, testing, modifications upsets, etc. Further, the historical effluent data was not collected or analyzed in accordance with a Quality Assurance Project Plan (QAPP) designed with the specific intent of quantifying historical effluent TIN performance or informing new effluent limits. A QAPP is the professional best practice for environmental monitoring generally required by regulatory agencies to be prepared, reviewed, and approved prior to data collection.</p>
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet and Draft Permit		General Comments	<p>2. Unknown Compliance Risk with New Effluent Limits</p> <p>a. The calculation method applied by Ecology to historical monthly TIN monitoring data to determine the Maximum Annual mass load limit obscures the variability in actual treatment performance and may, or may not, introduce new compliance risk. Ecology's Fact Sheet (page 31) states that "The numeric cap was calculated so that there is no more than a one percent chance of exceedance when annual load remain similar to historic loads." However, it is not clear that the chance of exceedance is minimal. The data used in the loading calculation was simply selected from the past 36 monthly dates, doesn't account for variability in the intervening times, and may not represent feasible treatment performance in the future. Ecology has employed a statistical technique to the historical data, as described in the Fact Sheet (page 31) based upon calculation of the mean monthly load described as follows: "The calculation uses a bootstrap method to estimate the distribution of possible means over a year. The size of the resample used in the bootstrap analysis was equal to the number of samples in the compliance period. This method randomly resamples the data with replacement." Using the bootstrap method to calculate average monthly TIN loads artificially constrains the variability in flow and concentration data such that the risk of exceedance appears low. Concerns about the use of the bootstrapping technical to calculate an effluent limit include the following: include:</p> <ul style="list-style-type: none"> <li>• The "original data" are not used directly in Ecology's bootstrap calculation. Loads are used in Ecology's calculation and loads are not what are actually measured in effluent monitoring. Effluent flow, ammonia (TKN) and nitrate+nitrite are the parameters measured and each of them may vary. Therefore, the variability in the measured data is lost after it is averaged, summed, and multiplied to a calculated a load value using Ecology's bootstrap approach.</li> <li>• Ecology's calculation method artificially limits variability because the minimum and maximum are set in the dataset and no values less than, or greater than those values can occur in the bootstrap resampling. It appears unlikely that the actual minimum and maximum discharge loads are captured in the bootstrap calculation and dataset selected.</li> <li>• Ecology's bootstrap statistical technique is simply a re-sampling of the dataset that that allows for replacement of values in the dataset that happens to be available. This means one load value can be resampled multiple times, when the same load is unlikely to occur in a real effluent dataset.</li> </ul>

**City of Tacoma Birch Bay Draft Permit Document Comments**

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Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Fact Sheet and Draft Permit		General Comments	3. Unclear Basis for Compliance a. The basis for compliance with the TIN load limit is unclear and is expressed in differing ways in the permit and fact sheet. The permit Table 2 presents the TIN limit as a Maximum Annual mass value in lbs/year. The footnote d. to Table 3 in the permit presents a calculation for a "Cumulative Total (lbs)" that is unclear and relies on an equation with "Previous Cumulative Total + Current Monthly Total" values, which are also not defined. The Fact Sheet (page 30) refers to an average load, not a maximum, in stating that "Treatment efficiency optimization is an adaptive management strategy the Permittee must use to limit the discharge of TIN to the maximum extent practicable and stay below the annual average load cap." It is not clear whether the effluent TIN limit is an average, or a maximum not to exceed value, and whether it is a calendar year value or a rolling 12-month value, or something else. In any event, the basis for compliance is not clear and the requirements or consequences for exceeding the limit is not defined. This lack of clarity presents a compliance risk with unknown consequences subject to varying interpretation in the future.
Dan Thompson Teresa Peterson	dthompson@cityoftacoma.org tpeterson@cityoftacoma.org	Both Documents			See attachment "Birch Bay and Big Lake NPDES Permit Review Comments on Optimization" PDF.

# City of Tacoma Comments on Birch Bay and Big Lake Draft NPDES Permits Review Comments – Optimization

July 24, 2020

## 1. Section S11 Nutrient Optimization Plan

Draft permit Section S11. Nutrient Optimization Plan calls for an optimization plan to be submitted within 12 months of the permit effective date. This time frame is too short for any substantive plan to be developed that would inform the realistic potential for nutrient reduction in existing treatment facilities for several reasons. Further, the foundation in nitrogen monitoring data for the effluent and the individual unit treatment processes is not robust enough to support an optimization analysis in a short 12 month time frame. Monthly effluent nitrogen data is not sufficient to inform nutrient optimization because it does not represent the variability in effluent nutrients that is known to occur on a much more frequent basis.

An essential first step in nutrient optimization is a monitoring plan designed specifically to inform the documentation of a baseline for existing effluent performance, as well as provide the foundation of tracking changes in effluent performance with efforts made in optimization. Without that, it will not be possible to conduct trends analysis to determine whether or not optimization efforts are effective, or whether changes in effluent quality are simply the result of changes in monitoring. Further, optimization planning requires that monitoring data is available for plant influent wastewater, and individual unit treatment processes within the plant, because that data is essential to understanding current performance, as well as conducting analysis and modeling to simulate potential optimization enhancements.

Optimization planning should begin with a Quality Assurance Project Plan (QAPP) for influent, effluent, and treatment process monitoring designed with the specific intent of quantifying historical effluent nitrogen treatment and supporting optimization efforts. Optimization planning can be initiated in conjunction with enhanced monitoring, but planning is unlikely to be completed in 12 months due to the lack of sufficient monitoring data. The initial monitoring effort to support optimization planning should include sampling on a frequent basis (e.g. daily, 3X per week, or weekly) to document variability during key periods (e.g. dry weather, wet weather, winter, summer, shoulder seasons, etc.). Sampling frequency may be reduced over time, but monitoring should extend over a multi-year period to capture influences of weather, seasonal loadings, service area changes, treatment process variations, plant upsets, etc.

A QAPP is the professional best practice for environmental monitoring generally required by regulatory agencies to be prepared, reviewed, and approved prior to data collection. Ecology provides guidance on QAPPs in both reports and permit writer guidance. Ecology's "Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies" (Ecology Publication 04-03-030) states the following:

"Each environmental study conducted by or for the Washington State Department of Ecology must have an approved Quality Assurance (QA) Project Plan. The QA Project Plan describes the objectives of the study and the procedures to be followed to achieve those objectives. The QA



Project Plan is a product of a systematic planning process.”  
(<https://fortress.wa.gov/ecy/publications/SummaryPages/0403030.html>)

Ecology’s “Water Quality Program Permit Writer’s Manual” states the following regarding the preparation of a QAPP to address the specific issues being investigated:

“The permit manager and permittee must understand the purpose of data collection, or the end use goal, because it may affect the data management procedures including statistical evaluations conducted on the analytical results. The data validation step following sample collection and analysis ensures results are usable to satisfy project objectives. Study objectives include determination of initial method target levels and the intended use of the final product. Essentially, successful study objectives involve knowing the question the additional monitoring is going to attempt to answer and what kind of data is needed to meet that end. When determining study objectives, permit writers should think about the problem statement. What are you trying to do? Making a decision versus estimating a problem are two examples of different study objectives.” (<https://fortress.wa.gov/ecy/publications/publications/92109.pdf>)

Draft permit Section S11. specifies that “treatment efficiency optimization must evaluate” a list of considerations including operational adjustments, anoxic zones, septage receiving policies, side-stream management, and/or minor upgrades. These considerations may, or may not be appropriate or feasible for any given treatment facility. Minor upgrades are defined as costs not exceeding 5% of the annual equipment and supplies budget, which may, or may not be an appropriate metric for an investment linked to optimization. This specificity may not be compatible with site specific circumstances and may unnecessarily constrain the potential for creative considerations to be included in optimization planning, and may omit promising new options from consideration, such as new technology, automation, reclamation and reuse, etc.

Rather than attempt to define what constitutes an optimization plan in discharge permit language, a more appropriate approach would be for the permit to specify the application of existing wastewater industry nutrient optimization resources to be used to benefit from experience in other locations. In this way, the scoping process for a unique facility optimization plan can apply an existing framework, as well as tailor the plan to site specific conditions. The following reference documents provide a framework for nutrient optimization, examples of nutrient optimization plans, and contemporary assessments of nutrient removal treatment technologies.

#### **Water Research Foundation (WRF4973) Nutrient Optimization**

(<https://www.waterrf.org/research/projects/guidelines-optimizing-nutrient-removal-plant-performance>)

- The WRF 4973 Nutrient Optimization project provides a structure and framework for optimization that distinguishes between optimizing an existing secondary treatment plant, or an existing nutrient removal facility. As part of that framework, basic themes are characterized to further organize optimization planning.

#### **Water Research Foundation (WRF NUTR5R14g) Nutrient Removal Challenge Synthesis Report**

(Water Research Foundation. 2019. "Nutrient Removal Challenge Synthesis Report." WRF NUTR5R14g/4827g.)

- This report is the culmination of more than a decade of wastewater nutrient removal research work by the Water Research Foundation, including publications by more than 30 Principal Investigators, and hundreds of collaborators from consulting firms, universities, and regulatory agencies. This synthesis report provides a concise summary of the most important aspects of state-of-the-art research conducted on nitrogen and phosphorus removal.

**Bay Area Clean Water Agencies Nutrient Reduction Study. 2018. "Potential Nutrient Reduction by Treatment Optimization, Sidestream Treatment, Treatment Upgrades, and Other Means.**

([https://bacwa.org/wp-content/uploads/2018/06/BACWA\\_Final\\_Nutrient\\_Reduction\\_Report.pdf](https://bacwa.org/wp-content/uploads/2018/06/BACWA_Final_Nutrient_Reduction_Report.pdf))

- This report provides a recent example of a nutrient reduction study for a west coast estuary that was prepared to evaluate potential nutrient discharge reduction by treatment optimization, sidestream treatment, and by treatment upgrades or other means. The purpose was to support the effort to track and evaluate treatment plant performance, fund nutrient monitoring programs, support load response modeling, and conduct studies to better understand treatment plant optimization opportunities and upgrade needs to achieve nutrient removal.

**Water Environment Federation (WEF) Manual of Practice 34. "Nutrient Removal, WEF MOP 34." New York: McGraw Hill Professional."**

- Reference Chapter 3 Overview of Nutrient Removal Processes for a framework of various technologies and processes for nutrient removal and potential pathways for converting from secondary treatment to nutrient removal.

**EPA Nutrient Control Design Manual – State of Technology Review Report.**

([https://cfpub.epa.gov/si/si\\_public\\_record\\_report.cfm?Lab=NRMRL&dirEntryId=203844](https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=203844))

- This document presents findings from an extensive review of nitrogen and phosphorus control technologies and techniques currently applied and emerging at municipal wastewater treatment plants (WWTP). It includes information on the importance of nutrient removal, the properties and analytical techniques for nitrogen and phosphorus species, and the principles behind biological nitrogen and phosphorus removal and chemical phosphorus precipitation.

Draft permit Section S11. specifies that "...planning level evaluation must also include estimates for nutrient load reductions from changes..." However, that will not be possible without more robust monitoring data collected in accordance with a QAPP for monitoring designed to inform the requirement for quantifying and tracking changes in nitrogen loadings. The permit requirements should be modified to call for the preparation of a QAPP for monitoring and the timeframe allowed for that activity should be based upon the development of the QAPP. Therefore, the appropriate permit requirement would be to develop and implement a QAPP for nitrogen monitoring within 12 months of the permit effective date, not the optimization plan. The optimization planning process should be sustained through the period of the permit.

The appropriate permitting requirement for optimization planning should be based upon scoping the optimization process within 12 months of the permit effective date, to produce a multi-year framework for optimization studies consistent with the wastewater industry guidance cited above. The scoping process should consider the site specific circumstances associated with the existing treatment facilities and the unique characteristics of the service area, wastewater sources, solids processing, physical plant space requirements, growth in flows and loadings, compliance with other regulatory requirements, etc.