DEPARTMENT OF ECOLOGY
State of Washington

PUGET SOUND NUTRIENT GENERAL PERMIT

Preliminary Draft

January 2021

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Contents

I. Introduction

The Washington State Department of Ecology (Ecology) is working on issuing the Puget Sound Nutrients General Permit. Ecology prepared preliminary draft permit language or narrative descriptions of specific permit sections and is **accepting informal comments until 11:59 pm, March 15, 2021**.

Submit your comments to: eComments

Or mail hard copies to:

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II. Coverage Requirements

A. Considerations for evaluating coverage requirements

A general permit must specify what categories of dischargers within what geographic area are covered by the permit conditions (173-226-050).

~~The~~ Ecology's application of the Salish Sea Model (Khangaonkar et al., 2018) ~~(Ahmed et al, 2019)~~ as presented in the Bounding Scenarios Report (Ahmed et al, 2019) has shown that nutrients discharged from domestic wastewater treatment plants (WWTPs) contribute to the low dissolved oxygen levels, below state water quality criteria, in Puget Sound. Therefore, Ecology must require wastewater treatment plants to control nutrients consistent with the Clean Water Act and Washington's Water Pollution Control Act.

The Salish Sea Model (SSM) has 67 current and distinct domestic point sources, or wastewater treatment plants, as inputs within the United States waters of the Salish Sea. There are other point sources included in the model which are outside the scope of coverage for this proposed permit. These include federal and tribal facilities, Canadian domestic sources and industrial discharges. All of the point sources can be viewed in the Salish Sea Web Map.

Point sources included in the Salish Sea Model primarily discharge directly to Puget Sound waters. However, since Ecology set modeling boundaries based on locations of freshwater monitoring stations, there are instances where the model includes wastewater treatment plants discharging to estuarine or freshwater as a point sources (i.e. Skagit County Big Lake WWTP). In the above mentioned instances, a freshwater monitoring station was upstream of a freshwater discharger's outfall location. When this occurred, Ecology represented the wastewater treatment plant as a discrete point source within the model rather than including the discharge as part of the aggregated watershed load.

The 67 distinct, domestic point sources represented in the SSM and under Ecology's jurisdiction include:

- 9 privately-owned domestic wastewater treatment plants.

- 58 publicly-owned domestic wastewater treatment plants (POTWs). POTWs are owned by municipalities or special purpose districts (i.e. sewer districts). (Note: The Everett WWTP and the Marysville WWTP share a Puget Sound outfall, which counts as one distinct point source.)

B. Coverage Proposal

Ecology proposes to cover the POTWs listed in Table 1 with this Puget Sound Nutrients General Permit. The individual National Pollutant Discharge Elimination System (NPDES) permits shown in Table 1 for the covered facilities will also remain in effect to regulate other aspects of the facilities' discharge and operations. If a new application for permit coverage is received for a facility not named in Table 1 but eligible for coverage under this general permit, Ecology proposes to issue an order for coverage rather than modifying the permit to revise the facility coverage list.

Table 1 – General Permit Proposed Facility Coverage List

Wastewater Treatment Plant	Individual NPDES Permit No.
Alderwood STP	WA0020826
Anacortes WWTP	WA0020257
Bainbridge Island WWTP	WA0020907
Birch Bay Sewage Treatment Plant (STP)	WA0029556
Boston Harbor STP	WA0040291
Bremerton STP	WA0029289
Chambers Creek STP	WA0039624
Clallam Bay STP	WA0024431
Clallam Bay Corrections Center STP	WA0039845
Coupeville STP	WA0029378
Eastsound Orcas Village WWTP	WA0030911
Eastsound Sewer and Water District WWTP	WA0030571
Edmonds STP	WA0024058
Everett STP	WA0024490
Fisherman Bay STP	WA0030589
Friday Harbor STP	WA0023582
Gig Harbor STP	WA0023957
Hartstene Pointe STP	WA0038377
King County Brightwater WWTP	WA0032247
King County South WWTP	WA0029581

King County Vashon WWTP	WA0022527
King County West Point WWTP	WA0029181
Kitsap County Central Kitsap WWTP	WA0030520
Kitsap County Kingston WWTP	WA0032077
Kitsap County Manchester WWTP	WA0023701
Kitsap County Sewer District #7 Water Reclamation Facility (WRF)	WA0030317
La Conner STP	WA0022446
Lake Stevens Sewer District WWTP	WA0020893
Lakota WWTP	WA0022624
Langley STP	WA0020702
Lighthouse Point WRF/Blaine STP	WA0022641
LOTT Budd Inlet WRF	WA0037061
Lynnwood STP	WA0024031
Marysville STP	WA0022497
McNeil Island Special Commitment Center WWTP	WA0040002
Midway Sewer District WWTP	WA0020958
Miller Creek WWTP	WA0022764
Mt Vernon WWTP	WA0024074
Mukilteo Water and Wastewater District WWTP	WA0023396
Oak Harbor STP	WA0020567
Penn Cove WWTP	WA0029386
Port Angeles STP	WA0023973
Port Orchard WWTP (South Kitsap WRF)	WA0020346
Port Townsend STP	WA0037052
Post Point WWTP (Bellingham STP)	WA0023744
Redondo WWTP	WA0023451
Rustlewood STP	WA0038075
Salmon Creek WWTP	WA0022772
Sekiu WRF	WA0024449
Sequim WRF	WA0022349

Shelton STP	WA0023345
Skagit County Sewer District 2 Big Lake WWTP	WA0030597
Snohomish STP	WA0029548
Stanwood STP	WA0020290
Tacoma Central No. 1	WA0037087
Tacoma North No. 3	WA0037214
Tamoshan STP	WA0037290
WA Parks Larrabee WWTP	WA0023787

C. Facilities excluded from Permit Coverage

Nutrient loads from wastewater discharges into rivers are part of the aggregated watershed load represented in the Salish Sea Model. While the Salish Sea Model predicts that the aggregated nutrient load from watersheds contributes to impairment, it does not contain sufficient information to estimate the watershed load attributable to a particular POTW in that watershed. Since additional analysis is needed to establish contributions of POTWs located in the watersheds, it is not appropriate to include those facilities in the general permit at this time. Ecology will evaluate required nutrient reductions from these facilities as part of the Nutrient Source Reduction Plan during the first permit term. Future permit coverage requirements will be addressed during permit renewal. Table 2, below, lists domestic watershed facilities that will be excluded from permit coverage during the first permit term.

Table 2 Domestic Watershed Facilities Excluded from Coverage

Wastewater Treatment Plant	Individual NPDES Permit No.
Arlington STP	WA0022560
Buckley STP	WA0023361
Burlington WWTP	WA0020150
Carbonado STP	WA0020834
Carnation WWTP	WA0032182
Cherrywood Mobile Home Manor*	WA0037079
Concrete STP	WA0020851
Duvall STP	WA0029513
Eatonville STP	WA0037231
Enumclaw WWTP	WA0020575
Everson STP	WA0020435
Ferndale STP	WA0022454

Fort Flagler State Park STP	WA0039829
Granite Falls STP	WA0021130
Lynden STP	WA0022578
Monroe City WWTP	WA0020486
North Bend STP	WA0029351
Orting WWT Plant	WA0020303
Seattle City Light Newhalem WWTP	WA0029670
Sedro Woolley STP	WA0023752
Snoqualmie WWTP	WA0022403
South Prairie STP	WA0040479
Sultan WWTP	WA0023302
Sumner	WA0023353
Wilkeson STP	WA0023281
Yelm STP	WA0040762
* Private Facility	

Ecology also proposes to exclude the following wastewater treatment plant categories from this general permit:

- Privately-owned domestic wastewater treatment plants. The 9 privately-owned facilities show in Table 3, below, collectively represent less than 1% of the total wastewater treatment plant nitrogen load to the greater Puget Sound. WAC 173-240-104, effective in 2000, requires ownership of domestic wastewater treatment facilities by public entities. Domestic wastewater treatment facilities owned by a private entity and permitted prior to the rule becoming effective may remain under private ownership but may not expand to serve additional customers. Existing privately-owned facilities must incorporate into a public entity such as a sewer district in the event they want to expand or make substantial modifications. At this point, if a privately-owned facility incorporates into a public entity, Ecology would consider these facilities for coverage under the general permit. Ecology proposes to evaluate the loading action levels and necessary monitoring requirements for the privately-owned domestic wastewater treatment plants while developing these requirement for the POTWs subject to this general permit. On a case-by-case basis, Ecology will consider appropriate action levels and monitoring requirements in the individual permits for the privately-owned facilities through permit modifications. Otherwise, Ecology will consider nutrient controls at the time of permit renewal.

Table 3 – Private Facilities Excluded from Coverage

Wastewater Treatment Plant	Individual NPDES Permit No.
Alderbrook Resort and Spa	WA0037753
Carlyon Beach STP	WA0037915
Messenger House Care Center	WA0023469
Port Ludlow WWTP	WA0021202
Roche Harbor Resort	WA0021822
Rosario WWTP	WA0029891
Seashore Villa STP	WA0037273
Taylor Bay STP	WA0037656
Warm Beach Christian Camp and Conference Center	WA0029904

- Industrial wastewater treatment plants. As a class, the industrial facilities included in the SSM collectively represent less than 1% of the total wastewater treatment plant nitrogen load to Puget Sound. Nutrient control permit requirements for the industrial facilities discharging to the greater Puget Sound Area will be managed on an individual permitting basis.
- Federal and tribal facilities. Ecology does not have delegated authority to write NPDES permits for these treatment plants. EPA is the responsible permitting authority for federal and tribal wastewater treatment plants in Washington State. Conditions for nutrient controls will be implemented through the 401 Water Quality Certification process.

D. Facilities with current limits

Permittees that already have either existing wasteload allocations from an approved TMDL or a design based effluent limit (WAC 173-220-130) for pollutants regulated by the general permit (e.g., total inorganic nitrogen) must still apply for general permit coverage. However, the existing numeric effluent limits in the individual permit will remain in effect. For example, the La Conner WWTP has a water quality-based total ammonia effluent limit, from an approved TMDL. This limit and related permit requirements, such as regular monitoring, will remain in their individual permit. However, the La Conner WWTP would also be subject to the proposed general permit conditions. Results from the individual permit's monitoring requirements may be used to satisfy the general permit's monitoring schedule provided the timing and frequencies align. Ecology will work to streamline permit compliance between the proposed general permit and active individual permits.

E. Coverage Mechanics

Each POTW eligible for coverage, listed in Table 1 above, must submit an electronic Notice of Intent (eNOI) for coverage under the general permit. An eNOI is a request for coverage, and. is separate from the application a Permittee submits for an individual permit renewal.

Ecology will provide a draft NOI form for review during the general permit formal draft comment period. The draft eNOI is not currently available. Ecology will require the eNOI submission to be completed electronically via the WQWebPortal.

Permittees identified in Table 1 must submit an eNOI for coverage within 90 days after the issuance date of the general permit. Any new Permittees must submit an eNOI for coverage at least 180 days before any discharge to waters of the State. For example, if one of the privately-owned domestic wastewater treatment plants must incorporate into a public entity due to an expansion, coverage under the proposed general permit would be required. Therefore, that privately-owned facility would need to submit an eNOI 180 days before incorporation into a public entity.

F. Permit Fees

Permit fees are required by state law, RCW 90.48.465. Fees collected fund the operation of Ecology's Water Quality Wastewater Permit Program. Permit fees for municipal or domestic wastewater facilities are governed by WAC 173-224.

III. Nutrient Action Levels

A. Why is a nutrient load trigger necessary?

~~The~~ Ecology's application of the Salish Sea Model ~~(Ahmed et al, 2019)~~ has shown that nutrients discharged from wastewater treatment plants contribute to low dissolved oxygen (D.O.) levels, below state water quality criteria, in Puget Sound. Nitrogen is the limiting nutrient in Puget Sound waters. Early Salish Sea Model (SSM) runs ("Bounding Scenarios") confirmed that circulation within the inner basins of Puget Sound distributes a portion of pollutants throughout the waters of the greater Sound area. Discharges in one basin can affect the water quality in other basins. Thus, all wastewater discharges to the greater Puget Sound containing inorganic nitrogen contribute to D.O. impairments. About 70% of the nutrient load comes from domestic wastewater treatment plants (WWTPs, or plants, or facilities) discharging to Puget Sound and the estuarine areas during the critical warmer season when D.O. impairments occur.

More specifically, inorganic nitrogen, the sum of nitrate-nitrite and ammonia, is the form of nitrogen more available for algal growth that drives eutrophication and the D.O. impairment. The SSM and associated reports discuss dissolved inorganic nitrogen (DIN) but use data representing total inorganic nitrogen (TIN) as a model input. TIN includes both the dissolved and suspended portions of inorganic nitrogen. The Salish Sea Model did not use a ratio, or other method, to calculate an assumed dissolved component from the TIN data. For the purposes of this general permit, Ecology will use TIN as a conservative measure of DIN. See the Section III for the proposed monitoring parameters that plants will report to Ecology during this permit term.

The discharges proposed for coverage under this general permit contain inorganic nitrogen. The SSM confirmed that these discharges have reasonable potential to cause or contribute to the D.O. impairment. Also, current individual permits do not address this pollutant. Therefore, this permit must require the Permittees to control nutrients consistent with the Clean Water Act and Washington's Water Pollution Control Act. 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)).

Ecology continues to work on refining inputs and outputs of the SSM to determine water quality impacts from both discrete point sources and watersheds entering Puget Sound. Because of the broad, far-field impacts TIN has on Puget Sound, spreadsheet tools designed for toxic pollutants (such as "Permit Calc") cannot be used for the development of a numeric inorganic nitrogen WQBEL.

Washington State has numeric criteria for D.O. but not for nitrogen which further limits use of existing limit development spreadsheet tools. Ecology uses inorganic nitrogen as an indicator parameter for D.O., as allowed in 40 CFR 122.44(d)(vi)(C). Use of this indicator parameter requires modeling to demonstrate water quality impacts from a discharge.

Nutrients have a longer averaging period than toxics, no acute toxicity, and drive both near-field and far-field effects. Modeling is necessary to quantify these far-field impacts and to derive applicable numeric WQBELs. In a receiving water as complex as Puget Sound, the modeling work necessary to develop numeric WQBELs for each discharge is comprehensive and requires extensive internal and external review.

While Ecology has documented reasonable potential implementing a numeric WQBEL for nitrogen in this first permit cycle remains infeasible. Additional modeling is necessary to quantify both the far-field water quality effects from all discharges and the corresponding effluent limits necessary to prevent an exceedance of the D.O. standard.

Model runs will be used to further understand the significance of the far- and near-field effects of wastewater discharges to marine waters along with the anthropogenic nutrient loads from Puget Sound watersheds. With the completed model results and other best-available science and monitoring data, Ecology must first establish a loading capacity for nutrients that will meet D.O. criteria in the marine waters of Puget Sound. Then Ecology will allocate the overall nutrient loading capacity amongst the wastewater discharges and watersheds. Draft allocations for point and non-point sources will be developed with the draft Nutrient Source Reduction Plan in 2023.

Ecology will continue to inform and engage stakeholders on the framework for establishing nutrient load and wasteload allocations at the Puget Sound Nutrient Forum. Permittees and other interested parties may also participate in the process focused on WQBEL development from the nutrient wasteload allocations. Ecology anticipates finalizing numeric point source nutrient load reductions that will support adoption of numeric WQBELs in the second permit term.

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 WQBELs are infeasible. Ecology believes that a combination of a nutrient action level, planning requirements, and treatment efficiency optimization constitutes a suite of BMPs that meets the intent of 40 CFR 122.44(k) for this first permit term.

B. How does the nutrient action level work with the optimization requirement?

The annual optimization report and its adaptive management requirement form the narrative limit proposed by Ecology for the first permit term. The nutrient action levels as described in this preliminary draft document serve as the "yardstick" for facilities and Ecology to use when assessing the effectiveness of the optimization BMPs and determining whether additional actions are required. This permit proposes using two action level thresholds loads for each facility, AL_0 and AL_1. See Section III.E for information about these two action levels. Any exceedance of either AL_0 or AL_1 will trigger further action as outlined in Sections V and VI of the preliminary draft proposal.

C. Nutrient Action Level Calculation Methods

For this metric, Ecology prefers that a single calculation method be applied to all plants. Ecology explored different ways to approach the nutrient action level calculation internally and with the Advisory Committee. The Advisory Committee did not reach a consensus on a preferred calculation method, and some of the utilities objected to establishing target loads that trigger additional actions at plants; they believed the existing data are insufficient to calculate representative loads. Possible calculation methods that were discussed included using a straight percentile from existing, representative data, using the performance based effluent limit method calculation using formulas in Appendix E of the EPA's Technical Support Document (1991), and a bootstrapping calculation method. The straight percentile method was deemed inappropriate because the resulting nutrient action level would be based on a single data point and not an average, representative load. EPA's TSD performance based approach resulted in loads that were higher than maximum loads reported by dischargers indicating inconsistency with the assumption of the underlying distribution of the data set. While this calculation may work for some dischargers, it would not work for all, thereby eliminating it from consideration. The bootstrapping calculation, a non-parametric method emerged as Ecology's preferred calculation alternative given that this approach can accommodate any data distribution using random sampling methods with replacement. This method was preferred by the state, federal, and environmental caucuses of the Advisory Committee.

Calculating the baseline, AL_0

Do reviewers have feedback on whether the 95% UCL or 99% UCL is more appropriate for AL_0? Ecology has considered both and would like additional input.

Traditional, parametric statistical methods make assumptions about the underlying distribution of a data set. The shape of that distribution is estimated from the observations. Predictions about future observations can then be made using the estimated distribution. Like parametric statistical approaches, the bootstrapping method assumes that the original data represents possible future observations in the absence of changing conditions. The difference is that instead of filling in the gaps between observations to create a continuous distribution, the distribution of the observations (empirical distribution) is assumed to represent the distribution of future observations. Confidence intervals for simulated means using the bootstrapping method can be derived by first randomly selecting values from the original observation data (with each selected value being returned to the original set for potential reselection) in order to create a new "bootstrapped" sample of observations. Then the mean of the sample is determined. The resampling process is repeated a large number of times, and the mean of each new bootstrap sample is determined. Ecology has determine that the confidence level of interest is 99% for determining the annual loading baseline, AL_0. The simulated means are ranked from smallest to largest, and the 99^{th} percentile is identified If each facility behaves over the course of the permit cycle in a manner similar to its historical record, we can assume that there is only a 1% chance of exceeding AL_0 by chance in any year.

Ecology used at least 3 years of data in the baseline action level (AL_0) calculation. Ecology verified whether enough data for each facility exists to make a reasonable representation of the unmeasured data by using cumulative distribution functions as a check. For those 11 facilities that did not have enough data, Ecology proposes requiring those facilities to collect additional data during the first year of the permit to establish a representative data set and calculate the nutrient action level. Note that this data collection may extend into permit year 2 depending on the availability of existing data at the time of issuance. Coverage modifications will then be used to add nutrient action levels for these facilities that did not have enough data.

Monthly or more frequent data were available for 28 facilities. Quarterly or less frequent data were available for 19 facilities. Some facilities sample different parameters on different frequencies. Ecology made the following assumptions:

- Monthly and quarterly samples are representative of the month or quarter sampled
- Daily flows were matched with concentration data to capture variability and follow the recommendation from the Advisory Committee.
- When a day has only one parameter sampled, Ecology calculated the load with the measured value and the representative value of the other parameter.

- When less than monthly data was available, Ecology calculated loads for intervening months using the representative concentration and flow from the intervening month.

It is important to emphasize that the nutrient action levels calculated for this permit will not supersede or replace any existing nitrogen or nitrogen-related numeric water quality based effluent limits developed from TMDLs that may exist in a current individual permit. For these facilities, the TIN action level will be in addition to any specific water quality-based nitrogen limits, such as ammonia or NBOD+CBOD, that currently apply to several of the WWTPs.

> Do reviewers agree with this approach proposed for plants that have existing nitrogen-related effluent limits in their individual permits?

Any exceedance of AL_0 triggers the facility to select and complete a Tier 2 nutrient reduction action. See Section III. D regarding actions required for facilities that are currently achieving average annual effluent concentrations below 10 mg/L TIN.

Secondary Threshold, AL_1

The second action level threshold, AL_1, proposed for this permit recognizes that Ecology previously approved the design criteria for WWTPs within their individual permits. Ecology understands that it will take time for most facilities to plan, design, and construct upgrades that will meet numeric water quality standards. However, to prevent water quality impairments from spreading in extent or duration, nutrient loads cannot continue to increase in an uncontrolled manner while facilities work toward eventual reduction. The second action level proposed by this permit attempts to balance the need to reduce nutrients within an optimization framework while allowing plants some limited use of the previously approved capacity. For this reason, Ecology proposes that the AL_1 adds a modest increase (5%) to the baseline AL_0, allowing some of this permitted capacity to be utilized before implementing additional nutrient reduction actions. Ecology is not intending to stop growth with the development and issuance of this permit. Plants seeing increased growth rates must make a concerted effort to plan and adopt nutrient reduction solutions faster than those who are not growing as quickly.

See Section III.D for the approach to AL_1 calculation for facilities that are currently achieving average annual effluent concentrations below 10 mg/L TIN.

Any exceedance of AL_1 triggers the facility to select and complete a Tier 3 nutrient reduction action.

D. Facilities discharging less than 10 mg/L Total Inorganic Nitrogen

Fourteen plants in Puget Sound are already partially removing nutrients by maintaining concentrations below 10 mg/L, hereafter described as facilities discharging less than 10mg/L. At this time, Ecology does not know the range of reductions that will eventually be required for individual facilities discharging to the greater Puget Sound's marine and estuarine waters. Ecology currently expects that the range of final effluent limits will vary between 10 and 3 mg/L TIN, with 3 mg/L being around the lower limit of current technology. Future SSM scenarios may determine that facilities that now have an annual average TIN concentration of less than 10 mg/L will not need to make further TIN reductions to meet standards. The Advisory Committee recommended facilities now operating under 10 mg/L be exempt from additional general permit requirements beyond monitoring and optimization.

> Do reviewers agree with the approach proposed for calculating AL_1 for facilities that have historically been able to maintain their annual average TIN effluent concentration below 10 mg/L?

Ecology proposes that facilities currently discharging 10 mg/L TIN or less do not need to complete actions beyond monitoring and annual optimization reporting during this permit cycle, provided they are able to stay below AL_1. For those 13 facilities that qualify, Ecology proposes that AL_1 be calculated as 10 mg/L concentration for 85% of the design flow, the capacity at which all plants are required to plan for maintaining capacity.

These facilities are not required to implement Tier 2 nutrient reduction actions if AL_0 is exceeded. If AL_1 is exceeded, these facilities must select and complete a Tier 3 action. See Appendix A at the back of this document for the action level flowchart.

E. Calculated action load options by facility

Ecology's individual permit managers worked with their dischargers' data to determine the range of previously collected representative effluent data for use in the total inorganic nitrogen load limit calculation. Table 4 details proposed action levels (AL_0 and AL_1) by facility.

Table 4 – Proposed Total Inorganic Nitrogen Action Levels by Facility

Wastewater Treatment Plant	AL_0, lbs/year	AL_1, lbs/year
Alderwood STP *	54,800	155,249
Anacortes WWTP	167,000	175,350
Bainbridge Island WWTP ***	TBD	TBD
Birch Bay Sewage Treatment Plant (STP)	67,900	71,295
Boston Harbor STP	3,790	3,980
Bremerton STP	561,000	589,050
Chambers Creek STP	1,830,000	1,921,500
Clallam Bay STP	1,670	1,754
Clallam Bay Corrections Center STP	5,150	5,408
Coupeville STP	9,160	9,618
Eastsound Orcas Village WWTP ***	TBD	TBD
Eastsound Sewer and Water District WWTP	10,200	10,710
Edmonds STP	409,000	429,450
Everett STP	1,420,000	1,491,000
Fisherman Bay STP	2,060	2,163
Friday Harbor STP *	8,030	17,854
Gig Harbor STP	31,000	62,100
Hartstene Pointe STP *	2,200	4,813
King County Brightwater WWTP	2,261,549	2,374,627

King County South WWTP	9,623,203	10,104,363
King County Vashon WWTP *	3,480	3,654
King County West Point WWTP	8,786,673	9,226,007
Kitsap County Central Kitsap WWTP ***	TBD	TBD
Kitsap County Kingston WWTP *	3,660	7,555
Kitsap County Manchester WWTP	8,570	8,999
Kitsap County Sewer District #7 Water Reclamation Facility (WRF) ***	TBD	TBD
La Conner STP	31,600	33,180
Lake Stevens Sewer District WWTP	122,000	128,100
Lakota WWTP	597,000	626,850
Langley STP	4,430	4,652
Lighthouse Point WRF/Blaine STP***	TBD	TBD
LOTT Budd Inlet WRF *,**	235,000	724,496
Lynnwood STP	340,000	357,000
Marysville STP	591,000	620,550
McNeil Island Special Commitment Center WWTP	4,520	4,746
Midway Sewer District WWTP	406,000	426,300
Miller Creek WWTP	297,000	311,850
Mt Vernon WWTP	369,000	387,450
Mukilteo Water and Wastewater District WWTP *	12,000	67,533
Oak Harbor STP ***	TBD	TBD
Penn Cove WWTP	1,750	1,838
Port Angeles STP	176,000	184,800
Port Orchard WWTP (South Kitsap WRF)	215,000	225,750
Port Townsend STP ***	TBD	TBD
Post Point WWTP (Bellingham STP)	932,000	978,600
Redondo WWTP	249,000	261,450
Rustlewood STP ***	TBD	TBD
Salmon Creek WWTP	199,000	208,950
Sekiu WRF	2,620	2,751

Sequim WRF *	8,900	43,211
Shelton STP *	20,700	114,108
Skagit County Sewer District 2 Big Lake WWTP	2,570	9,056
Snohomish STP	86,300	90,615
Stanwood STP ***	TBD	TBD
Tacoma Central No. 1	2,370,000	2,488,500
Tacoma North No. 3	340,000	357,000
Tamoshan STP ***	TBD	TBD
WA Parks Larrabee WWTP***	TBD	TBD
* AL_1 = 10 mg/L *(0.85* Maximum Month Avg Flow (MGD)) * 8.34 lbs/gal * 365 days/year ** Facility has effluent limit for total inorganic nitrogen in individual permit *** Insufficient TIN data for AL calculation		

IV. Monitoring and Reporting

A. Monitoring requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's conditions. Most treatment plants conduct their own process control sampling in addition to permit compliance sampling as part of their day to day operations in order to track treatment efficiencies. Ecology expects that facilities will continue to collect process control data on their own as this data may be helpful in future upgrade evaluations. Ecology proposes both influent and effluent monitoring in this permit to help inform, evaluate and measure process changes due to optimization progress, provide accurate loading estimates, and augment Salish Sea Model (SSM) inputs for future model runs. The goal of the monitoring schedule for this permit is to provide enough information to track nutrient loads and reduction efforts. Treatment plants covered under this general permit must use analytical methods approved under 40 CFR 136 for all permit required compliance monitoring.

Each facility covered by this general permit also has an individual NPDES permit. All individual National Pollutant Discharge Elimination System (NPDES) permits contain monitoring requirements. Monitoring conducted under this general permit will supplement the information collected under the facility's individual NPDES permit and is limited to analyses necessary to track nutrients in the influent and effluent. Traditionally, Ecology follows agency guidance, outlined in the Permit Writer's Manual, to determine the frequency of monitoring for different sizes and types of public owned treatment works (POTWs). Frequencies proposed in this preliminary draft reflect the recommendations from the Puget Sound Nutrient General Permit Advisory Committee. Monitoring, at some frequency, is always required for parameters that have effluent limits.

Ecology considered developing a single monitoring schedule for all treatment plants. However, a tiered monitoring schedule for different sizes and types of POTWs, similar to monitoring requirements in individual NPDES permits was recommended by the Advisory Committee. This preliminary draft proposes to standardize data collection among all POTWs covered under the proposed general permit. Standardized data collection will provide:

- A more robust comparison of the nutrient removal capabilities of POTWs with similar and different processes.
- Useful information to treatment plant operators seeking to optimize current treatment processes.
- A more uniform data set for all POTWs to inform future decision making.

Ecology proposes to require the monitoring schedules shown in Tables 5 – 7~~1 – 3~~, with monitoring beginning one month after the effective date of the proposed general permit. In the formal draft, Ecology will describe a pathway for reducing (not eliminating) monitoring through a coverage modification and administrative order for permittees that have established a representative baseline following year 2 of the permit cycle. This avoids the administrative burden of having to modify the general permit following each monitoring reduction request from multiple permittees. Monitoring schedules in the tables below represent the minimum sampling and analysis frequency required by the permit. Plants may need to sample more frequently to characterize discharges in cases where there is little to no monitoring data available. If the permittee elects to collect additional monthly samples for parameters listed in Tables 5 – 7, those results must be submitted to Ecology in the discharge monitoring report (DMR).

Table 5 – Monitoring schedule: Large treatment plants, > 10 MGD Maximum Month Daily Flow (MMDF)

Parameter	Units & Specifications	Minimum Sampling Frequency	Sample Type
Wastewater Influent			
Wastewater influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant. If a Permittee conducts additional total ammonia and/or nitrate plus nitrite sampling during the month using the same method at the same monitoring point, all results must be reported on the monthly DMR. The influent total ammonia, nitrate plus nitrate, and TKN samples must be taken during the same sampling event.			
$CBOD_5$	mg/L	4/week [b]	24-hour composite [c]
Total Ammonia	mg/L as N	4/week [b]	24-hour composite [c]
Nitrate plus Nitrite Nitrogen	mg/L as N	4/week [b]	24-hour composite [c]
Total Kjeldahl Nitrogen	mg/L as N	4/week [b]	24-hour composite [c]
Final wastewater effluent			
Final Wastewater Effluent means wastewater exiting the last treatment process or operation. Typically, this is after or at the exit from the chlorine contact chamber or other disinfection process. The effluent total ammonia and nitrate plus nitrate samples must be taken during the same sampling event.			
Flow	MGD	Continuous [d]	Metered/recorded
Total Monthly Flow [e]	MG	1/month [f]	Metered/recorded

$CBOD_5$ [a]	mg/L	4/week [b]	24-hour composite [c]
Total Organic Carbon	mg/L	1/week [g]	24-hour composite [c]
Total Ammonia	mg/L as N	4/week [b]	24-hour composite [c]
Nitrate plus Nitrite Nitrogen	mg/L as N	4/week [b]	24-hour composite [c]
TKN	mg/L as N	4/week [b]	24-hour composite [c]
Total Inorganic Nitrogen [h]	mg/L as N	4/week [b]	Calculated
Total Inorganic Nitrogen Load [i]	Lbs/day	4/week [b]	Calculated
Average Monthly Total Inorganic Nitrogen [j]	Lbs	1/month [f]	Calculated
Annual Total Inorganic Nitrogen, year to date [k]	Lbs	1/month [f]	Calculated

Footnote	Information
a	Take effluent samples for the $CBOD_5$ analysis before or after the disinfection process. If taken after, dechlorinate and reseed the sample.
b	4/week means four (4) times during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.
c	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
d	Continuous means uninterrupted except for brief lengths of time for calibration, power failure or unanticipated equipment repair or maintenance. The permittee must report the total flow for the 24-hour period.
e	Total Monthly Flow = Sum of all daily flows for the reporting period.
f	1/month means one (1) time during each month
g	1/week means one (1) time during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.
h	TIN (mg/L) as N = Total Ammonia (mg/L as N) + Nitrate plus Nitrite (mg/L as N)
i	Calculate mass concurrently with the respective concentration of a sample, using the following formula: Concentration (in mg/L) X daily flow (in MGD) X Conversion Factor (8.34) = lbs/day
j	Calculate the monthly average total inorganic nitrogen load (lbs as N) using the following equation: $\text{Monthly average TIN load (lbs as N)} = \left(\left(\sum \text{Calculated TIN loads } \left(\frac{\text{lbs}}{\text{day}} as\ N\right)\right) / number\ of\ samples\right) \text{ x number of days in the calendar month}$
k	Calculate the annual total inorganic nitrogen, year to date using the following calculation: $\text{Annual TIN load (lbs as N)} = \sum \text{Monthly average TIN loads, to date}$

Table 6 – Monitoring schedule: Medium treatment plants, 3 - 10 MGD MMDF

Parameter	Units & Specifications	Minimum Sampling Frequency	Sample Type
Wastewater Influent			
Wastewater influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant. If a Permittee conducts additional total ammonia and/or nitrate plus nitrite sampling during the month, all results must be reported on the monthly DMR. The total ammonia, nitrate plus nitrate, and TKN samples must be taken during the same sampling event.			
$CBOD_5$	mg/L	1/week [b]	24-hour composite
Total Ammonia	mg/L as N	1/week [b]	24-hour composite
Nitrate plus Nitrite Nitrogen	mg/L as N	1/week [b]	24-hour composite
Total Kjeldahl Nitrogen	mg/L as N	1/week [b]	24-hour composite
Final wastewater effluent			
Final Wastewater Effluent means wastewater exiting the last treatment process or operation. Typically, this is after or at the exit from the chlorine contact chamber or other disinfection process. The total ammonia and nitrate plus nitrate samples must be taken during the same sampling event.			
Flow	MGD	Continuous [d]	Metered/recorded
Total Monthly Flow [e]	MG	1/month [f]	Metered/recorded
$CBOD_5$ [a]	mg/L	1/week [b]	24-hour composite [c]
Total Organic Carbon	mg/L	1/week [b]	24-hour composite [c]
Total Ammonia	mg/L as N	1/week [b]	24-hour composite [c]
TKN	mg/L as N	1/week [b]	24-hour composite [c]
Nitrate plus Nitrite Nitrogen	mg/L as N	1/week [b]	24-hour composite [c]
Total Inorganic Nitrogen [g]	mg/L as N	1/week [b]	Calculated
Total Inorganic Nitrogen [h]	Lbs/day	1/week [b]	Calculated
Average Monthly Total Inorganic Nitrogen [i]	Lbs	1/month [f]	Calculated
Annual Total Inorganic Nitrogen, year to date [j]	Lbs	1/month [f]	Calculated

Footnote	Information
a	Take effluent samples for the $CBOD_5$ analysis before or after the disinfection process. If taken after, dechlorinate and reseed the sample.
b	1/week means one (1) time during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.
c	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
d	Continuous means uninterrupted except for brief lengths of time for calibration, power failure or unanticipated equipment repair or maintenance. The permittee must report the total flow for the 24-hour period.

e	Total Monthly Flow = Sum of all daily flows for the reporting period.
f	1/month means one (1) time during each month
g	TIN (mg/L) as N = Total Ammonia (mg/L as N) + Nitrate plus Nitrite (mg/L as N)
h	Calculate mass concurrently with the respective concentration of a sample, using the following formula: Concentration (in mg/L) X daily flow (in MGD) X Conversion Factor (8.34) = lbs/day
i	Calculate the monthly average total inorganic nitrogen load (lbs as N) using the following equation: $\text{Monthly average TIN load (lbs as N)} = ((\sum \text{Calculated TIN loads } (\frac{\text{lbs}}{\text{day}} as\ N)) / number\ of\ samples) \text{ x number of days in the calendar month}$
j	Calculate the annual total inorganic nitrogen, year to date using the following calculation: $\text{Annual TIN load (lbs as N)} = \sum \text{Monthly average TIN loads, to date}$

Table 7 – Monitoring schedule: Small treatment plants, < 3 MGD MMDF

Parameter	Units & Specifications	Minimum Sampling Frequency	Sample Type
Wastewater Influent			
Wastewater influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant. If a Permittee conducts additional total ammonia and/or nitrate plus nitrite sampling during the month, all results must be reported on the monthly DMR. The total ammonia, nitrate plus nitrate, and TKN samples must be taken during the same sampling event.			
$CBOD_5$	mg/L	2/month [b]	24-hour composite
Total Ammonia	mg/L as N	2/month [b]	24-hour composite
Nitrate plus Nitrite Nitrogen	mg/L as N	2/month [b]	24-hour composite
Total Kjeldahl Nitrogen	mg/L as N	2/month [b]	24-hour composite
Final wastewater effluent			
Final Wastewater Effluent means wastewater exiting the last treatment process or operation. Typically, this is after or at the exit from the chlorine contact chamber or other disinfection process. The total ammonia and nitrate plus nitrate samples must be taken during the same sampling event.			
Flow	MGD	Continuous [d]	Metered/recorded
Total Monthly Flow [e]	MG	1/month [f]	Metered/recorded
$CBOD_5$ [a]	mg/L	2/month [b]	24-hour composite
Total Organic Carbon	mg/L	2/month [b]	24-hour composite
Total Ammonia	mg/L as N	2/month [b]	24-hour composite
TKN	mg/L as N	2/month [b]	24-hour composite [c]
Nitrate plus Nitrite Nitrogen	mg/L as N	2/month [b]	24-hour composite

Total Inorganic Nitrogen [g]	mg/L as N	2/month [b]	Calculated
Total Inorganic Nitrogen [h]	Lbs/day	2/month [b]	Calculated
Average Monthly Total Inorganic Nitrogen [i]	Lbs	1/month [f]	Calculated
Annual Total Inorganic Nitrogen, year to date [j]	Lbs	1/month [f]	Calculated

Footnote	Information
a	Take effluent samples for the $CBOD_5$ analysis before or after the disinfection process. If taken after, dechlorinate and reseed the sample.
b	2/month means two (2) times during each month and on a rotational basis throughout the days of the week, except weekends and holidays.
c	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
d	Continuous means uninterrupted except for brief lengths of time for calibration, power failure or unanticipated equipment repair or maintenance. The permittee must report the total flow for the 24-hour period.
e	Total Monthly Flow = Sum of all daily flows for the reporting period.
f	1/month means one (1) time during each month
g	TIN (mg/L) as N = Total Ammonia (mg/L as N) + Nitrate plus Nitrite (mg/L as N)
h	Calculate mass concurrently with the respective concentration of a sample, using the following formula: Concentration (in mg/L) X daily flow (in MGD) X Conversion Factor (8.34) = lbs/day
i	Calculate the monthly average total inorganic nitrogen load (lbs as N) using the following equation: $\text{Monthly average TIN load (lbs as N)} = ((\sum \text{Calculated TIN loads } (\frac{\text{lbs}}{\text{day}} \textit{ as N})) / \textit{number of samples}) \text{ x number of days in the calendar month}$
j	Calculate the annual total inorganic nitrogen, year to date using the following calculation: $\text{Annual TIN load (lbs as N)} = \sum \text{Monthly average TIN loads, to date}$

B. Reporting and recording requirements

As stated above, Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's conditions.

Ecology proposes that monitoring data be summarized, reported, and submitted monthly on the electronic DMR form provided by Ecology within the Water Quality Permitting Portal. See ~~the Optimization preliminary draft document~~ Section V for more information on how DMR data should be used in the annual optimization assessment.

Many wastewater treatment plants (WWTPs) have required nitrogen species monitoring in their individual NPDES permit. Permit modifications are required to remove or amend any duplicative monitoring requirements. Therefore, at this time any proposed monitoring in a general permit would be in addition to the monitoring required in individual permits. Permittees may take one sample to satisfy monitoring requirements in both permits; however, reporting would need to be duplicated to meet each permit's monthly electronic WQWebDMR submittal requirement. Ecology proposes modifying, as necessary, duplicative nutrient monitoring requirements in individual permits prior to or during normal reissuance schedules for expired permits after the proposed general permit is issued and effective.

V. Optimization and Additional Actions

A. Optimization Framework

This proposed permit uses optimization of existing treatment processes as a primary mechanism for dischargers to stay below the nutrient action level and reduce nitrogen in their discharge to the greatest extent possible during the permit term. All treatment facilities covered by this general permit must identify short term actions (low cost controls and process changes focused on improving existing performance) and begin implementing them in the first year of the permit. In annual reports, facilities must document what was tried, document what was learned, identify next steps, determine what is not feasible as a near term solution, and use monitoring data to quantify results. See the Monitoring and Reporting preliminary draft for details on proposed monitoring for the first permit cycle.

The purpose of optimization and adaptive management is to evaluate existing treatment processes for opportunities to reduce nutrients to the greatest extent and as soon as possible without requiring capital investments. Optimization, as required by this permit, is the suite of low-cost activities that result in improved nitrogen removal at an existing treatment plant regardless of the treatment type. Optimization does not include activities that result in costly upgrades or capital infrastructure improvements. While this permit requires implementation of low cost optimization solutions, Ecology cannot specify a single low cost threshold due to the variety of treatment plants under permit coverage. Ecology proposes that each facility will document their optimization strategy selection including any financial and technical analysis that results in the exclusion of an approach or procedure in the annual submittal. Ecology encourages facilities to experiment and try different strategies to reduce nutrients with existing treatment processes during this first permit cycle. Successful optimization implementation requires the collection and analysis of sufficient influent and effluent data. Monitoring requirements in this proposed permit represent the minimum monitoring frequencies based on plant size. Facilities should use process control data collected outside of the permit framework in addition to permit required monitoring data to evaluate optimization opportunities and successes.

> Do reviewers have suggestions on what information permittees use to justify their decision making process when conducting financial and technical analyses to select (or eliminate) optimization strategies?

Fundamentally, optimization investigations as required by this permit follow a four step iterative cycle for continuous improvement and problem solving. At a high level, the annual steps in this process are plan>do>check>act>evaluate. A number of different optimization strategies exist and Ecology expects implementation opportunities to vary from facility to facility. The most successful optimization strategies include a detailed influent characterization and process performance review based on historical and current data.

Each facility utilizes a unique combination of treatment processes. Optimizing current treatment processes includes understanding existing treatment performance and operational practices. Increasing this awareness across all levels of the utility's organization from operators to laboratory analysts will aid in decision making when it comes to identifying what it will take to reduce the facility's effluent nutrient load. As previously stated, the permit contains minimum influent and effluent monitoring frequencies and parameters. See the Monitoring and Reporting Preliminary Draft for permit required monitoring. Each facility will need to identify internal process control sampling locations and additional laboratory analyses for other parameters at different stages within the overall treatment train. Identification of this additional process control monitoring meets the expectations for a Tier 1 optimization action. See Section B below for more information on the proposed tiered actions. The optimization investigation should identify recommendations for future process improvements that are beyond optimization of existing treatment processes, but will likely be necessary to meet future numeric water quality based effluent limits.

B. Optimization and Additional Tiered Actions

Do reviewers have suggestions for "reasonable investments" at small (<3 MGD), medium (3-10 MGD) and large (>10 MGD) that could be used to separate the two tiers of optimization actions required by this permit?

This permit proposes two levels of actions for reducing nutrient loads in WWTP effluent. Ecology proposes that each August (1 year after issuance) that facilities will report their nutrient reduction efforts over the previous year, including monitoring data. Tier 1 action starting in year 1, Tier 2 action triggered by findings in annual reports. Tier 1 optimization actions focus more on operational strategies with very little, if any, equipment procurement. Tier 2 actions include more robust strategies that may require the facility to invest in equipment or tools for successful implementation. In the first year of the permit, dischargers must evaluate their ability to implement items in the list below (and also other strategies not listed) for effluent TIN reduction. Dischargers must then determine a schedule for implementing these initial optimization actions and continue evaluating other items or activities that can be implemented throughout the permit term.

Tier 1 actions must be implemented by all permittees. The following suggestions for Tier 1 optimization strategies are not exhaustive. Rather the list provides examples of strategies a facility may use to stay below Action Level$_0$ (AL_0) as defined in the Action Level Preliminary Draft. Ecology intends Tier 1 actions to be the easiest to implement. Some of these strategies require the availability of existing tankage. Note that there could be some cross over between Tier 1 and Tier 2 strategies due to utilization of different treatment processes, equipment configurations, and available tankage.

Tier 1 optimization actions can include:

Are there any additional Tier 1 optimization actions that should be included in this document?

- Modifying solids retention time, mixed liquor suspended solids concentration, F/M ratios
- Improved flow equalization, utilizing existing tankage
- Internal Recycle rate controls
- Improved side-stream return control, utilizing existing tankage
- Sequencing batch reactor cycle modifications
- Aeration pattern alterations
- Improved process control sampling
- Process modeling
- Septage handling practice review/modifications

Tier 2 actions are triggered when a permittee exceeds AL_0 following the annual compliance assessment after the previous reporting period. Tier 2 actions are more substantial than Tier 1 optimization actions and are likely to have an increased implementation cost. An engineering report or other technical design report may be necessary for some of these additional actions. Facilities should work with their operators and solicit input from other knowledgeable parties when identifying the suite of actions that are most appropriate for their facility. The list below is not meant to be exhaustive but should provide a starting point for the identification and selection process.

Process control changes can include:

- Variable Frequency Drives (VFD) and/or return activated sludge pumps for internal recycles
- Online analyzers/probes/controls (ORP,DO, Ammonia, nitrate, nitrite)
- New screens/grit removal to improve performance
- Improved flow equalization
- Side-stream (centrate) return controls
- Pre-digestion of primary sludge

Are there any additional Tier 2 optimization actions that should be included in this document?

Are the tiers broken out appropriately?

Configuration modifications can include:

- Channel changes through use of gates or valve
- Step feed alterations
- Creation of anoxic zones and internal recycles
- Plug flow vs series flow changes
- Discharge/Outfall modifications

Aeration modifications can include:

- Energy efficient blowers, VFDs
- Improved diffusers
- Airflow control valves
- Mixer installation or retrofit of existing equipment

Chemical feed additions or modification can include:

- Alkalinity feed
- Carbon addition
- pH adjustment

The selection process and criteria for identification must be explained as part of the annual optimization plan. Permittees do not have to change the suite of optimization actions annually if they are found to be effective at reducing nitrogen and are staying below their action levels. Annual reports are required to document optimization and additional actions, regardless of effectiveness.

C. Requirements if unable to stay below action levels

The strategies listed above are the two tiers of actions Ecology expects facilities to use to stay within the facility specific AL_0 and AL_1 thresholds identified in Section II.E of this document. All facilities that exceed AL_1, regardless of maintaining a TIN effluent concentration below 10 mg/L, will be required to advance planning efforts towards nutrient reduction. See Section VI for proposed planning submittal requirements.

Ecology is soliciting input on what types of Tier 3 actions plants must take to achieve further nutrient reduction, sooner, if they exceed their second action level trigger. Should these actions vary by facility size?

Tier 3 actions are triggered by a facility exceedance of AL_1 which indicates that more significant near term steps need to be taken to reduce nitrogen in the plant effluent during the first permit term. This intermediate step needs to meaningfully advance the facility toward future nutrient reduction and bridge the period between this first permit cycle and the achievement of final numeric water quality based effluent limits.

Tier 3 actions can include:

- Evaluation of possibilities for reducing nitrogen in return flows from solids handling by adding or expanding side stream treatment at the plant. This evaluation will be followed by initiation of side stream treatment design.

  OR

- Evaluation of viable treatment process upgrades to achieve low nitrogen concentrations through formal pilot testing, followed by implementation.

  OR

- Early development of the nutrient reduction evaluation for achieving effluent concentration bookends of 10 mg/L and 3 mg/L as described in the Planning Preliminary Draft. Construction of any solutions identified with these analyses is not expected within the permit term. Final design would begin immediately in the second permit term once numeric water quality based effluent limits are established.

Permittees required to take Tier 3 actions must notify Ecology which of these actions they will take with the annual optimization report, and include a proposed schedule for completion. Ecology proposes to review and approve Tier 3 reports within 60 days of receipt. See Section VI.E for proposed Tier 3 actions.

D. Components of an annual nitrogen optimization plan

Steps for a successful Nitrogen Optimization Plan include:

- Familiarizing operators and staff with the facility's processes and flow schematics.
- Quantifying influent and effluent nitrogen concentrations and loads.
- Evaluating the WWTP's nitrogen reduction potential.
- Developing facility specific nitrogen reduction goals.
- Evaluating how to implement changes to meet the nitrogen reduction goals.
- Evaluating nitrogen reduction potential from commercial and residential users.
- Creating an implementation plan to meet the nitrogen reduction goals.

Ecology proposes to require this annual Nitrogen Optimization Plan as an electronic permit submittal. Monthly DMR data submitted through the WQWebDMR system can be used to quantify reductions. Other monitoring (i.e., process control monitoring) conducted by the facility may be useful in the development of the Nitrogen Optimization Plan. Facilities should not feel limited to DMR data only when putting their plan together.

Do reviewers have feedback on Ecology's proposed use of a standardized form for the annual optimization report?

The following is a proposed framework for the annual permit submittal. Ecology is requesting feedback on the components of this annual submittal. A draft worksheet for the proposed annual submittal is also included for review and comment in Appendix B of this preliminary draft.

Nutrient Optimization Plan Submittal and Requirements

The Permittee must:

a. Prepare a Nutrient Optimization Plan and submit it to Ecology for review and approval before {Date = one year after permit issuance date}. Thereafter, submit annual updates for review and approval.

Nutrient Optimization Plan Components

The Nitrogen Optimization Plan must include:

a. A facility description from the most recent NPDES permit or Ecology approved engineering report.
    i. A current process flow diagram
    ii. Design criteria from NPDES permit or Ecology approved engineering report
        1. Hydraulic capacity
        2. Organic and solids loading capacity
b. A summary of influent and effluent flow, TIN loads and concentrations from at least the previous year, including:
    i. Monthly data
    ii. Annual totals of influent flow, effluent flow, influent TIN load, effluent TIN load and TIN percent removal.
c. An evaluation of the facility's Nitrogen Reduction potential by examining patterns and trends of the existing treatment processes over time
    i. Identification of operating procedures that maximize nitrogen removal
    ii. Identification of recommended actions to improve the facility's nitrogen removal performance
        1. If data show that the facility is capable of consistently generating effluent with a concentration below 10 mg/L TIN, then maintain or work to improve performance.
        2. If data show that the facility consistently generates effluent with TIN concentrations exceeding 10 mg/L, evaluate additional nitrogen reduction strategies.
d. Determine or revise a facility specific, annual nitrogen reduction goal (i.e., % removal) utilizing knowledge of the treatment plant.
e. Evaluate the different optimization strategies identified in C.ii to maximize nitrogen removal capabilities and select the actions your facility will implement over the next year. Provide detail on cost implications and lack of affordability for those strategies not selected due to financial reasons.
f. Create or modify an implementation plan to meet nitrogen reduction and removal goals.
    i. In the first annual submittal, indicate the expected outcome of each Tier 1 activity selected for implementation.

ii. Summarize past nitrogen reduction activities following the baseline year including the identification of the most successful.

iii. After the baseline year, select additional nitrogen reduction strategies from either Tier 1, Tier 2 or other previously identified facility specific strategies. The annual total TIN load reported on the DMR should be used to determine which tier of actions must be used. If the facility stays below AL_0, no additional Tier 2 actions are required.

iv. Develop a timeline for implementation and assessment of strategies over the coming year.

E. State Review and Acceptance of Optimization Plans

Ecology will review each annual optimization plan electronic submittal within 60 days after receipt or notify the permittee if additional time is needed. Upon Ecology approval the facility must begin following the implementation plan detailed in the most recently approved annual submittal.

F. Conventional Limit Exceedances due to Optimization Exercises or Pilot Testing

Ecology understands that making operational adjustments to maximize nitrogen removal at a facility not specifically designed to remove nutrients may cause temporary exceedances of conventional parameters regulated by the individual NPDES permit. Permittees will still be considered compliance with their individual permit limits for $BOD_{5,}$ TSS, and/or pH in the event of an intermittent exceedance of these limits when caused by optimization efforts or pilot studies related to nutrient reduction. Ecology must be notified of any formal pilot testing prior to initiation.

The permittee must notify Ecology within 24 hours of the time the permittee becomes aware of the BOD, TSS and/or pH exceedance. Within 5 days of the time the permittee becomes aware of the exceedance, the permittee must submit a written report to Ecology. The written report must identify the actions causing the limit exceedance, describe the duration and magnitude of the exceedance, and, if the exceedance has not been corrected, the anticipated time the exceedance is expected to continue, and steps taken or planned to reduce eliminate and prevent reoccurrence of the exceedance. If Ecology determines that the exceedance is causing or contributing to a water quality standards violation, Ecology will notify the permittee in writing that an adaptive management response is required.

Within 30 days of receiving Ecology's written notification, the Permittee must review the operational strategies that created the conventional limit exceedance and submit a report to Ecology. This report shall include details about the adaptive management response necessary to prevent future conventional limit excursions, including:

- A description of potential additional operational changes or BMPs that may be implemented to prevent the excursion from occurring again.
- A clear description of how adjustments will be made to prevent the exceedance in the future, including assessment or evaluation efforts that will or may be implemented to monitor, assess or evaluate the effectiveness of the operational changes.

Provided the permittee has complied with the notice and report requirements and is implementing the approved adaptive management response as outlined above, and continuing to reduce nitrogen in the discharge as much as possible, Ecology will consider the Permittee in compliance with their individual permit, despite any temporary BOD, TSS and/or pH violations caused to optimization or pilot testing.

VI. Planning Requirements

A. Planning introduction

With our region's growing population, and recognizing that engineering design and construction of WWTP improvements to limit nutrients will take time and require financial planning, Ecology believes work must begin now to meaningfully assess point source nutrient reduction opportunities. Important steps must be taken during this first permit term towards future nutrient loading reductions that will meet numeric water quality standards. Per the Advisory Committee's recommendation each plant that is not already achieving TIN concentrations <10 mg/L will be required to conduct a nutrient reduction evaluation during this first permit cycle.

Ecology intends to provide flexibility and incentives for communities to address nutrients collaboratively to encourage outside of the box solutions to solve the water quality problems caused by nutrient over-enrichment in Puget Sound. This permit is the first regulatory step in what will be a multi-year, multiple permit cycle undertaking. Ecology is asking for feedback on possible planning approaches for this first permit.

- Section VI.B details the topics that must be addressed in the Nutrient Reduction Evaluation report submittal for each WWTP.
- Section VI.C details a potential regional planning strategy to partially or completely meet nutrient reduction evaluation requirements for participating WWTPs.
- Section VI.D details the planning requirements for WWTPs currently achieving TIN <10 mg/L.
- Section VI.E details requirements for permittees exceeding action levels detailed in the Nutrient Action Level ~~draft document~~ section.

B. Proposed Nutrient Reduction Evaluation Requirement

The nutrient reduction evaluation will identify options and estimate costs for potential future treatment upgrades and any plant expansions necessary to achieve nutrient removal. The evaluation must look at facility improvements necessary to:

a. Reduce total inorganic nitrogen (TIN) concentrations to a range of 8-10 mg/L, and

b. Identify additional strategies that can further reduce TIN concentrations to a range of 3-4 mg/L.

Additional information on why TIN is the focus is presented in the Section III ~~Action Level~~of this preliminary draft document. The Nutrient Reduction Evaluation report shall be prepared for each discharger's treatment process and can be submitted as part of a collaborative report rather than independent evaluation. Each WWTP would formally notify Ecology if electing to participate in the regional study to establish submittal due dates for their Nutrient Reduction Evaluation report. See Section VI.C for information on a regional study.

Ecology proposes the Nutrient Reduction Evaluation report build on the Optimization Report by requiring plant operators to:

- Update current plant equipment descriptions and existing short-term capacities to reduce nutrients
- Present site-specific flows, loadings, and population growth projections for the 30-year planning horizon.
- Discuss options for treatment technology alternatives and effluent total inorganic nitrogen concentrations and loads that will guide the treatment upgrades evaluation.

- Identify site-specific constraints, risk, or circumstances that may cause implementation challenges or eliminate any specific technologies from consideration. Provide justification.
- Describe the additional information that was considered and how the evaluation was developed.
  - Include a description of existing data as well as any data gaps. Describe what monitoring and data analysis was used in the evaluation.
    - Ecology suggests all treatment facilities conducting this evaluation have at least 3 years of nutrient-related operating data.
  - Describe any necessary treatment process modeling or analyses to support identification of potential upgrade alternatives.
- Evaluate more significant site-specific main stream treatment plant upgrades, side stream treatment options, and "outside the fence opportunities," such as alternative effluent management options (i.e. disposal to ground, reclaimed water beneficial uses), pretreatment programs, source control, expanded maintenance and line replacement, and other I/I reduction efforts, requiring separate plumbing and/or other building scale solutions, and evaluation of septage handling practices.
  - Describe where existing treatment systems have already been upgraded or where nutrient removal pilot studies have been implemented.
  - Estimate the reduction in effluent nutrient loads discharged due to treatment plant upgrade options that can attain both 10 mg/L and 3 mg/L TIN over the long term.
- Evaluate other capital improvements that are needed over the planning horizon absent requirements for nutrient controls.
- Develop planning level capital, operations (annual), and life-cycle cost estimates associated with the identified upgrade or effluent management alternatives.
- Develop an example rate structure to consider funding shortages and ensure environmental justice in plant upgrades.

> Do reviewers have examples of information from an existing, unrelated planning process that could meaningfully apply to meet this nutrient reduction evaluation requirement?

If a Permittee has recently completed or is currently undertaking a planning effort, Ecology may consider alternatives or allowances for the Permittee to use information presented in those planning documents to satisfy some or all of this Nutrient Reduction Evaluation requirement.

The above proposed Nutrient Removal Evaluation is not intended to be an engineering report. Rather it is a feasibility investigation and does not require the level of detail required in WAC 173-240-060 for an engineering report. It will, however, require the seal of a registered professional engineer given that it is a document that will be reviewed under RCW 90.48.110. The intent of the proposed facility Nutrient Reduction Evaluation requirement is to help prepare communities for meeting future nutrient effluent limits; and to inform future decisions and regulatory strategies. The outcome of this or any proposed planning or evaluation requirement could support a regional nutrient reduction framework and a potential, future nutrient trading program.

C. Regional Approach for Advanced and Emerging Technology Assessment

Ecology will develop numeric water quality based effluent limits for each permitted WWTP after additional Salish Sea modeling scenarios are run and analyzed. Draft allocations for basins within Puget Sound are expected to be released with the Nutrient Source Reduction Plan in 2023. These will formulate the basis for final, numeric water quality based effluent limits for all treatment plants covered by the first general permit.

While Ecology is unable to calculate these final limits at this time, it is known that the final solution to achieve water quality standards includes a combination of treatment plant upgrades and non-point source reductions. Treatment technologies currently exist to remove nitrogen down to approximately 3 mg/L TN; however, most of the treatment solutions that can do this have high capital and O&M costs and may require a total facility upgrade.

> Aside from treatment solutions, do reviewers have feedback on types of questions a regional study could answer? How could a regional study like this be used to develop and/or support a nutrient trading framework?

In recent years, there has been advancement in research around emerging technologies suitable for nutrient reduction. However, outside of Europe many of these technologies have not been tested on a full scale basis. And, to date, many of these technologies are championed by proprietary companies so design elements are not available. Until common design elements are available for some of the emerging treatment technologies dischargers are at risk of trying a new technology that may not meet future numeric water quality based effluent limits. This risk likely precludes dischargers from pursuing an emerging technology given an overall lack of certainty.

The scope of a regional study has not been determined, yet. At a minimum, it would need to satisfy elements in Section VI.B. Ecology wants the outcome of any regional investigation to further the collective knowledge in our region and identify comprehensive strategies for reducing nutrients from point sources. Two possibilities are briefly detailed in Sections VI.C1 and VI.C2. Regional studies have seen success in other parts of the country. Any regional investigation conducted in the greater Puget Sound area would need to build on the findings from studies conducted in these other locations (e.g., San Francisco Bay) and consider the ancillary benefits from advanced treatment processes as detailed in Ecology's soon to be published February 2021 Contaminants of Emerging Concern and Wastewater Treatment Technologies report.

C.1. Regional Study for Nutrient Reduction Evaluation

One of the recommendations from the Advisory Committee included conducting a regional study to support optimization and long-term planning. A regional study would not be a substitute for the annual optimization report proposed in ~~the Optimization Preliminary Draft document~~ Section V.D or for the nutrient Reduction Evaluation described in Section VI.B above. It must be completed in a way so that all participating plants can provide answers to the requirements listed in Section B. Ecology proposes that:

> Do reviewers prefer one approach to a regional study over the other? Ecology is soliciting specific feedback on how to develop permit requirements for a regional study that advances understanding of treatment upgrades by building on existing bodies of knowledge related to nutrient treatment processes.

- If a WWTP formally commits to participation in a regional study that produces their Nutrient Reduction Evaluation; it would be due in permit year 4, but
- If a WWTP formally chooses instead to develop their own independent, facility specific nutrient reduction evaluation, it must be submitted in permit year 3.

> Do reviewers have feedback on whether a regional study should be limited to WWTPs < 10 MGD so that larger facilities can conduct their own evaluation? Or, should Ecology provide minimum elements that must be satisfied leaving participation up to each discharger?

C.2. Regional Collaboration for Technology Exploration

Another option for a regional approach would be to collaboratively investigate and share information on the advancement in technology for nutrient removal. In concept, a neutral third party would convene utilities, environmental groups, Tribes, federal and state agencies and facilitate the investigation of advancements in nutrient removal technology. Consultants could participate on behalf of utilities, if desired. Ecology, EPA, and other agencies would be involved so that policy positions and technical review requirements are represented. Overall this process would be geared to identifying and implementing the opportunities for achieving numeric water quality standards for Do within the greater Puget Sound. This educational process would support collaboration between involved parties and collective understanding of the implementation of advanced and emerging technologies so that facilities can adopt solutions without the perceived risk previously mentioned. It may also feed into the identification and implementation of watershed based solutions outlined by the Nutrient Source Reduction Plan. And, potentially provide the collaborative foundation necessary for water quality trading.

> Is there interest in folding this type of treatment technology information sharing into an existing stakeholder process?

Regional coordination to solve this complex problem requires initial buy in from all parties involved in finding the solution. Anticipated permit requirements for this sort of approach would need to include a report out, likely in permit year 4 so that it can inform the development of the next permit cycle.

D. Alternatives to the proposed evaluation requirement for WWTPs discharging less than 10 mg/L

Under the Action Level Preliminary draft proposal, Ecology proposed a TIN action level calculation method for WWTPs intentionally designed with TIN removal capabilities or those who have maintained average concentrations below 10 mg/L TIN. Ecology proposes the following alternatives for these WWTPs:

- If the WWTP has TIN (or TN) design criteria from an Ecology-approved plan or is able to submit a design criteria update based on the engineering report, Ecology will not require an additional nutrient reduction evaluation during the first general permit term provided the facility is able to stay under AL_1 using the design criteria in the load calculation.
- If the WWTP has maintained an average TIN concentration below 10 mg/L over the period of time used in the calculation, Ecology will not require an additional nutrient reduction evaluation during the first general permit term provided the facility is able to stay under AL_1 using 10 mg/L in the load calculation.

In either case, if the facility exceeds AL_1 at any point during the permit term, they must complete a Tier 3 action as detailed in the Optimization preliminary draft proposal within 12 months.

E. Planning Requirements following exceedance of Action Level$_1$

Each facility required to obtain coverage under this general permit has the responsibility to stay within the action level thresholds calculated by Ecology. See ~~the~~ Section III ~~Action Level Preliminary Draft Document~~ for information on this calculation procedure. Also, see ~~the Optimization Preliminary Draft Document~~ Section V for information on the response to exceedance of a facility specific action level, AL_0 or AL_1. This section describes the Tier 3 actions Ecology proposes that facilities would select from upon WWTP exceedance of AL_1.

The first Tier 3 planning option is the evaluation of sidestream treatment for additional reduction of nitrogen. Sidestream returns to the head of the plant are known to have significant nutrient concentrations. These returns can be generated from membrane reject streams but are most often associated with digester supernatant or centrate returns from biosolids dewatering processes. On average, sidestream returns can comprise between 15-30% of the influent nitrogen load. Reducing nitrogen from these return flows can be a more efficient and cost effective solution to reduce a plants overall nitrogen load prior to discharge. This can be attributed to the low volume and high concentration of nutrients. And, it is possible to treat only a portion of the sidestream return flows making it a scalable option. Sidestream treatment is not a workable solution for all plants especially for those without anaerobic digesters or other solids handling equipment. It may be best suited for facilities that have existing unused tankage which would decrease the capital expenditure associated with implementation; although, depending on flow rates, modular tankage could be used where there's available footprint. The evaluation of sidestream treatment as a Tier 3 action includes assessing the viability of implementing treatment for both a portion and the total return flow. There are different biological processes for sidestream nutrient removal: nitrification/deammonification, nitrification/denitrification, and bioaugmentation. Facilities will need to identify the method of treatment that would work best for their situation.

Ecology expects this evaluation to include:

> Do reviewers have feedback on the proposed timeframes for this evaluation?

- The review and identification of the most suitable sidestream treatment technology.
- An estimate of the current nutrient load being returned to the head of the plant. An estimate of sidestream nutrient load reduction when treating 25%, 50%,75% and 100% of the return flow volume.
- An estimate of the overall nutrient reduction in the facility's effluent from treating 25%, 50%, 75% and 100% of the return flow.
- A cost estimate including capital and present worth analysis of the annual O&M costs over the design life when treating 25%, 50%, 75% and 100% of the return flow.
- If determined to be financially viable, include a schedule for design and implementation.

The second Tier 3 option is additional Nutrient Reduction Evaluation work during the first permit term. This expanded NRE report would be due within 18 months of exceeding the action level. This option allows for a facility to evaluate different treatment process upgrades capable of achieving low nitrogen concentrations (3-4 mg/L TIN) and initiate a pilot test. Once Ecology receives notification of this Tier 3 option selection, the facility must:

- Select an applicable nutrient reduction treatment technology.
- Develop a scope of work submittal for the pilot study after selection of the treatment technology and submit to Ecology for acceptance. This scope of work must include information on the overall project description, project goals and objectives, project narrative including the scale of the pilot relative to facility design flow, work plan and assessment criteria, required monitoring, possible impacts to the primary treatment train, a project schedule, and how results will be evaluated.
- Following pilot testing, provide a summary report of results stamped by a registered professional engineer that includes anticipated reduction at full scale implementation and a viability assessment for full scale implementation including estimated capital and O&M costs.

> Do reviewers have suggestions or ideas for other Tier 3 actions that Ecology should consider? Should plants be able to identify different Tier 3 actions during the permit term provided Ecology pre-approval?

Ecology would like to expand the suite of Tier 3 actions in the general permit so that permittees can choose between more than two options. The siting of satellite treatment plants, additional source reduction and implementation of other “outside the fence” solutions are examples of Tier 3 actions under consideration by Ecology.

VII. References

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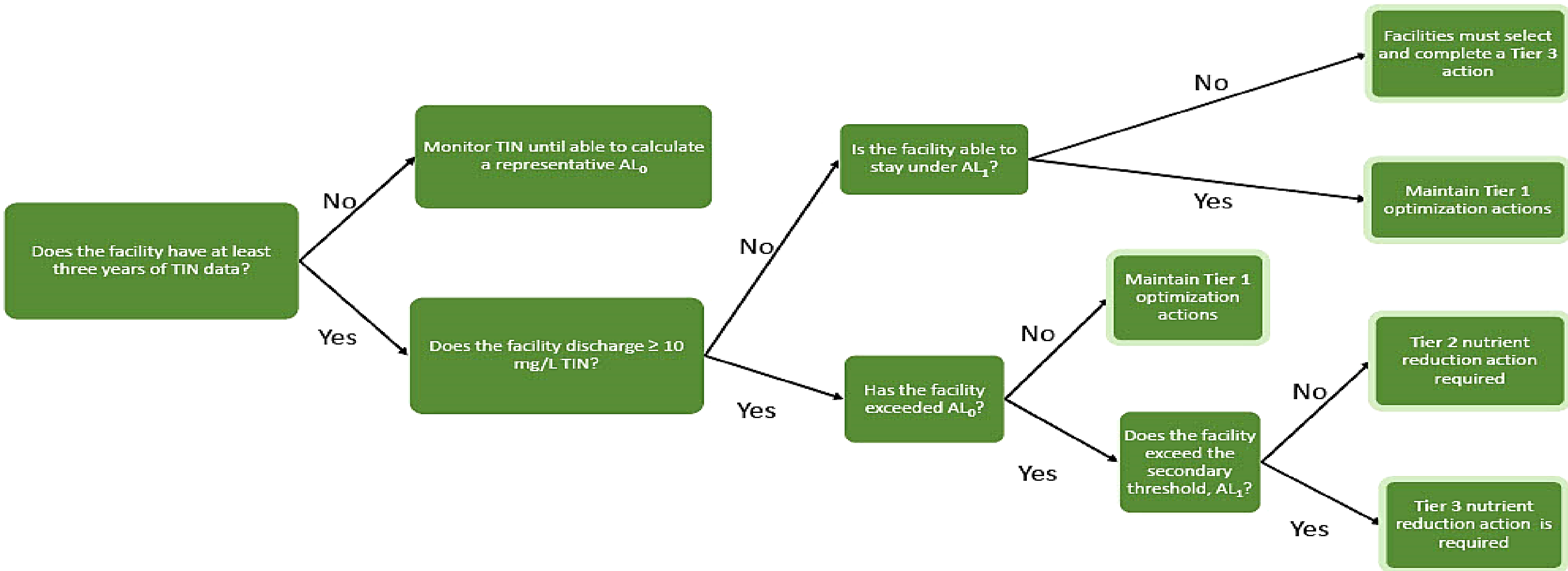
Appendix A: Action Level Flow Chart


Does the facility have at least three years of TIN data?
No
Monitor TIN until able to calculate a representative AL_0
Yes
Does the facility discharge ≥ 10 mg/L TIN?
No
Is the facility able to stay under AL_1?
No
Facilities must select and complete a Tier 3 action
Yes
Maintain Tier 1 optimization actions
Yes
Has the facility exceeded AL_0?
No
Maintain Tier 1 optimization actions
Yes
Does the facility exceed the secondary threshold, AL_1?
No
Tier 2 nutrient reduction action required
Yes
Tier 3 nutrient reduction action is required

Appendix B: Example Optimization Worksheet

Nitrogen Optimization Plan Worksheet

Facility Name: ______________________

Permit Number: ___________________________

Part 1: Background Information

1. Briefly describe existing wastewater treatment processes including any current nitrogen reduction capability. Provide updated process flow diagram for both liquid and solid streams if necessary.

2. Baseline information

Month	Influent Flow, MG	Influent Average TIN Concentration, mg/L	Influent TIN Load, lbs/month	Effluent Flow, MG	Effluent Avg TIN, mg/L	Effluent TIN Load, lbs/month	TIN % Removal
Jan							
Feb							
Mar							
Apr							
May							
Jun							
Jul							
Aug							
Sep							
Oct							
Nov							
Dec							
Annual Summary							

3. Did your facility exceed either AL_0 or AL_1 at the end of the reporting period? If yes, which one?

4. Possible Contributors: Identify possible sources of nitrogen within your sewershed in excess of typical household contributions. This could include hauled septage and industrial contributions.

Name of Possible Source	Type of Process	Estimated Load	Potential Actions to Reduce

Part 2: Nitrogen Optimization Plan and Assessment

List and document the actions or items that will be attempted to reduce nitrogen in the effluent during the annual reporting period, including anticipated outcomes and results, a schedule for implementation, and associated costs. Following the first submittal, also document the result of each implemented optimization action and indicate whether or not it was successful. Each year should reflect on what was done, and what can still be done to reduce nitrogen at the facility. For each optimization action, complete sub bullets a-g.

1. Optimization Action Description:
    a. Identify action (example: Add VFDs to blowers and oxygen probes to aeration basin to control air delivery based on preset concentrations after exceeding AO_0)

    b. Briefly describe implementation (example: Work with consultant to scope blower VFD retrofit and to select DO probe, determine what set point to use to balance O2 delivery)

    c. Expected Outcome (example: more efficient air delivery and air control in aeration zones)

    d. Anticipated (or Actual) reduction

    e. Anticipated time frame for implementation

    f. Associated costs including initial capital and annual O&M costs with rationale for annual costs (electricity, chemical costs, time, etc.). Note that the initial report may contain estimates for associated costs. These initial estimates should be revised with actual costs in the report due the following year.

    g. Evaluate success after action implementation. Did your facility see the anticipated reduction and achieve the expected outcome? Why or why not?

2. Identify any issues or problems that may interfere with the facility's ability to achieve lower nitrogen loads.