

# Fact Sheet for NPDES PERMIT WA0023744

Bellingham Sewage Treatment Plant

Date of Public Notice: November 30, 2022

Permit Effective Date: March 1, 2023

## Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for the City of Bellingham Sewer Treatment Plant (Bellingham STP).

This fact sheet complies with [Section 173-220-060 of the Washington Administrative Code \(WAC\)](#), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for Bellingham STP, NPDES permit WA0023744, were available for public review and comment from November 30, 2022, to December 30, 2022. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

The city of Bellingham (City) reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, wastewater discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology summarizes substantive comments and provides responses to them. Ecology includes the summary and responses to comments in this fact sheet as **Appendix E - Response to Comments** and publishes it when issuing the final NPDES permit. Ecology generally will not revise the rest of the fact sheet. The full document will become part of the legal history contained in the facility's permit file.

## Summary

The city of Bellingham operates an activated sludge wastewater treatment plant that discharges to Bellingham Bay. Ecology issued the previous permit for this facility on June 19, 2014.

The proposed permit contains the same effluent limits for Biological Oxygen Demand (BOD<sub>5</sub>), Total Suspended Solids (TSS), Total Residual Chlorine, Fecal Coliform Bacteria, and pH as the permit issued in 2014. The proposed permit contains limits for Carbonaceous Biological Oxygen Demand (CBOD<sub>5</sub>) in place of limits for Biological Oxygen Demand (BOD<sub>5</sub>). BOD<sub>5</sub> monitoring will be reduced to once a month to verify the system is not over design limits.

The city of Bellingham will assume full delegation of their pretreatment program starting on the effective date of this permit. The City submitted their pretreatment program to Ecology May 17, 2019 and Ecology approved the program September 18, 2019. The city of Bellingham Council adopted "An Ordinance Establishing an Industrial wastewater Pretreatment Program" October 21, 2019.

## Table of Contents

<b>I.</b>	<b>Introduction .....</b>	<b>3</b>
<b>II.</b>	<b>Background Information .....</b>	<b>4</b>
	A. Facility description .....	5
	B. Description of the receiving water.....	10
	C. Wastewater influent characterization .....	12
	D. Wastewater effluent characterization.....	12
	E. Summary of compliance with previous permit issued .....	13
	F. State environmental policy act (SEPA) compliance.....	14
<b>III.</b>	<b>Proposed Permit Limits.....</b>	<b>14</b>
	A. Design criteria .....	14
	B. Technology-based effluent limits.....	15
	C. Surface water quality-based effluent limits.....	16
	D. Designated uses and surface water quality criteria.....	23
	E. Water quality impairments .....	24
	F. Evaluation of surface water quality-based effluent limits for narrative criteria.....	24
	G. Evaluation of surface water quality-based effluent limits for numeric criteria .....	25
	H. Human health .....	30
	I. Sediment quality .....	30
	J. Whole effluent toxicity.....	30
	K. Groundwater quality limits .....	32
	L. Comparison of effluent limits with the previous permit modified on October 15, 2014 .....	32
<b>IV.</b>	<b>Monitoring Requirements.....</b>	<b>33</b>
	A. Wastewater monitoring.....	33
	B. Lab accreditation.....	34
<b>V.</b>	<b>Other Permit Conditions .....</b>	<b>35</b>
	A. Reporting and record keeping .....	35
	B. Prevention of facility overloading .....	35
	C. Operation and maintenance .....	35
	D. Pretreatment .....	35
	E. Solid wastes.....	36
	F. Combined sewer overflows.....	37
	G. General conditions.....	39
<b>VI.</b>	<b>Permit Issuance Procedures .....</b>	<b>40</b>
	A. Permit modifications.....	40
	B. Proposed permit issuance.....	40
<b>VII.</b>	<b>References for Text and Appendices .....</b>	<b>40</b>
	<b>Appendix A — Public Involvement Information .....</b>	<b>42</b>
	<b>Appendix C — Glossary .....</b>	<b>44</b>
	<b>Appendix D - Technical Calculations .....</b>	<b>52</b>
	<b>Appendix E — Response to Comments .....</b>	<b>66</b>

## I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in [90.48 RCW](#) (Revised Code of Washington).

The following regulations apply to domestic wastewater NPDES permits:

- Procedures Ecology follows for issuing NPDES permits ([chapter 173-220 WAC](#))
- Technical criteria for discharges from municipal wastewater treatment facilities ([chapter 173-221 WAC](#))
- Water quality criteria for surface waters ([chapter 173-201A WAC](#))
- Water quality criteria for groundwaters ([chapter 173-200 WAC](#))
- Whole effluent toxicity testing and limits ([chapter 173-205 WAC](#))
- Sediment management standards ([chapter 173-204 WAC](#))
- Submission of plans and reports for construction of wastewater facilities ([chapter 173-240 WAC](#))
- The following additional regulations apply to communities operating collection systems with Combined Sewer Overflows:
  - Submission of plans and reports for construction and operation of combined sewer overflow reduction facilities ([chapter 173-245 WAC](#))
- US EPA CSO control policy ([59 FR 18688](#))

These rules require any treatment facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days ([WAC 173-220-050](#)). (See **Appendix A-Public Involvement Information** for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix E**.

## II. Background Information

**Table 1 – Facility Information**

Applicant	City of Bellingham
Facility Name and Address	Bellingham STP 200 McKenzie Street Bellingham, WA 98225
Contact at Facility	Name: Steven Bradshaw Telephone #: (360) 778-7700
Responsible Official	Name: Seth Fleetwood Title: Mayor, City of Bellingham Address: 210 Lottie Street Bellingham WA 98225 Telephone: (360) 778-8100
Type of Treatment	Activated Sludge
Facility Location (NAD83/WGS84 reference datum)	Latitude: 48.7191 Longitude: -122.5231
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	<u>Bellingham Bay</u> Outfall 001 – Main outfall Latitude: 48.7189 Longitude: -122.5249 Outfall 002 – Alternate outfall Latitude: 48.72030 Longitude: -122.5183 Outfall 003 – C Street CSO Latitude: 48.75077 Longitude: -122.48978

**Table 2 – Permit Status**

Issuance Date of Previous Permit	June 19, 2014
Application for Permit Renewal Submittal Date	September 27, 2018
Date of Ecology Acceptance of Application	October 23, 2018

**Table 3 – Inspection Status**

Date of Last Sampling Inspection	1/03/2009
Date of Last Non-sampling Inspection Date	3/28/2018

**Figure 1 Facility Location Map**



## **A. Facility description**

### **History**

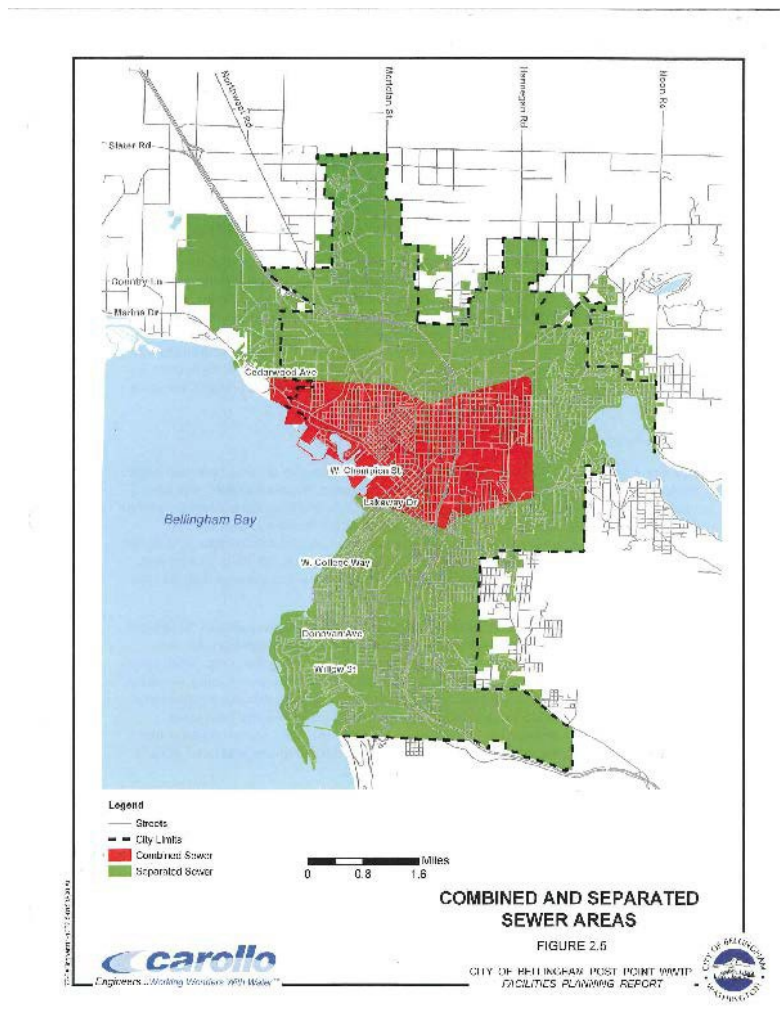
The city of Bellingham built a wastewater plant at the mouth of Whatcom Creek in 1947 to provide primary treatment of the city's sewage. In 1960 the capacity of this treatment facility was expanded from 4.5 MGD to 11 MGD. The Bellingham STP at Post Point, which replaced the original plant at the mouth of Whatcom Creek, was built in 1974 and operated as a primary wastewater treatment facility with a capacity of 55 MGD.

A consent decree issued in 1987 required Bellingham to upgrade the plant to meet secondary treatment standards by the beginning of 1994. In 1994 the plant began to operate as a high purity oxygen (HPO), activated sludge, secondary treatment system. The plant was re-rated via an Engineering Report submitted in 2004. Modifications to the plant include a RAS return modification (2005), the addition of variable speed HPO mixers (2006), the installation of high-rate centrifuges (2010), and the transition to 7-day a week incineration operation (2011). In 2012 construction began to upgrade and expand secondary treatment including an external anaerobic basin, two additional activated sludge basins, an additional secondary clarifier, and replacement of the high purity oxygen delivery system with a diffused air system. In 2022 the City plans to begin the construction of an on-site hypochlorite generation system to provide disinfection and odor control. Post Point is presently classified as a major facility by EPA.

### Collection system status

The wastewater collection system for the city of Bellingham consists of 318 miles of gravity-fed pipe and 9 miles of pressure-fed pipe. The majority of piping ranges from 8 inches (238 miles of pipe) to 12 inches (19.2 miles of pipe) though the total range of pipe diameters vary from 4 inches up to 60 inches. The city operates 33 lift stations that move wastewater to the Post Point facility. Each lift station is equipped with SCADA (Supervisory Control and Data Acquisition) system telemetry that notifies operators of lift station problems or power failures that can cause wastewater overflows. Backup power is available at all major lift stations.

**Figure 2 - Combined and Separated Sewer Areas**



Bellingham has a combined sewer system (CSS), one of 11 designated CSS municipalities in Washington, meaning that both sanitary sewer and storm sewer systems are combined in some sections of the city. Combined collection systems are common in older portions of a city's collection system built before wastewater treatment plants existed or were required. Figure 2 shows the Bellingham direct service area in green and the CSS portion in red. Although most of the flow from the combined area receives treatment at the Post Point plant, the system includes a combined sewer overflow (CSO) outfall at the end of C Street. During extremely high

flow events untreated sewage combined with stormwater can over-top a weir in the pipe, sending the excess flow to the C Street outfall. Prior to the extraordinary weather of winter 2021/2022, the city had not recorded an overflow event from this outfall since 2010. The CSO discharged 26.5 million gallons over 29.7 hours ending on November 15, 2021, and 2.42 million gallons over 7.5 hours on November 28, 2021.

Bellingham estimates that three percent of their total collection system is combined, based on total collection system piping. The City continues to separate sanitary and stormwater collections within both the combined area and the separated areas.

### **Treatment processes**

The WWTP includes a septage receiving facility, three mechanically cleaned bar screens and two manually-cleaned bar screens, influent flow paced sampling with flow measurement and five Parshall flumes occurring after the screening. After screening, wastewater flows to two grit chambers, where sand, grit and heavy particles fall out. A cyclone separator continuously removes grit. The separator deposits the grit into a bin for removal to a landfill. Bar screens remove debris. The city sends the removed debris to a landfill for disposal. Screened and dewatered wastewater flows on to one or both primary clarifiers. Primary clarifiers collect and remove the majority of the remaining settleable solids and some BOD. All wastewater entering the plant receives primary treatment.

The City completed plant upgrades in June 2014 adding an external anaerobic selector basin to improve sludge settleability in the secondary clarifiers. Two additional aeration basins increased the total aerobic volume to 3.5 million gallons. Luminescent dissolved oxygen probes remotely monitor oxygen percentage within the aeration basins to improve process control. After biological stabilization, wastewater gravity flows through a flow splitter box to secondary clarifiers. The 2014 upgrade added a new clarifier, giving the plant four secondary clarifiers.

The secondary process provides complete secondary treatment for flows up to 40 million gallons a day (MGD). During wet weather, flow from the primary effluent pump station can exceed the design flow of the aeration basins. Exceeding the aeration basin design flow causes the secondary clarifiers to washout and removes the microbiology necessary for biologic treatment. To prevent washout from the secondary process, a weir allows bypass of excess primary-treated flow around the activated sludge basins and secondary process. The diverted primary flow recombines with secondary treated effluent prior to disinfection. The 2014 improvements added reliability and redundancy to secondary operations but deferred construction of chemically enhanced primary treatment additions. Capacity of the secondary treatment was estimated at over 50 mgd at that time. In light of evolving and more stringent regulations decreasing, plant operational flexibility, and based on evaluating recent operational data. The city's consultants, Carollo Engineers, recommends that Post Point remain at its current individual NPDES authorization of design loadings and that the CSO-related bypass of the secondary treatment portion of the facility remain as it is currently authorized in the individual NPDES permit for flows that exceed a 40 mgd design flow. Ecology concurs with this assessment, and will limit secondary bypasses to flows exceeding 40 mgd.

Based on annual reports submitted by the city since 2015, the plant has used this wet weather bypass between three and eight times per year. See Table 4. Many events lasted less than an

hour while some lasted for nearly a full day. All events complied with the requirements in the previous permit that allowed for the wet weather bypasses.

**Table 4 — Secondary Bypass Summary, Annual Averages**

Year	Number	Duration (hours)	Volume (MG)	Rain Duration (hours)	Rain Depth (inches)
2015	8	6.33	2.43	57.0	1.90
2016	6	7.44	3.75	63.5	2.03
2017	4	7.38	3.38	60.8	1.86
2018	3	6.8	3.15	168.	2.99
2019	5	2.84	0.779	57.0	1.50
2020	4	14.3	4.81	70.1	2.29
2021	9	14.0	3.80	64.4	2.49

All flow from the four secondary clarifiers and any blended primary flow passes through a chlorine mixing chamber, and a chlorine contact chamber for disinfection. Final effluent is dechlorinated with sodium bisulfite. Plant flow is measured either 1) using an ultrasonic flow meter through a Parshall flume for flows below 25 MGD or 2) using a doppler flow meter for flows above 25 MGD. Post Point STP primarily discharges through Outfall 001, as described below. Both metering devices represent effluent flow. Historically the city recorded the same values as influent flow, as the meter available for influent flow measurement is very noisy and confidence in the values was low. This permit will remove influent flow measurement.

The City receives industrial wastewater flows from 12 industries that require pretreatment permits. The industries include food and seafood processors, a plywood mill, a chemical formulator, and an engine rebuild company. The industries are listed below in Table 5

**Table 5 — Industrial wastewater generators**

Facility Name	ECY Permit Number	Effective Date	Expiration Date	Industry Type
Bellingham Cold Storage	ST0007426	9/1/2019	8/31/2024	Seafood Processing, Cold Storage of Food Products
Bornstein Seafoods	ST0007304	9/3/20 mod	12/31/2023	Seafood Processing
Cesco Solutions	ST0045533	Dec-18 Letter	Auth Letter	Formulation, blending and distribution of chemical products
Homeport Seafoods	ST0007362	7/3/2018	7/31/2023	Seafood Processing
King and Prince Seafoods	ST0007318	2/20/2019	2/29/2024	Seafood Processing
Mt Baker Products	ST0007253	8/1/2018	7/31/2023	Plywood Manufacturer
North American ATK	ST0007428	3/8/2018	3/31/2023	Rebuilding of Automotive Engines

Facility Name	ECY Permit Number	Effective Date	Expiration Date	Industry Type
PSE Encogen Generating Station	ST0007336	1/10/2018	1/31/2023	Gas Fired Power Generating Plant
Q Sea Specialty Services	ST0007440	8/16/2018	8/31/2023	Seafood Processing
Trans Ocean Products	ST0007354	8/16/2018	8/31/2023	Seafood Processing
Trident Seafood Bellingham	ST0007303	10/30/2014	11/30/2019	Seafood Processing
Nanak Foods Inc	ST0501304	3/9/18 Letter		Food Processing

The plant is a Class IV facility requiring a Group IV operator in responsible charge and at least one Group III operator available during all shifts. There are 18 plant operators, 11 certified for water, wastewater, and incineration, with two more operator positions in the 2022 budget. This allows the plant to operate 24 hours a day, 7 days a week.

#### **Solid wastes/Residual Solids**

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the primary and secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Bellingham STP drains inert solids such as grit, rags, and screenings and disposes this solid waste at the local landfill.

Solids removed from the primary and secondary clarifiers may be stored in three tanks with a total storage volume of 110,400 gallons. Solids are thickened via one of two gravity belt thickeners. They are then dewatered further in one of two centrifuges before being sent to either one of two incinerators for thermal destruction. Ash is removed at the bottom of the incinerator and sent to Roosevelt Landfill in eastern Washington.

This facility has not been evaluated for the solid waste requirements for waste screening, as required by [WAC 173-308-205](#). The facility incinerates the screened solids and so those requirements do not apply.

Bellingham is in the planning phase of assessing how to treat and manage solids in the future. The incinerators are reaching the end of their useful life. The facility planning process must evaluate the fiscal and environmental effects of solids handling alternatives.

#### **Discharge outfalls**

The treated and disinfected effluent normally flows into Bellingham Bay through outfall 001. Outfall 001 is a 425-foot-long multiport diffuser, 2,375 feet offshore at depth from 70 (near end) to 82 feet, with an average depth of 76 feet below Mean Lower Low Water.

At extremely high flows and/or during high tide, treated and disinfected flows exceeding the hydraulic capacity of Outfall 001 passively passes over a weir in the discharge channel and discharges to Outfall 002. Outfall 002 is a single port diffuser that normally discharges stormwater. When Outfall 002 is in use for sanitary flows duck bill valves allow blending of

stormwater into the sanitary flow without contaminating the rest of the stormwater line.

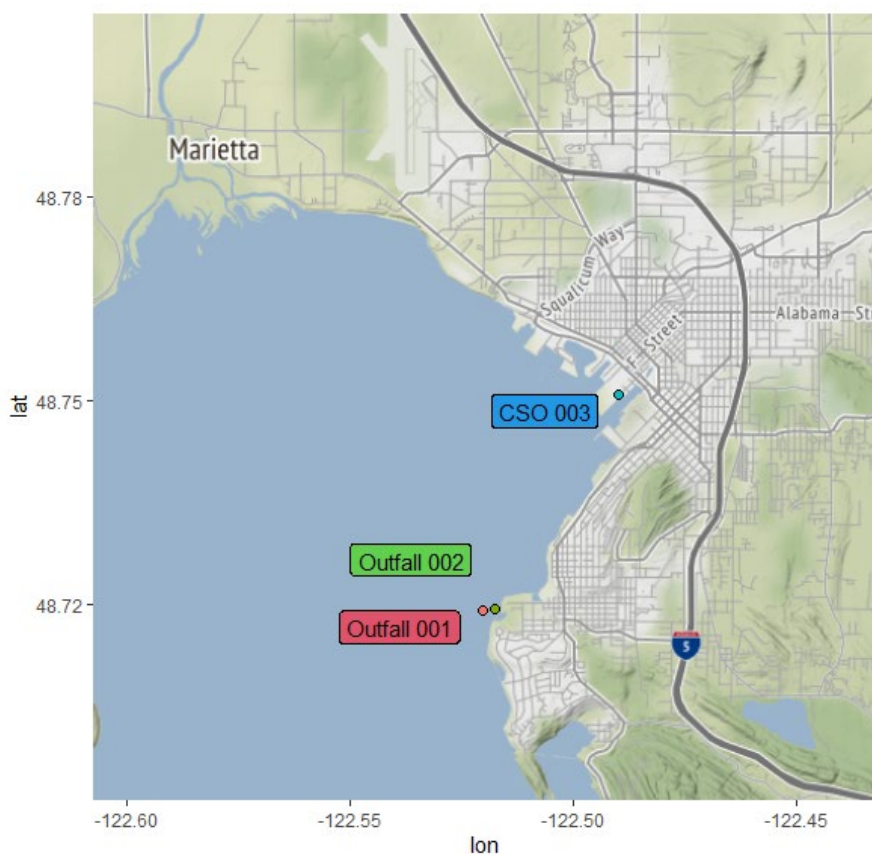
Discharge through Outfall 002 occurs infrequently with reported discharges on only two days in 2016, one day in 2018 and one day in 2021.

Outfall 002 was rebuilt and put into service October 25, 2007. When in use water flows into a storm drain vault. Stormwater flows in the part of the system connected to the vault are closed off, by duckbill valves, when sewer pressure is greater than the stormwater pressure. The water is conveyed to Bellingham Bay.

Flow to CSO Outfall 003, is controlled by a weir in the sewer system along Roeder Avenue.

Outfall 003 is an open pipe near the edge of the water in the Whatcom Waterway.

**Figure 3 - Outfall Locations**



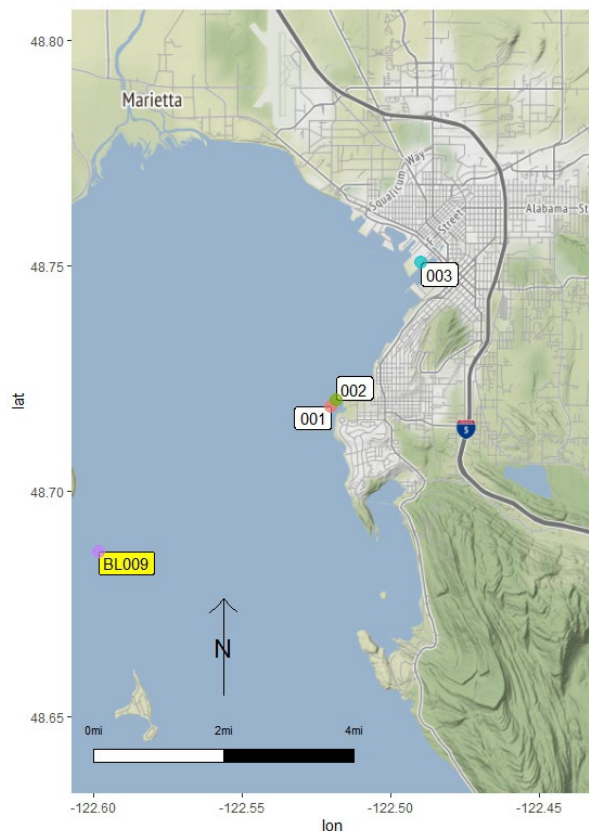
## **B. Description of the receiving water**

Bellingham STP discharges to Bellingham Bay. There are no significant nearby outfalls. There are stormwater discharges associated with general permits for Municipal, Industrial and Construction sources. All of the stormwater from Bellingham is regulated by a municipal stormwater general permit. The Nooksack River discharges into the north part of Bellingham Bay. The Nooksack river carries rural and agricultural nonpoint pollution to Bellingham Bay. No drinking water intakes are impacted by this marine discharge. Receiving waterbody impairments are described in Section III E of this fact sheet.

Ambient background data in Table 6 was taken from Ecology's ambient monitoring program site BLL009, located 4 miles WSW of Outfall 001. Other values used in reasonable potential

calculations came from Ecology's Environmental Information Management database. The database was searched for marine data in northern Salish Sea not associated with source investigations. Where no data was available, a zero value was used.

**Figure 4 – Location of BL009 relative to Outfalls 001, 002 and 003**



**Table 6 — Ambient Background Data**

Parameter	Value Used
Temperature (highest annual 1-DMax)	13.0° C
pH (Maximum / Minimum)	8.7 / 7.5 standard units
Dissolved Oxygen (minimum 1-Dmax)	4.7 mg/L (5 <sup>th</sup> percentile value)
Total Ammonia-N	1.73 mg/L
Fecal Coliform (data from Portage Bay, dry season May to October)	7 and 43 /100 mL dry season 5 and 38 /100 mL wet season
Turbidity	4.5 NTU
Salinity	21 to 30 practical salinity unit (psu)
Lead	0.096 µg/L
Zinc	1.21 µg/L mean 5.87 µg/L 90 <sup>th</sup> percentile
Antimony	0.35 µg/L
Cadmium	0.098 µg/L
Mercury	0.00005 µg/L mean 0.018 µg/L 90 <sup>th</sup> percentile

Parameter	Value Used
Nickel	0.41 µg/L mean 0.461 µg/L 90 <sup>th</sup> percentile

### C. Wastewater influent characterization

Bellingham STP reported the concentration of influent pollutants in discharge monitoring reports. Ecology used data from 1/1/2014 to 12/31/2019 to characterize the influent wastewater. A catastrophic collapse of a return activated sludge pipeline on May 6, 2017 created abnormal plant conditions impacting the ability to fully treat wastewater at the treatment plant from 5/6/17 to 5/12/17. Table 7 and Table 8 excludes data from this period.

**Table 7 — Wastewater Influent Characterization**

Parameter	Units	# of Samples	Average Value of monthly averages	Maximum Value of monthly averages
BOD <sub>5</sub>	mg/L	71	228	315
BOD <sub>5</sub>	lbs/day	71	20,576	24,052
TSS	mg/L	71	270	435
TSS	lbs/day	71	24,615	30,855

### D. Wastewater effluent characterization

Bellingham STP reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. Date in Table 8 represents the quality of the wastewater effluent discharged from 1/7/2014 to 12/31/2019. As discussed above for influent characterization, Table 8 excludes data from 5/6/2017 to 5/12/2017 due to a pipe failure that impacted plant performance.

Bellingham STP conducts two Acute Whole Effluent Toxicity (WET) each year. None of the tests show toxicity, but not all tests meet a high enough (65%) survival to demonstrate that there is no potential of exceeding acute toxicity. This permit will continue acute WET testing twice per year.

**Table 8 — Wastewater Effluent Characterization**

Parameter	Units	# of Months	Average Value of monthly average	Maximum Value of monthly average
BOD <sub>5</sub>	mg/L	71	10.5	16.2
BOD <sub>5</sub>	lbs/day	71	1,032	1,982
TSS	mg/L	71	7.42	12.5
TSS	lbs/day	71	756	1825

Parameter	Units	# of Months	Average Value of monthly geometric means	Maximum Value of monthly geometric means
Fecal Coliform	#/100ml	71	5.62	20.2

Parameter	Units	# of Months	Minimum Value	Maximum Value
pH	standard units	88	6.4	8.2

## E. Summary of compliance with previous permit issued

The previous permit placed effluent limits on BOD<sub>5</sub>, TSS, total residual chlorine, fecal coliform bacteria, and pH. Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections. Table 9 summarizes the violations that occurred during the permit term.

Bellingham STP has complied with the effluent limits and permit conditions throughout the duration of the permit issued on July 1, 2014, with exceptions shown in Table 9. Outfall 001 discharges nearly all (99.8%) of the effluent from the facility. The facility violated the maximum weekly BOD<sub>5</sub> for outfall 001 during the week of May 7 to May 13, 2017 due to the collapse of the RAS pipeline inside the treatment plant. Therefore, Ecology does not consider this a reflection of the facility's typical performance, but rather a result of a major process element failure. Plant operators quickly corrected the failure and returned the plant to normal operation.

The facility also violated outfall 002 weekly average effluent limits for BOD<sub>5</sub>, TSS and fecal coliform once during the current permit term. However, outfall 002 only discharged for 13 hours over part of two days during the week of the violations and during the highest flow of a storm driven event. Given the intermittent and short duration nature of discharges from this outfall, Ecology now considers the weekly average limits on discharges from outfall 002 in the previous permit inappropriate. Therefore, Ecology does not consider these violations as indicators of a problem at the facility.

**Table 9 — Violations**

Month	Outfall	Parameter	Statistical Base	Units	Value	Limit Min/Max	Violation
Feb. 2016	2	BOD <sub>5</sub>	Average	mg/L	30.75	30	Numeric effluent violation
Feb. 2016	2	Fecal Coliform	Monthly geometric mean	#/100ml	277	200	Numeric effluent violation
Feb. 2016	2	TSS	Average	mg/L	47	30	Numeric effluent violation
Feb. 2016 <sup>1</sup>	2	TSS	Weekly Average	mg/L	47	45	Numeric effluent violation
Feb. 2017	1	Temperature		Degrees C	NA	NA	Missing 1 day of temperature reporting
May 2017 <sup>2</sup>	1	BOD <sub>5</sub>	Weekly Average	mg/L	91	45	Numeric effluent violation

<sup>1</sup>. Duration was 7 hours of 168-hour week.

<sup>2</sup>. Value result of pipeline collapse at STP resulting in incomplete treatment

Under the previous permit, 52 submittals were received. All but a couple of the toxicity tests were received on time. Toxicity tests that were late can be attributed to delays at the laboratory.

## **F. State environmental policy act (SEPA) compliance**

State law exempts the issuance, reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than federal and state rules and regulations ([RCW 43.21C.0383](#)). The exemption applies only to existing discharges, not to new discharges.

## **III. Proposed Permit Limits**

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis ([40 CFR 125.3](#), and [chapter 173-220 WAC](#)).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards ([chapter 173-201A WAC](#)), Ground Water Standards ([chapter 173-200 WAC](#)), Sediment Quality Standards ([chapter 173-204 WAC](#)), or the Federal Water Quality Criteria Applicable to Washington ([40 CFR 131.45](#)).
- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [[40 CFR 122.42\(a\)](#)]. Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

## **A. Design criteria**

Under [WAC 173-220-150 \(1\)\(g\)](#), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant in the engineering report "Post Point Wastewater Treatment Plant Improvements" dated 10/13/2011 and prepared by Carollo Engineers. The Table 10, below includes design criteria from the referenced report.

**Table 10 — Design Criteria for Bellingham STP**

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	34.3 MGD
Peak Instantaneous Design Flow (PIDF)	72 MGD
Secondary Treatment Capacity (for wet weather diversions)	40 MGD
BOD <sub>5</sub> Loading for Maximum Month	39,800 lb/day
TSS Loading for Maximum Month	47,000 lb/day

## B. Technology-based effluent limits

Federal and state regulations define some technology-based effluent limits for domestic wastewater treatment plants. These effluent limits are given in [40 CFR Part 133](#) (federal) and in chapter [173-221 WAC](#) (state).

The federal CSO Control Policy (59 FR 18688) also requires entities with Combined Sewer Overflows to implement “Nine Minimum Controls” as technology-based performance standards for CSO discharges. Nine Minimum Controls are discussed in more detail in Section V of this fact sheet.

The table below identifies technology-based limits for pH, fecal coliform, CBOD<sub>5</sub>, and TSS, as listed in [chapter 173-221 WAC](#). While previous permits include technology-based limits on BOD<sub>5</sub>, the facility requested that Ecology regulate their discharge based on CBOD<sub>5</sub> for consistency with monitoring requirements in the Puget Sound Nutrient General Permit.

Therefore, Table 11 includes technology-based limits for CBOD<sub>5</sub> rather than BOD<sub>5</sub>. Section III.F of this fact sheet describes the potential for water quality-based limits. Chlorine is a performance-based limit and included here.

**Table 11 — Technology-based Limits**

Parameter	Average Monthly Limit	Average Weekly Limit
CBOD <sub>5</sub> (concentration)	25 mg/L	40 mg/L

CBOD<sub>5</sub> (concentration): In addition, the CBOD<sub>5</sub> effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.

Parameter	Average Monthly Limit	Average Weekly Limit
TSS (concentration)	30 mg/L	45 mg/L

TSS (concentration): In addition, the TSS effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.

Parameter	Average Monthly Limit	Daily Maximum
Chlorine	0.198 mg/L	0.429 mg/L

Parameter	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria	200 organisms/100 mL	400 organisms/100 mL

Parameter	Daily Minimum	Daily Maximum
pH	6.0 standard units	9.0 standard units

The existing permit has a water quality-based chlorine limit of 0.198 mg/L monthly average and 0.429 mg/L daily maximum. Based on discharge records for the past permit term, the facility is able to comply with this limit. Therefore, the proposed permit retains the same limit. Ecology reexamines whether this limit remains protective of water quality in Section III.F of this fact sheet.

Technology-based mass limits are based on [WAC 173-220-130\(3\)\(b\)](#) and [WAC 173-221-030\(11\)\(b\)](#). Ecology calculated the monthly and weekly average mass limits for BOD<sub>5</sub> and TSS as follows:

Mass Limit = CL x DF x CF

Where : NA

CL = Technology-based concentration limits listed in the above table

DF = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

**Table 12 Technology-based Mass Limits**

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
CBOD <sub>5</sub> Monthly Average	25	7,152
CBOD <sub>5</sub> Weekly Average	40	11,442
TSS Monthly Average	30	8,582
TSS Weekly Average	45	12,873

### C. Surface water quality-based effluent limits

The Washington State surface water quality standards ([chapter 173-201A WAC](#)) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards ([WAC 173-201A-510](#)). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

#### Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the water quality standards for surface waters ([chapter 173-201A WAC](#)). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

#### Numerical criteria for the protection of human health

Effective numeric water quality criteria for the protection of human health are promulgated in Chapter 173-201A WAC and 40 CFR 131.45. These criteria are designed to protect humans from

exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

#### **Narrative criteria**

Narrative water quality criteria (e.g., [WAC 173-201A-240\(1\)](#); 2016) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters ([WAC 173-201A-200, 2016](#)) and of all marine waters ([WAC 173-201A-210, 2016](#)) in the state of Washington.

#### **Antidegradation**

**Description** — The purpose of Washington's Antidegradation Policy ([WAC 173-201A-300-330; 2016](#)) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.
- The previous permit renewal for the Bellingham STP included a Tier II analysis of the expanded action resulting from the 2014 upgrades.

**Facility Specific Requirements** — This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in [chapter 173-201A WAC](#).

Ecology's analysis described in this section of the fact sheet demonstrates that the proposed permit conditions will protect existing and designated uses of the receiving water.

### **Combined Sewer Overflows**

[Chapter 173-245 WAC](#) requires that "All CSO sites shall achieve and at least maintain the greatest reasonable reduction, and neither cause violations of applicable water quality standards, nor restrictions to the characteristic uses of the receiving water, nor accumulation of deposits which: (a) Exceed sediment criteria or standards; or (b) have an adverse biological effect." "The greatest reasonable reduction" means control of each CSO outfall such that an average of no more than one untreated discharge may occur per year. Ecology includes specific conditions in the proposed permit to ensure that Bellingham STP continues to make progress towards meeting water quality goals for each CSO outfall in its system. Section V of this fact sheet contains more detailed information on these CSO requirements.

### **Mixing zones**

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones, the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn't interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [[WAC 173-201A-400 \(7\)\(a\)\(ii-iii\)](#) or [WAC 173-201A-400\(7\)\(b\)\(ii-iii\)](#)].

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the

boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Most aquatic life *acute* criteria are based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Most aquatic life *chronic* criteria are based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two and four tenths (2.4) liters/day for drinking water (increased from two liters/day in the 2016 Water Quality Standards update).
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge ([WAC 173-201A-400](#)). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

- a. Ecology must specify both the allowed size and location in a permit.

The proposed permit specifies the size and location of the allowed mixing zone (as specified below).

- b. The facility must fully apply “all known, available, and reasonable methods of prevention, control and treatment” ([AKART](#)) to its discharge.

Ecology has determined that the treatment provided at Bellingham STP meets the requirements of AKART (see “Technology-based Limits”).

- c. Ecology must consider critical discharge conditions.

Surface water quality-based limits are derived for the water body’s critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated waterbody uses). The critical discharge condition is often pollutant-specific or waterbody-specific.

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification

is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology uses the water depth at mean lower low water (MLLW) for marine waters. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at:  
<https://fortress.wa.gov/ecy/publications/documents/92109.pdf>

**Table 13 Critical Conditions Used to Model the Discharge from Outfall 001**

Critical Condition	Value <sup>a</sup>
Water depth at MLLW	76 feet
Density profile with a difference of 3.2 sigma-t units between 33 feet and the surface	yes
10th or 90th percentile current speeds for acute mixing zone	.013 or .126 m/sec
50th percentile current speeds for chronic and human health mixing zones	.044 m/sec
Maximum average monthly effluent flow for chronic and human health non-carcinogen	34.3
Annual average flow for human health carcinogen	34.3 MGD
Maximum daily flow for acute mixing zone	70 MGD
1 DAD MAX effluent temperature	23.7 °C

<sup>a</sup> flow values for 2035 are used. This is a conservative assumption

**Table 14 Critical Conditions Used to Model the Discharge Outfall 002**

Critical Condition <sup>1</sup>	Value
Water depth at MLLW	60 feet
Density profile with a difference of 3.2 sigma-t units between 33 feet and the surface	NA
10th or 90th percentile current speeds for acute mixing zone	Assumed 0 m/sec
50th percentile current speeds for chronic and human health mixing zones	NA
Maximum average monthly effluent flow for chronic and human health non-carcinogen	NA
Annual average flow for human health carcinogen	NA
Maximum daily flow for acute mixing zone	1.19
1 DAD MAX effluent temperature	23.7 °C

<sup>1</sup>Outfall 002 has only been used twice since 2014. Neither occurrence exceeded 13 hours. The longest occurrence was 2/15/2016 on a day that saw 1.99" of rainfall. Neither Acute nor Chronic conditions evaluated.

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from Mixing Zone Study dated October 5, 2016 and submitted by CH2M. Ecology obtained ambient data from Ecology's ambient monitoring station BLL011 (48.7333 N, 122.5833 W) located in Bellingham Bay.

- d. Supporting information must clearly indicate the mixing zone would not:
- Have a reasonable potential to cause the loss of sensitive or important habitat.
  - Substantially interfere with the existing or characteristic uses.
  - Result in damage to the ecosystem.
  - Adversely affect public health.

Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms and set the criteria to generally protect the species tested and to fully protect all commercially and recreationally important species.

EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic standards assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of discharge.

The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers) because the buoyant plume rises in the water column. Ecology has additionally determined that the effluent will not exceed 33 degrees C for more than two seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics, and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem, or adversely affect public health if the permit limits are met.

- e. The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.

Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met.

- f. The size of the mixing zone and the concentrations of the pollutants must be minimized.

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. Because tidal currents change velocity and direction, the plume orientation within the mixing zone changes. The plume mixes as it rises through the water column therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving waterbody. When a diffuser is installed, the discharge is more completely mixed with the receiving water in a shorter time. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

g. Maximum size of mixing zone.

The authorized mixing zone does not exceed the maximum size restriction.

h. Acute mixing zone.

- The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.

Ecology determined the acute criteria will be met at 10% of the distance of the chronic mixing zone 10 percentile current flow.

- The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

- Comply with size restrictions.

The mixing zone authorized for this discharge complies with the size restrictions published in [chapter 173-201A WAC](#).

i. Overlap of mixing zones.

This mixing zone does not overlap another mixing zone.

## D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in [chapter 173-201A WAC](#). The tables included below summarize the criteria applicable to the receiving water's designated uses.

- Aquatic life uses are designated using the following general categories. All indigenous fish and non-fish aquatic species must be protected in waters of the state.
  - a. Extraordinary quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
  - b. Excellent quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
  - c. Good quality salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
  - d. Fair quality salmonid and other fish migration.

The *Aquatic Life Uses* for Bellingham Bay are classified for Excellent Quality. Table 15 lists the associated criteria for this receiving water.

### Marine Aquatic Life Uses and Associated Criteria

**Table 15 Excellent Quality**

Criteria	Limit
Temperature Criteria – Highest 1D MAX	16°C (60.8°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	6.0 mg/L
Turbidity Criteria	<ul style="list-style-type: none"> <li>• 5 NTU over background when the background is 50 NTU or less; or</li> <li>• A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.</li> </ul>
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- To protect shellfish harvesting, fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

The water quality standards also designate the recreational use of Bellingham Bay as primary contact recreation. Table 16 lists the standard for this use.

**Table 16 Recreational Uses**

Recreational Use	Criteria
Primary Contact Recreation	Enterococci organism levels within an averaging period must not exceed a geometric mean of 30 CFR or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample values exist) obtained within the averaging period exceeding 110 CFU or MPN per 100 mL.

- The *miscellaneous marine water uses* are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

## E. Water quality impairments

The 2014 Water Quality Assessment identified 136 impaired area 303(d) listings for dissolved oxygen in the Salish Sea and 331 Category 2 listings indicating waters of concern. Ecology's extensive ongoing scientific investigations supporting the Puget Sound Nutrient Reduction Project demonstrate that the cumulative impact of point and nonpoint sources of nutrients, specifically nitrogen, contribute to areas of dissolved oxygen depletion in Puget Sound and the Salish Sea. Ecology is developing the Puget Sound Nutrient Reduction Plan (NRP) to address dissolved oxygen impairment listings in Puget Sound in a comprehensive manner. See the Puget Sound Nutrient Reduction Project webpage (<https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Helping-Puget-Sound/Reducing-Puget-Sound-nutrients/Puget-Sound-Nutrient-Reduction-Project>) for more information about this effort.

Ecology has not documented any additional water quality impairments in the receiving water (Outer Bellingham Bay) in the vicinity of the outfall. However, Ecology's records show an existing water quality impairment for bacteria (enterococcus) along the shoreline of Inner Bellingham Bay, approximately 2000 feet East of the outfall in shallow water. There is not a TMDL but the Bellingham WWTP monitors fecal coliform, and will add enterococci to confirm that the WWTP discharges does not cause or contribute to the impairment.

North of the outfall, also in Inner Bellingham Bay, there is a TMDL addressing 67 parameters in 47 locations for sediment contamination. The TMDL did not identify Bellingham STP as a source of the sediment contamination.

## F. Evaluation of surface water quality-based effluent limits for narrative criteria

Ecology must consider the narrative criteria described in [WAC 173-201A-160](#) when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria.

In addition, Ecology considers the toxicity of the wastewater discharge by requiring whole effluent toxicity (WET) testing when there is a reasonable potential for the discharge to contain toxics. Ecology's analysis of the need for WET testing for this discharge is described later in the fact sheet.

#### **G. Evaluation of surface water quality-based effluent limits for numeric criteria**

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biochemical oxygen demand (BOD<sub>5</sub>) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge exceed water quality criteria. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by [chapter 173-201A WAC](#).

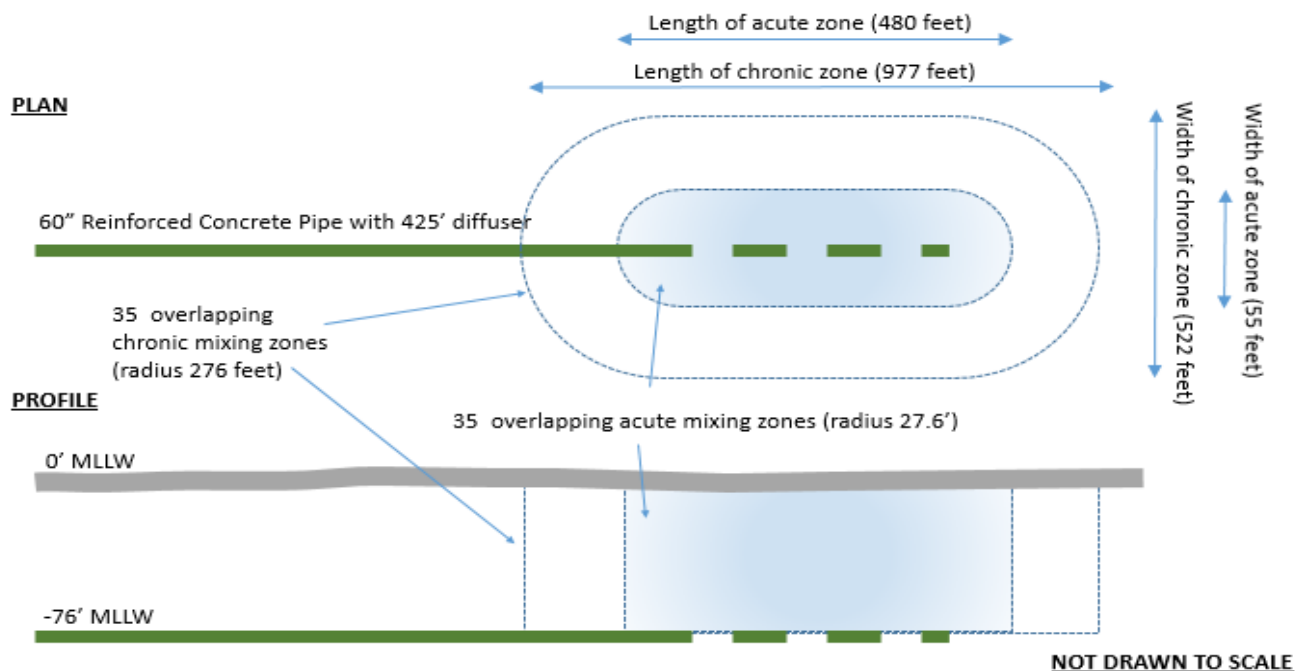
The diffuser at Outfall 001 is 425 feet long with a diameter of 60 inches. The diffuser has thirty-five 6-inch diameter ports spaced 12 feet apart on center. The diffuser stretches downward along the sloping sea bottom between the depths of 70 and 82 feet below mean lower low water (MLLW). The average depth of the diffuser is 76 feet MLLW. Ecology obtained this information from the Dilution Ratio Study Report dated October 5, 2016.

**Chronic Mixing Zone** — [WAC 173-201A-400\(7\)\(b\)](#) specifies that mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge ports and may not occupy more than 25% of the width of the water body as measured during MLLW.

The horizontal distance of the chronic mixing zone is 276 feet from any discharge port. The mixing zone extends from the bottom to the top of the water column.

**Acute Mixing Zone** — [WAC 173-201A-400\(8\)\(b\)](#) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone. The acute mixing zone for Outfall 001 extends 27.6 feet in any direction from any discharge port.

Figure 4 shows the dimensions of the stadium shaped mixing zone created by 35 overlapping circles of radius 27.6 feet for the acute zone, and 276 feet for the chronic zone. The extent of the acute zone is 55 feet by 480 feet. The extent of the chronic zone is 552 feet by 977 feet.



**Figure 5 - Bellingham WWTP mixing zone P**

Ecology determined the dilution factors listed in table 16 that occur within these zones at the critical condition from the Outfall Mixing Zone Study Report dated on 10/5/2016. The dilution factors listed below represent projected flows for 2035 for outfall 001. Table 18 shows the dilution factors for Outfall 002

**Table 17 -- Dilution Factors (DF) Outfall 001**

Criteria	Acute	Chronic
Aquatic Life	47	65
Human Health, Carcinogen	NA	65
Human Health, Non-carcinogen	NA	81

**Table 18 -- Dilution Factors (DF) Outfall 002**

Criteria	Factor
Acute Aquatic Life Criteria	3.7
Chronic Aquatic Life Criteria	14.7
Human Health Criteria - Carcinogen	14.7
Human Health Criteria - Non-carcinogen	14.7

**Dissolved Oxygen — BOD<sub>5</sub> and Ammonia Effects** — Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Carbonaceous Biochemical Oxygen Demand (CBOD<sub>5</sub>) of an effluent sample indicates the amount of biodegradable carbon-based material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate

in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water.

Ecology modeled the impact of CBOD<sub>5</sub> on the receiving water using DO<sub>sag-marine</sub>, at critical condition and with the technology-based effluent limit for CBOD<sub>5</sub> described under "Technology-Based Effluent Limits" above. The calculations to determine dissolved oxygen impacts are shown in **Appendix D**.

Ecology predicted no violation of the surface water quality standards for dissolved oxygen at the edge of the mixing zone due to the impacts of CBOD<sub>5</sub> under critical conditions. Therefore, the proposed permit contains the technology-based effluent limit for CBOD<sub>5</sub>. The permit also does not contain a limit on ammonia based on dissolved oxygen impacts (ammonia toxicity is examined elsewhere in this fact sheet).

Technology-based limits for CBOD<sub>5</sub>, in combination with the Puget Sound Nutrient General Permit that addresses other sources of oxygen demand, will ensure that dissolved oxygen criteria are met in the receiving water.

**Nutrients** — Ecology's Puget Sound Nutrient Reduction Project evaluated the cumulative impact of anthropogenic sources of nutrients using the Salish Sea Model (Ahmed et al, 2019). That model's simulations predict that nutrients discharged from wastewater treatment plants have a reasonable potential to contribute to existing low dissolved oxygen levels, below state water quality criteria, in the Salish Sea (which includes Puget Sound). On December 1, 2021, Ecology issued the Puget Sound Nutrient General Permit (PSNGP) to regulate the discharge of Total Inorganic Nitrogen from 58 domestic wastewater treatment plants that discharge to marine and estuarine waters in Washington's waters of the Salish Sea (<https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Nutrient-Permit>). The Bellingham STP is covered by the PSNGP, which includes requirements for the control and monitoring of nutrients. This individual permit does not contain limits or other conditions related to the regulation of nutrients.

**pH** — Compliance with the technology-based limits of 6.0 to 9.0 will assure compliance with the water quality standards of surface waters because of the high buffering capacity of marine water.

**Bacteria** — In the previous permit cycle, Ecology modeled the number of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 mL and a dilution factor of 65. That analysis showed no violation of the fecal coliform water quality criterion under critical conditions. Changes to the State's surface water quality criteria for bacteria did not affect the technology-based limits for fecal coliform in WAC 173-221. Without a site-specific correlation between fecal coliform and Enterococci, Ecology cannot determine whether the discharge will violate the water quality criterion for Enterococci. Given that the characteristics of the receiving water and the discharge have not changed substantially since the analysis conducted in the previous permit cycle, the proposed permit will maintain the technology-based effluent limit for fecal coliform. In addition, the permit requires the Bellingham STP to conduct comparison monitoring of both fecal coliform and Enterococci necessary for development of the site-specific correlation. Ecology will then use this data to

assess the reasonable potential to exceed the applicable water quality criterion in the next iteration of this permit.

**Turbidity** — Ecology evaluated the impact of turbidity based on the range of total suspended solids in the effluent and turbidity of the receiving water. Ecology expects no violations of the turbidity criteria outside the designated mixing zone provided the facility meets its technology-based total suspended solids permit limits.

**Toxic Pollutants** (aquatic life) — Federal regulations ([40 CFR 122.44](#)) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

The permit application identified the presence of the following toxic pollutants in the discharge: chlorine, ammonia, antimony, cadmium, copper, cyanide, lead, mercury, nickels, zinc, bis(2-ethylhexyl) phthalate, diethylphthalate, phenol, and toluene. Ecology conducted a reasonable potential analysis (See Appendix D) on these parameters to determine whether they would require effluent limits in this permit.

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature, pH, and salinity of the receiving marine water. To evaluate ammonia toxicity, Ecology used the available receiving water information for Marine Waters in Washington State and Ecology spreadsheet tools.

Valid ambient background data were available for antimony, arsenic, bis(2-ethylhexyl)phthalate, cadmium, lead, mercury, nickel, and zinc. Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards. No valid ambient background data were available for chlorine, chromium (hex), chloroform, copper, cyanide, diethylphthalate, phenol, selenium, and toluene. Ecology used zero for the background concentrations of these parameters.

Ecology determined that ammonia, antimony, arsenic, bis(2-ethylhexyl)phthalate, cadmium, chloroform, chromium (hex), copper, cyanide, and diethylphthalate, lead, mercury, nickel, phenol, selenium, toluene and zinc pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 (**Appendix D**) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

The previous permit included a water quality-based limit on total residual chlorine because of a previous reasonable potential determination. Ecology reevaluated this limit and determined that it remains appropriate to protect water quality. Therefore, the proposed permit retains the following limits on total residual chlorine: 0.198 mg/L monthly average and 0.429 mg/L daily maximum.

**Temperature**--The state temperature standards for marine waters ([WAC 173-201A-210](#)) include multiple elements:

- Annual 1-Day maximum criteria
- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits. See Table D5 for outfall 001. Outfall 002 discharges rarely and only during high flows when temperatures are moderate.

- Annual 1-Day maximum criteria

Each marine water body has an annual maximum temperature criterion [WAC 173-201A-210(1)(c)(i)-(ii) and WAC 173-201A-612]. These threshold criteria (e.g., 13, 16, 19, 22°C) protect specific categories of aquatic life by controlling the effect of human actions on water column temperatures. The threshold criteria apply at the edge of the chronic mixing zone. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax). Ecology concludes that there is no reasonable potential to exceed the temperature standard when the mixture of ambient water and effluent at the edge of the chronic mixing zone is less than the criteria of 16°C.

- Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [[WAC 173-201A-210\(1\)\(c\)\(i\)-\(ii\)](#)]. The incremental warming criteria apply at the edge of the chronic mixing zone. At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment ( $T_i$ ), calculated as:

$$T_i = \frac{12}{(T_{amb} - 2)}$$

This increment is permitted only to the extent doing so does not cause temperatures to exceed the annual maximum criteria.

- Temperature Acute Effects

1. Instantaneous lethality to passing fish: The upper 99<sup>th</sup> percentile daily maximum effluent temperature must not exceed 33°C; unless a dilution analysis indicates ambient temperatures will not exceed 33°C 2-seconds after discharge.
2. General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.
3. Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

### Reasonable Potential Analysis

**Annual summer maximum, and incremental warming criteria:** Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum, and the incremental warming criteria (See temperature calculations in **Appendix D**). The analysis predicts that the discharge will increase the temperature at the edge of the chronic mixing zone by 0.14 °C during the summer season to 15.14 °C. Both remain below the water quality standard of 16.0 °C for the 1-maximum temperature along with the allowable incremental warming of 0.92 °C. The analysis shows that the discharge has no reasonable potential to exceed chronic temperature criteria. In addition, the effluent temperature from the Post Point

WWTP does not approach or exceed 33 °C at any time and has no reasonable potential to exceed acute temperature criteria. Therefore, the proposed permit does not include limits on effluent temperature.

## H. Human health

Washington's water quality standards include numeric human health-based criteria for priority pollutants that Ecology must consider when writing NPDES permits.

Ecology determined the effluent contains the following chemicals of concern for human health: antimony, arsenic, bis(2-ethylhexyl) phthalate, chromium (VI), copper, cyanide, lead, mercury, nickel, selenium, and zinc .

Ecology evaluated the discharge's potential to violate the water quality standards as required by 40 CFR 122.44(d) by following the procedures published in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001) and Ecology's *Permit Writer's Manual* to make a reasonable potential determination. Results of this evaluation can be found in Appendix D. The evaluation showed that the discharge has no reasonable potential to cause a violation of water quality standards, and effluent limits are not needed for the parameters listed above.

## I. Sediment quality

The aquatic sediment standards ([chapter 173-204 WAC](#)) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards ([WAC 173-204-400](#)). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website. <https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups>

Ecology determined that this discharge has potential to cause a violation of the sediment quality standards because of the volume of the discharge and based on previous sediment sampling results. Sediments in the vicinity of outfall 001 have not been sampled in the last 10 years. The proposed permit includes a requirement for the Bellingham STP to demonstrate either:

- The point of discharge is not an area of deposition, or
- Toxics do not accumulate in the sediments even though the point of discharge is a depositional area.

Bellingham STP must repeat the sampling every ten years, because of the size of the design flow.

## J. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called

whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

A mixing zone study by CH2M dated October 5, 2016, estimated dilution factors for the outfall expected at present and future. The most conservative projections (DF = 47:1, 2.1%) for 2035 were used in as limits for ACEC.

- *Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent.* Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.
- *Chronic toxicity tests measure various sublethal toxic responses, such as reduced growth or reproduction.* Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

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 an NOEC, LC50, EC50, IC25, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, [Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria](https://apps.ecology.wa.gov/publications/documents/9580.pdf) (<https://apps.ecology.wa.gov/publications/documents/9580.pdf>), which is referenced in the permit. Ecology recommends that Bellingham STP send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during the previous permit term showed the facility's effluent has a reasonable potential to cause acute toxicity in the receiving water. The proposed permit will include an acute toxicity limit. The effluent limit for acute toxicity is: No acute toxicity detected in a test sample representing the acute critical effluent concentration (ACEC). The acute critical effluent concentration (ACEC) is the concentration of effluent at the boundary of the acute mixing zone during critical conditions. The ACEC was 2.1% effluent.

Compliance with an acute toxicity limit is measured by an acute toxicity test comparing test organism survival in the ACEC (using a sample of effluent diluted to equal the ACEC) to survival in nontoxic control water. Bellingham STP complies with the acute toxicity limit if there is no statistically significant difference in test organism survival between the ACEC sample and the control sample.

Bellingham complied with the effluent limit for acute toxicity. However, two tests (July 2016 and July 2018) failed to meet the performance standard that indicates a reasonable potential for acute toxicity. Both tests resulted in less than 65% survival in 100% effluent. Failure to meet that performance standard indicates a reasonable potential to cause acute toxicity in the receiving water. Therefore, Ecology will retain the effluent limits for acute toxicity in the permit. The proposed permit retains the previous monitoring frequency of twice per year. Acute testing will continue to use Topsmelt (*Atherinops affinis*) survival and growth, and Mysid shrimp (*Americamysis bahia*) survival and growth as the test species and end points.

All WET testing results conducted in order to monitor for compliance with a chronic WET limit assigned in a previous permit met the chronic toxicity performance standard defined in WAC 173-205-020. See Table D9 for details. In addition, Ecology has determined that the Permittee

has not made any changes to the facility that would trigger an additional effluent characterization pursuant to WAC 173-205-060. For these reasons, Ecology has not included the chronic WET limit in the proposed permit. Instead, the Permittee must conduct WET testing at the end of the permit term in order to verify that effluent toxicity has not increased.

#### Sample frequency

Sampling for acute toxicity will be semi-annually. Table D10 (appendix D) shows the ranking following the guidance in section 4.1 of Chapter 14 section of the Permit Writer's Manual.

#### Species selected for testing.

Acute and chronic toxicity test will continue to use Topsmelt, and Mysid shrimp.

### K. Groundwater quality limits

The groundwater quality standards ([chapter 173-200 WAC](#)) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards ([WAC 173-200-100](#)).

Bellingham STP does not discharge wastewater to the ground. No permit limits are required to protect groundwater.

### L. Comparison of effluent limits with the previous permit modified on October 15, 2014

**Table 19 Comparison of Previous and Proposed Effluent Limits – Outfall #001**

Parameter	Basis of Limit	Average Monthly	Average Weekly	Average Monthly	Average Weekly
BOD <sub>5</sub>	Technology	30 mg\L 8582lbs/day	45 mg\L 12873 lbs/day	NA	NA
CBOD <sub>5</sub>	Technology	NA	NA	25 mg/L 7152 lbs/day <sup>1</sup>	40 mg/L 11,442 lbs/day <sup>1</sup>
TSS	Technology	30 mg\L 8582 lbs/day	45 mg\L 12873 lbs/day	30 mg\L 8582 lbs/day <sup>1</sup>	45 mg\L 12873 lbs/day <sup>1</sup>
NA	NA	<b>Monthly Geometric Mean Limit</b>	<b>Weekly Geometric Mean Limit</b>	<b>Monthly Geometric Mean Limit</b>	<b>Weekly Geometric Mean Limit</b>
Fecal Coliform Bacteria	Technology	200 #/100 mL	400 #/100 mL	200 #/100 mL	400 #/100 mL
NA	NA	<b>Lower Limit</b>	<b>Upper Limit</b>	<b>Lower Limit</b>	<b>Upper Limit</b>
pH	Technology	6.0 (grab)	9.0 (grab)	6.0 (continuous)	9.0 (continuous)
NA	NA	<b>Average Monthly</b>	<b>Maximum Daily</b>	<b>Average Monthly</b>	<b>Maximum Daily</b>
Chlorine	Performance	0.198 mg/L	0.429 mg/L	0.198 mg/L	0.429 mg/L

**Table 20 Comparison of Previous and Proposed Effluent Limits – Outfall #002**

Parameter	Basis of Limit	Average Monthly	Average Weekly	Average Monthly	Average Weekly
BOD <sub>5</sub>	Technology	30 mg\L 8582lbs/day	45 mg\L 12873 lbs/day	NA <sup>1</sup>	NA <sup>1</sup>
TSS	Technology	30 mg\L 8582 lbs/day	45 mg\L 12873 lbs/day	NA <sup>1</sup>	NA <sup>1</sup>

Parameter	Basis of Limit	Average Monthly	Average Weekly	Average Monthly	Average Weekly
NA	NA	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria <sup>1</sup>	Technology	200 #/100 mL	400 #/100 mL	200 #/100 mL	400 #/100 mL
NA	NA	Lower Limit	Upper Limit	Lower Limit	Upper Limit
pH <sup>1</sup>	Technology	6.0 (grab)	9.0 (grab)	6.0 (continuous)	9.0 (continuous)
NA	NA	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Chlorine	Performance	0.003 mg/L	0.048 mg/L	NA <sup>1</sup>	0.048mg/L

Notes:

<sup>1</sup> Outfall 002 only operates occasionally, therefore weekly and monthly average limits are not appropriate. In addition, composite sampling is not feasible for intermittent, short duration flows observed from this outfall. Ecology considers concentrations at outfall 001 are representative of concentrations at both outfalls. The mass limit will also apply to the sum of the flows at outfall 001 and outfall 002. Outfall 001 samples for fecal coliform, pH and chlorine may be used for compliance at outfall 002 if representative.

## IV. 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 effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, detection level (DL), and quantitation level (QL) on the discharge monitoring report or in the required report.

### A. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-109) for activated sludge facilities with design flows greater than 5 mgd.

The time during which effluent discharges through Outfall 002 is typically very short. As such, separate monitoring for Outfall 002 for BOD, TSS, and temperature have been removed from the proposed permit. The Outfall 002 effluent originates from the same location prior to the overflow weir and exhibits the same water quality characteristics as effluent samples collected at Outfall 001. The proposed permit retains monitoring and reporting of flow, residual chlorine and pH for outfall 002. This monitoring may use the results of samples collected from effluent discharged from outfall 001 that occur during the period of time flow discharges from outfall 002.

Ecology updated the water contact recreation bacteria criteria in, effective January 1, 2021. This change eliminated all recreational uses except for primary contact criteria in both fresh

and marine waters. Primary contact criteria changed to *E.coli* for freshwater and to enterococci for marine water. Because Bellingham STP has an effluent limit based on recreation, this permit requires monitoring of both fecal coliform and enterococci during this permit cycle. Ecology will reevaluate the bacteria limit based on the new indicator during the next permit cycle.

Ecology has required monitoring of both fecal coliform and enterococci in the permit application. This dual monitoring will help inform both Ecology and Bellingham STP of the correlation between the two indicators. Dual monitoring requirements consist of analyzing samples for both fecal coliform and enterococci. The data will be used to determine the reasonable potential of exceeding primary contact criteria.

As a pretreatment publicly owned treatment works (POTW), the Bellingham STP is required to sample influent and final effluent for toxic pollutants in order to characterize the industrial input. Sampling is also done to determine if pollutants interfere with the treatment process or pass-through the plant to the sludge or the receiving water. The permit's pretreatment annual reporting requirements also requires Bellingham STP to submit results of incinerator feed sludge sampling, as required by the facility's air emissions permitting, in lieu of biosolids monitoring typically required of pretreatment POTWs. Bellingham STP will use the influent, effluent, and sludge monitoring data to develop local limits that commercial and industrial users must meet. Future permits may include additional sludge monitoring requirements should the facility transition from incineration to the production of biosolids suitable for beneficial use.

## B. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of [chapter 173-50 WAC](#), Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters). Ecology accredited the laboratory at this facility (Accreditation #W669) for:

**Table 21 Accredited Parameters**

Parameter Name	Category	Method Name	Matrix Description
Dissolved Oxygen	General Chemistry	Hach 10360 rev 1.2	Non-Potable Water
Turbidity	General Chemistry	SM 2130 B-2011	Non-Potable Water
Solids, Total Suspended	General Chemistry	SM 2540 D-2011	Non-Potable Water
Chlorine (Residual), Total	General Chemistry	SM 4500-Cl G-2011	Non-Potable Water
pH	General Chemistry	SM 4500-H+ B-2011	Non-Potable Water
Ammonia as N	General Chemistry	SM 4500-NH3 D-2011	Non-Potable Water
Nitrate + Nitrite as N	General Chemistry	SM 4500-NO3 <sup>-</sup> F-2011	Non-Potable Water
Orthophosphate	General Chemistry	SM 4500-P F-2011	Non-Potable Water
Phosphorus, Total	General Chemistry	SM 4500-P F-2011	Non-Potable Water
BOD	General Chemistry	SM 5210 B-2011	Non-Potable Water

Parameter Name	Category	Method Name	Matrix Description
CBOD	General Chemistry	SM 5210 B-2011	Non-Potable Water
Fecal coliform-count	Microbiology	SM 9222 D (mFC)-06	Non-Potable Water
Enterococci	Microbiology	SM 9230 D Enterolert®	Non-Potable Water
Solids, Total	General Chemistry	SM 2540 G-2011	Solid and Chemical Materials

## V. Other Permit Conditions

### A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges ([WAC 173-220-210](#)).

### B. Prevention of facility overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, [RCW 90.48.110](#) and [WAC 173-220-150](#) require Bellingham STP to:

- Take the actions detailed in proposed permit Special Condition S.4.
- Design and construct expansions or modifications before the treatment plant reaches existing capacity.
- Report and correct conditions that could result in new or increased discharges of pollutants.

Special Condition S.4 restricts the amount of flow.

### C. Operation and maintenance

The proposed permit contains Special Condition S.5 as authorized under [RCW 90.48.110](#), [WAC 173-220-150](#), [chapter 173-230 WAC](#), and [WAC 173-240-080](#). Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that Bellingham STP takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

### D. Pretreatment

#### Duty to enforce discharge prohibitions

This provision prohibits the publicly owned treatment works (POTW) from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer.

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes “pass-through” or “interference”. This general prohibition is from [40 CFR §403.5\(a\)](#). **Appendix C** of this fact sheet defines these terms.
- The second section reinforces a number of specific state and federal pretreatment prohibitions found in [WAC 173-216-060](#) and [40 CFR §403.5\(b\)](#). These reinforce that the POTW may not accept certain wastes, which:
  - a. Are prohibited due to dangerous waste rules.
  - b. Are explosive or flammable.

- c. Have too high or low of a pH (too corrosive, acidic or basic).
- d. May cause a blockage such as grease, sand, rocks, or viscous materials.
- e. Are hot enough to cause a problem.
- f. Are of sufficient strength or volume to interfere with treatment.
- g. Contain too much petroleum-based oils, mineral oil, or cutting fluid.
- h. Create noxious or toxic gases at any point.

[40 CFR Part 403](#) contains the regulatory basis for these prohibitions, with the exception of the pH provisions which are based on [WAC 173-216-060](#).

- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology. These discharges include:
  - a. Cooling water in significant volumes.
  - b. Stormwater and other direct inflow sources.
  - c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Ecology is prepared to delegate authority to the City of Bellingham for permitting, monitoring, and enforcement over industrial users discharging to their treatment system to provide more direct and effective control of pollutants. Ecology reviewed and approved the City's pretreatment program via letter on September 18, 2019. Beginning on the effective date of the permit, Ecology will oversee the delegated Industrial Pretreatment Program to assure compliance with federal pretreatment regulations ([40 CFR Part 403](#)) and categorical standards and state regulations ([chapter 90.48 RCW](#) and [chapter 173-216 WAC](#)).

As sufficient data becomes available, the City of Bellingham must, in consultation with Ecology, reevaluate its local limits in order to prevent pass-through or interference. If any pollutant causes pass-through or interference, or exceeds established sludge standards, the City must establish new local limits or revise existing local limits as required by [40 CFR 403.5](#). In addition, Ecology may require revision or establishment of local limits for any pollutant that causes a violation of water quality standards or established effluent limits, or that causes whole effluent toxicity.

Ecology may modify this permit to incorporate additional requirements relating to the establishment and enforcement of local limits for pollutants of concern.

## **E. Solid wastes**

To prevent water quality problems the facility is required in permit Special Condition S7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of [RCW 90.48.080](#) and state water quality standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under [40 CFR 503](#), and by Ecology under [chapter 70A.226.005 RCW](#), [chapter 173-308 WAC](#) "Biosolids Management," and [chapter 173-350 WAC](#) "Solid Waste Handling Standards." The disposal of other solid waste is under the jurisdiction of the Whatcom County Health Department.

Requirements for monitoring sewage sludge and record keeping are included in this permit. Ecology will use this information, required under [40 CFR 503](#), to develop or update local limits.

## **F. Combined sewer overflows**

Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same piping system. Most of the time, combined sewer systems transport all wastewater to a sewage treatment plant, where it is treated and then discharged to a water body. During periods of heavy rainfall or snowmelt, however, the wastewater volume in a combined sewer system can exceed the capacity of the combined sewer system or treatment plant. For this reason, combined sewer systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies. [Chapter 173-245 WAC](#) and [EPA's CSO control policy \(59 FR 18688\)](#) identify the required measures for control of overflows from combined sewer systems.

Federal regulations require all CSOs to comply with both technology-based and water quality-based requirements of the Clean Water Act. Similarly, state regulations require the use of all known, available, and reasonable methods of prevention and control to achieve and maintain the “greatest reasonable reduction” in CSO discharges. State regulations also do not allow CSO discharges that:

- Cause violations of applicable water quality standards,
- Restrict the characteristic uses of the receiving water,
- Cause accumulation of deposits that exceed sediment criteria or standards, or have an adverse biological effect.

### **CSO Reduction Plan/Long-Term Control Plan and CSO Reduction Plan Amendments**

The state legislature amended chapter 90.48 RCW in 1985 to establish a requirement for Ecology to work with local governments to develop “reasonable plans and compliance schedules for the greatest reasonable reduction of combined sewer overflows...at the earliest possible date” (RCW 90.48.480). Ecology codified the requirement as [chapter 173-245 WAC](#) in 1987. This regulation established a maximum allowable discharge frequency for untreated CSOs.

Ecology required municipalities to develop CSO reduction plans for approval by January 1, 1988. As required by [chapter 173-245 WAC](#), these plans documented how the municipality planned to reduce the discharge frequency of each CSO outfall to a performance standards of no more than one untreated discharge per year, on average. These plans are substantially equivalent to the long-term control plan (LTCP) defined by [EPA's CSO control policy \(59 FR 18688\)](#).

Ecology defines the technology-based performance standard for controlled CSOs as achieving a discharge frequency of no more than one discharge per year, on average, for each outfall. Once achieved, Chapter 173-245-015 WAC requires municipalities to maintain compliance with this standard. The City of Bellingham currently complies with the performance standard for CSO control. The proposed permit requires the City to maintain compliance with the performance standard, but does not require further CSO reduction planning at this time.

### **Nine Minimum Controls**

Municipalities with combined sewer overflow outfalls must implement nine minimum controls as technology-based standards for CSO discharges. The nine minimum controls are largely programmatic policies and practices designed to minimize the impacts untreated CSOs have on human health and the environment. It is not possible with current knowledge and technology to calculate numeric water quality-based effluent limits for CSOs. Ecology may include numeric water quality-based effluent limits in the future permits only after the long-term control plan is in place and after collection of sufficient water quality data.

The nine minimum controls include:

1. Use proper operations and maintenance practices within the combined collection system to reduce the magnitude, frequency and duration of CSOs.
2. Implement procedures that maximize storage capacity of the combined collection system.
3. Minimize pollution from non-domestic wastewater sources through close management of a pretreatment program.
4. Maximize treatable flow to the wastewater treatment plant during wet weather.
5. Prevent CSO discharges during dry weather and properly report any dry weather CSO discharges immediately to Ecology.
6. Implement procedures to control solid and floatable materials in CSOs.
7. Implement and maintain a pollution prevention program designed to keep pollutants from entering the combined sewer system.
8. Establish a process to notify the public when and where CSOs occur.
9. Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls, including event-based monitoring of all CSO flow quantity, frequency and duration.

### **CSO Monitoring and reporting**

In addition to the technology-based requirements described above, the City of Bellingham must ensure that untreated CSO discharges comply with the state's water quality standards. It is not possible with current knowledge and technology to calculate numeric water quality-based effluent limits for untreated CSOs. [Chapter 173-201A-400](#) WAC allow Ecology to authorize a mixing zone for untreated CSO discharges that comply with the CSO performance standard. This allowance grants an exemption to the numeric size criteria and overlap restrictions established for regulatory mixing zones. The exemption applies for discharges that comply with the performance standard, except when allowing the mixing zone would result in a reasonable potential to:

- Cause a loss of sensitive or important habitat,
- Substantially interfere with the existing characteristic uses of the water body,
- Result in damage to the ecosystem,
- Adversely affect public health.

Under [EPA's CSO control policy's \(59 FR 18688\)](#) presumption approach, CSO controls are presumed to attain water quality standard (WQS) if certain performance criteria are met. Under the state's regulations, compliance with the technology-based requirements described above provides a means for Ecology to authorize a mixing zone to ensure CSO discharges comply with numeric water quality criteria. While Ecology presumes that a program that meets the technology-based requirements in state and federal regulations provides an adequate level of control to meet the water quality-based requirements of the Clean Water Act, the City of Bellingham must perform post-construction monitoring to verify compliance. Ecology approved the post-construction monitoring plan for the City of Bellingham's CSO outfall in 2005.

Along with any monitoring required by the approved post-construction monitoring plan, the proposed permit requires, at a minimum, that the City monitor the volume and duration of any CSO discharge. The permit also requires reporting the amount of precipitation that occurred prior to the discharge as well as the duration of the storm event. The proposed permit requires reporting the results of this monitoring electronically through the WQWebDMR system, consistent with EPA's E-reporting rules.

The City must also submit annual reports according to the requirements of [WAC 173-245-090\(1\)](#). These reports must contain the following information:

- A summary of the past year's frequency and volume of combined sewage discharge from each CSO outfall along with an assessment of whether the discharge volume or frequency has increased over baseline annual conditions.
- A discussion of the previous year's CSO reduction accomplishments
- A list of the projects planned for the next year (if any)
- A comparison of each outfalls' average discharge frequency with the CSO performance standard.
- A discussion of any corrective actions required by an adaptive management strategy for controlled CSOs
- A discussion of compliance with the Nine Minimum Controls
- A summary of results from post-construction monitoring completed during the reporting year.
- Identification of any outfall whose compliance status changed during the reporting period.
- A summary of wet weather bypasses (flow blending) at the Bellingham STP.

## **G. General conditions**

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual domestic wastewater NPDES permits issued by Ecology.

## **VI. Permit Issuance Procedures**

### **A. Permit modifications**

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwaters, based on new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

### **B. Proposed permit issuance**

This proposed permit meets all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

## **VII. References for Text and Appendices**

### **CH2M**

2016. Outfall Mixing Zone Study Report for Post Point Wastewater Plant Outfall 001. Prepared for the City of Bellingham. October 5, 2016.

### **Environmental Protection Agency (EPA)**

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

### **Tsivoglou, E.C., and J.R. Wallace.**

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

### **Washington State Department of Ecology.**

July 2018. [Permit Writer's Manual](https://fortress.wa.gov/ecy/publications/documents/92109.pdf). Publication Number 92-109

(<https://fortress.wa.gov/ecy/publications/documents/92109.pdf>)

September 2011. [Water Quality Program Guidance Manual – Supplemental Guidance on Implementing Tier II Antidegradation](https://fortress.wa.gov/ecy/publications/summarypages/1110073.html). Publication Number 11-10-073

(<https://fortress.wa.gov/ecy/publications/summarypages/1110073.html>)

October 2010 (revised). [Water Quality Program Guidance Manual – Procedures to Implement the State's Temperature Standards through NPDES Permits](https://fortress.wa.gov/ecy/publications/summarypages/0610100.html). Publication Number 06-10-100

(<https://fortress.wa.gov/ecy/publications/summarypages/0610100.html>)

[Laws and Regulations](http://leg.wa.gov/LawsAndAgencyRules/Pages/default.aspx) (<http://leg.wa.gov/LawsAndAgencyRules/Pages/default.aspx>)

[Permit and Wastewater Related Information](https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance) (<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance>)

Water Pollution Control Federation.  
1976. *Chlorination of Wastewater*.

**Wright, R.M., and A.J. McDonnell.**

1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

## Appendix A — Public Involvement Information

Ecology proposes to reissue a permit to Bellingham STP. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Draft Permit on November 30, 2022 in the Bellingham Herald to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft permit and fact sheet are available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Asks people to tell us how well the proposed permit would protect the receiving water.
- Invites people to suggest fairer conditions, limits, and requirements for the permit.
- Invites comments on Ecology's determination of compliance with antidegradation rules.
- Urges people to submit their comments, in writing, before the end of the comment period.
- Tells how to request a public hearing about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled [Frequently Asked Questions about Effective Public Commenting](https://fortress.wa.gov/ecy/publications/documents/0307023.pdf), which is available on our website at <https://fortress.wa.gov/ecy/publications/documents/0307023.pdf>.

You may obtain further information from Ecology by telephone, (206) 594-0167, or by writing to the address listed below.

Water Quality Permit Coordinator  
Department of Ecology  
Northwest Regional Office  
PO Box 330316  
Shoreline, WA 98133-9716

The primary author of this permit and fact sheet is Steve Hood.

## Appendix B — Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by [chapter 43.21B RCW](#) and [chapter 371-08 WAC](#). “Date of receipt” is defined in [RCW 43.21B.001\(2\)](#) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in [chapter 43.21B RCW](#) and [chapter 371-08 WAC](#).

**Table 22 Address and Location Information**

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	Department of Ecology Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	Pollution Control Hearings Board PO Box 40903 Olympia, WA 98504-0903

## Appendix C — Glossary

**1-DMax or 1-day maximum temperature** – The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

**7-DADMax or 7-day average of the daily maximum temperatures** – The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

**Acute toxicity** – The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

**AKART** – The acronym for “all known, available, and reasonable methods of prevention, control and treatment.” AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with [RCW 90.48.010](#) and [RCW 90.48.520](#), [WAC 173-200-030\(2\)\(c\)\(ii\)](#), and [WAC 173-216-110\(1\)\(a\)](#).

**Alternate point of compliance** – An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site-specific basis following an AKART analysis. An “early warning value” must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with [WAC 173-200-060\(2\)](#).

**Ambient water quality** – The existing environmental condition of the water in a receiving water body.

**Ammonia** – Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

**Annual average design flow (AADF)** – average of the daily flow volumes anticipated to occur over a calendar year.

**Average monthly (intermittent) discharge limit** – The average of the measured values obtained over a calendar months time taking into account zero discharge days.

**Average monthly discharge limit** – The average of the measured values obtained over a calendar month's time.

**Background water quality** – The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [[WAC 173-200-020\(3\)](#)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

**Best management practices (BMP)** – 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 include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

**BOD<sub>5</sub>** – Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD<sub>5</sub> is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD<sub>5</sub> is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

**Bypass** – The intentional diversion of waste streams from any portion of a treatment facility.

**Categorical pretreatment standards** – National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

**Chlorine** – A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

**Chronic toxicity** – The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

**Clean water act** (CWA) – The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

**Compliance inspection-without sampling** – A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

**Compliance inspection-with sampling** – A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition, it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

**Composite sample** – A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

**Construction activity** – Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

**Continuous monitoring** – Uninterrupted, unless otherwise noted in the permit.

**Critical condition** – The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

**Date of receipt** – This is defined in [RCW 43.21B.001\(2\)](#) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

**Detection limit** – The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

**Dilution factor (DF)** – A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

**Distribution uniformity** – The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

**Early warning value** – The concentration of a pollutant set in accordance with [WAC 173-200-070](#) that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

**Enforcement limit** – The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [[WAC 173-200-020\(11\)](#)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

**Engineering report** – A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in [WAC 173-240-060](#) or [WAC 173-240-130](#).

**Enterococci** – A subgroup of fecal streptococci that includes *S. faecalis*, *S. faecium*, *S. gallinarum*, and *S. avium*. The enterococci are differentiated from other streptococci by their ability to grow in 6.5% sodium chloride, at pH 9.6, and at 10°C and 45°C.

***E. coli*** – A bacterium in the family Enterobacteriaceae named *Escherichia coli* and is a common inhabitant of the intestinal tract of warm-blooded animals, and its presence in water samples is an indication of fecal pollution and the possible presence of enteric pathogens.

**Fecal coliform bacteria** – Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

**Grab sample** – A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

**Groundwater** – Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

**Industrial user** – A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

**Industrial wastewater** – Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated stormwater and, also, leachate from solid waste facilities.

**Interference** – A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in [40 CFR Part 501](#), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

**Local limits** – Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

**Major facility** – A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

**Maximum daily discharge limit** – The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

**Maximum day design flow (MDDF)** – The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

**Maximum month design flow (MMDF)** – The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

**Maximum week design flow (MWDF)** – The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) – See Detection Limit.

**Minor facility** – A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

**Mixing zone** – An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations ([chapter 173-201A WAC](#)).

**National pollutant discharge elimination system (NPDES)** – The NPDES ([Section 402 of the Clean Water Act](#)) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

**pH** – The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

**Pass-through** – A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

**Peak hour design flow (PHDF)** – The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

**Peak instantaneous design flow (PIDF)** – The maximum anticipated instantaneous flow.

**Point of compliance** – The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

**Potential significant industrial user (PSIU)** – A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

- a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;
- b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

**Quantitation level (QL)** – Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is

calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to  $(1, 2, \text{or } 5) \times 10^n$ , where  $n$  is an integer. (64 FR 30417).

**ALSO GIVEN AS:**

The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

**Reasonable potential** – A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

**Responsible corporate officer** – A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding \$25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures ([40 CFR 122.22](#)).

**Sample Maximum** – No sample may exceed this value.

Significant industrial user (SIU) –

- 1) All industrial users subject to Categorical Pretreatment Standards under [40 CFR 403.6](#) and [40 CFR Chapter I, Subchapter N](#) and;
- 2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority\* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with [40 CFR 403.8\(f\)\(6\)](#)].

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority\* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with [40 CFR 403.8\(f\)\(6\)](#), determine that such industrial user is not a significant industrial user.

\*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

**Slug discharge** – Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

**Soil scientist** – An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the

credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3,or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

**Solid waste** – All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

**Soluble BOD<sub>5</sub>** – Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD<sub>5</sub> test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD<sub>5</sub> test is sufficient to remove the particulate organic fraction.

**State waters** – Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

**Stormwater** – That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

**Technology-based effluent limit** – A permit limit based on the ability of a treatment method to reduce the pollutant.

**Total coliform bacteria** – A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

**Total dissolved solids** – That portion of total solids in water or wastewater that passes through a specific filter.

**Total maximum daily load (TMDL)** – A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

**Total suspended solids (TSS)** – Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

**Upset** – An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

**Water quality-based effluent limit** – A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

## Appendix D - Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the [PermitCalc workbook](https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance) on Ecology's webpage at <https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance>.

### Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The predicted concentration at the edge of a mixing zone ( $C_{mz}$ ) is based on the following calculation:

$$C_{mz} = Ca + \frac{(Ce - Ca)}{DF}$$

NA    where  
e:    Ce = Effluent Concentration

NA    NA    Ca = Ambient Concentration

NA    NA    DF = Dilution Factor

### Reasonable Potential Analysis:

The spreadsheets Input 2 – Reasonable Potential, and LimitCalc in Ecology's PermitCalc Workbook determine reasonable potential (to violate the aquatic life and human health water quality standards) and calculate effluent limits. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the **'Technical Support Document for Water Quality-based Toxics Control'**, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).



**Table D1(continued): Reasonable Potential Calculation Outfall 001**

**Reasonable Potential Calculation - Page 2**

Facility		Dilution Factors:											Acute	Chronic
Bellingham STP													47.0	65.0
Water Body Type													65.0	81.0
Pollutant, CAS No. & NPDES Application Ref. No.		11	12	13	14	15	16	17	18	19	20			
		LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	NICKEL - 7440200 9M - Dependent on hardness	PHENOL 108952 10A	SELENIUM 7782492 10M	TOLUENE 108883 25V	ZINC- 7440066 13M hardness dependent						
Effluent Data	# of Samples (n)	5	5	5	5	5	5	5						
	Coeff of Variation (Cv)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6			
	Effluent Concentration, ug/L (Max. or 95th Percentile)	0.6	0.013	2	12	1	4.6	46						
	Calculated 50th percentile Effluent Conc. (when n>10)	4.1												
Receiving Water Data	90th Percentile Conc., ug/L	0.036	0.018	0.461	0	0	0	5.87						
	Geo Mean, ug/L	0.058	5E-04	0.41	0	0	0	1.21						
Water Quality Criteria	Aquatic Life Criteria, Acute ug/L	210	1.8	74	-	230	-	30						
	Chronic ug/L	8.1	0.025	8.2	-	71	-	81						
	WQ Criteria for Protection of Human Health, ug/L	-	0.15	130	2E+05	480	410	2300						
	Metal Criteria, Acute	0.351	0.85	0.33	-	-	-	0.346						
	Translator, decimal	0.351	-	0.33	-	-	-	0.346						
	Carcinogen?	N	N	N	N	N	N	N						
Aquatic Life Reasonable Potential														
Effluent percentile value		0.350	0.350	0.350		0.350		0.350						
$s^2=\ln(CV^2+1)$		0.555	0.555	0.555		0.555		0.555						
$P_n=(1-\text{confidence level})^{1/n}$		0.543	0.543	0.543		0.543		0.543						
Multiplier		2.32	2.32	2.32		2.32		2.32						
Max concentration (ug/L) at edge of...		0.122	0.018	0.543		0.043		7.837						
Chronic		0.115	0.018	0.525		0.036		7.336						
Reasonable Potential? Limit Required?		NO	NO	NO		NO		NO						
Aquatic Life Limit Calculation														
# of Compliance Samples Expected per month														
LTA Coeff. Var. (CV), decimal														
Permit Limit Coeff. Var. (CV), decimal														
Waste Load Allocations, ug/L		Acute												
Long Term Averages, ug/L		Acute												
		Chronic												
Limiting LTA, ug/L														
Metal Translator or 1?														
Average Monthly Limit (AML), ug/L														
Maximum Daily Limit (MDL), ug/L														
Human Health Reasonable Potential														
$s^2=\ln(CV^2+1)$		0.555	0.5545	0.555	0.5545	0.5545	0.5545							
$P_n=(1-\text{confidence level})^{1/n}$		0.543	0.543	0.543	0.543	0.543	0.543							
Multiplier		0.934	0.9336	0.934	0.9336	0.9336	0.9336							
Dilution Factor		81	81	81	81	81	81							
Max Conc. at edge of Chronic Zone, ug/L		6E-04	0.428	0.138	0.0115	5.1E-02	1.7E+00							
Reasonable Potential? Limit Required?		NO	NO	NO	NO	NO	NO							

**Table D2: Reasonable Potential Calculation Outfall 002****Reasonable Potential Calculation**

Facility	Bellingham STP	Acute	Chronic
Water Body Type	Marine	4.7	14.7
		Human Health Carcinogenic	14.7
		Human Health Non-Carcinogenic	14.7

		6	7	8	9	10
<b>Pollutant, CAS No. &amp; NPDES Application Ref. No.</b>		CHLORINE (Total Residual) 7782505				
<b>Effluent Data</b>	# of Samples (n)	2438	1	5	5	5
	Coeff of Variation (Cv)	0.57	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)	30	0.069	9	15	1.4
	Calculated 50th percentile Effluent Conc. (when n>10)					
<b>Receiving Water Data</b>	90th Percentile Conc., ug/L	0	0	0	0	0
	Geo Mean, ug/L	0			0	0
<b>Water Quality Criteria</b>	Aquatic Life Criteria, Acute ug/L	13				
	Chronic	7.5				
	WQ Criteria for Protection of Human Health, ug/L					
	Metal Criteria, Acute					
	Translator, decimal					
	Carcinogen?	N				

**Aquatic Life Reasonable Potential**

Effluent percentile value		0.950
$s^2 = \ln(CV^2 + 1)$		0.530
$P_n = (1 - \text{confidence level})^{1/n}$		0.999
Multiplier		1.00
Max concentration (ug/L) at edge of...	Acute	6.383
	Chronic	2.041
<b>Reasonable Potential? Limit Required?</b>		<b>NO</b>

**Aquatic Life Limit Calculation**

# of Compliance Samples Expected per month		
LTA Coeff. Var. (CV), decimal		
Permit Limit Coeff. Var. (CV), decimal		
Waste Load Allocations, ug/L	Acute	
	Chronic	
Long Term Averages, ug/L	Acute	
	Chronic	
Limiting LTA, ug/L		
Metal Translator or 1?		
<b>Average Monthly Limit (AML), ug/L</b>		
<b>Maximum Daily Limit (MDL), ug/L</b>		

**Human Health Reasonable Potential**

$s^2 = \ln(CV^2 + 1)$		
$P_n = (1 - \text{confidence level})^{1/n}$		
Multiplier		
Dilution Factor		
Max Conc. at edge of Chronic Zone, ug/L		
<b>Reasonable Potential? Limit Required?</b>		

**Table D3: Calculation of Fecal Coliform at Chronic Mixing Zone Outfall 001**

**Calculation of Fecal Coliform at Chronic Mixing Zone**

INPUT	
Chronic Dilution Factor	65.0
Receiving Water Fecal Coliform, #/100 ml	7
Effluent Fecal Coliform - worst case, #/100 ml	22
Surface Water Criteria, #/100 ml	14
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	7
Difference between mixed and ambient, #/100 ml	0

Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for fecal coliform.

**Table D4: Calculation of Fecal Coliform at Chronic Mixing Zone Outfall 002**

**Calculation of Fecal Coliform at Chronic Mixing Zone**

INPUT	
Chronic Dilution Factor	14.7
Receiving Water Fecal Coliform, #/100 ml	7
Effluent Fecal Coliform - worst case, #/100 ml	22
Surface Water Criteria, #/100 ml	14
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	8
Difference between mixed and ambient, #/100 ml	1

Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for fecal coliform.

**Table D5: Calculation of Temperature at Chronic Mixing Zone Outfall 001**

**Marine Temperature Reasonable Potential and Limit Calculation**

Based on WAC 173-201A-200(1)(c)(i)–(ii) and Water Quality Program Guidance. All Data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at:  
<http://www.ecy.wa.gov/biblio/0610100.html>

INPUT	May-Sep	Oct-Apr
1. Chronic Dilution Factor at Mixing Zone Boundary	65.0	65.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	15.0 °C	10.6 °C
3. 1DADMax Effluent Temperature (95th percentile)	24.1 °C	20.8 °C
4. Aquatic Life Temperature WQ Criterion	16.0 °C	16.0 °C
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	15.14 °C	10.76 °C
6. Incremental Temperature Increase or decrease:	0.14 °C	0.16 °C
7. Incremental Temperature Increase $12/(T-2)$ if $T \leq$ crit:	0.92 °C	1.40 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	15.92 °C	12.00 °C
<b>A. If ambient temp is warmer than WQ criterion</b>		
9. Does temp fall within this warmer temp range?	NO	NO
10. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>B. If ambient temp is cooler than WQ criterion but within <math>12/(T_{amb}-2)</math> and within 0.3 °C of the criterion</b>		
11. Does temp fall within this incremental temp. range?	NO	NO
12. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>C. If ambient temp is cooler than (WQ criterion-0.3) but within <math>12/(T_{amb}-2)</math> of the criterion</b>		
13. Does temp fall within this Incremental temp. range?	NO	NO
14. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>D. If ambient temp is cooler than (WQ criterion - <math>12/(T_{amb}-2)</math>)</b>		
15. Does temp fall within this Incremental temp. range?	YES	YES
16. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	NO LIMIT
RESULTS		
17. Do any of the above cells show a temp increase?	NO	NO
18. Temperature Limit if Required?	NO LIMIT	NO LIMIT

**Table D6: Calculation of Temperature at Chronic Mixing Zone Outfall 002**

**Marine Temperature Reasonable Potential and Limit Calculation**

Based on WAC 173-201A-200(1)(c)(i)–(ii) and Water Quality Program Guidance. All Data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at:  
<http://www.ecy.wa.gov/biblio/0610100.html>

INPUT	May-Sep	Oct-Apr
1. Chronic Dilution Factor at Mixing Zone Boundary	65.0	65.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	15.0 °C	10.6 °C
3. 1DADMax Effluent Temperature (95th percentile)	24.1 °C	20.8 °C
4. Aquatic Life Temperature WQ Criterion	16.0 °C	16.0 °C
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	15.14 °C	10.76 °C
6. Incremental Temperature Increase or decrease:	0.14 °C	0.16 °C
7. Incremental Temperature Increase $12/(T-2)$ if $T \leq$ crit:	0.92 °C	1.40 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	15.92 °C	12.00 °C
<b>A. If ambient temp is warmer than WQ criterion</b>		
9. Does temp fall within this warmer temp range?	NO	NO
10. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>B. If ambient temp is cooler than WQ criterion but within <math>12/(T_{amb}-2)</math> and within 0.3 °C of the criterion</b>		
11. Does temp fall within this incremental temp. range?	NO	NO
12. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>C. If ambient temp is cooler than (WQ criterion-0.3) but within <math>12/(T_{amb}-2)</math> of the criterion</b>		
13. Does temp fall within this Incremental temp. range?	NO	NO
14. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>D. If ambient temp is cooler than (WQ criterion - <math>12/(T_{amb}-2)</math>)</b>		
15. Does temp fall within this Incremental temp. range?	YES	YES
16. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	NO LIMIT
RESULTS		
17. Do any of the above cells show a temp increase?	NO	NO
18. Temperature Limit if Required?	NO LIMIT	NO LIMIT

**Table D7: Marine Un-ionized Ammonia Criteria Calculation**

**Marine Un-ionized Ammonia Criteria Calculation**

Calculation of seawater fraction of un-ionized ammonia from Hampson (1977). Un-ionized ammonia criteria for salt water are from EPA 440/5-88-004. Revised 19-Oct-

INPUT	
1. Receiving Water Temperature, deg C (90th percentile):	13.0
2. Receiving Water pH, (90th percentile):	8.2
3. Receiving Water Salinity, g/kg (10th percentile):	27.3
4. Pressure, atm (EPA criteria assumes 1 atm):	1.0
5. Unionized ammonia criteria (mg un-ionized NH <sub>3</sub> per liter) from EPA 440/5-88-004:	
Acute:	0.233
Chronic:	0.035
OUTPUT	
Using mixed temp and pH at mixing zone boundaries?	No
1. Molal Ionic Strength (not valid if >0.85):	0.560
2. pKa8 at 25 deg C (Whitfield model "B"):	9.310
3. Percent of Total Ammonia Present as Unionized:	3.1%
4. Total Ammonia Criteria (mg/L as NH <sub>3</sub> ):	
Acute:	7.50
Chronic:	1.13
RESULTS	
Total Ammonia Criteria (mg/L as N)	
Acute:	6.17
Chronic:	0.93

**Table D8 WET Test Results Summary for Bellingham STP (WA0023744)**

Scheduled	Duration	Organism	Endpoint	NOEC	LOEC	Effluent Survival (100%)	Met Performance Standard?
2014 July	Acute	Mysis bahia Shrimp	48-Hour Survival	100%	>100%	80.0%	Yes
2015 January	Acute	Atherinops affinis Topsmelt	96-Hour Survival	100%	>100%	100.0%	Yes
2015 July	Acute	Mysis bahia Shrimp	48-Hour Survival	50%	100%	65.0%	Yes
2016 January	Acute	Atherinops affinis Topsmelt	96-Hour Survival	100%	>100%	90.0%	Yes
2016 July	Acute	Mysis bahia Shrimp	48-Hour Survival	50%	100%	60.0%	No*
2017 January	Acute	Atherinops affinis Topsmelt	96-Hour Survival	100%	>100%	85.0%	Yes
2017 July	Acute	Mysis bahia Shrimp	48-Hour Survival	100%	>100%	92.5%	Yes

Scheduled	Duration	Organism	Endpoint	NOEC	LOEC	Effluent Survival (100%)	Met Performance Standard?
2017 November	Chronic	Atherinops affinis Topsmelt	7 Day Survival 7 Day Biomass 7 Day Weight	50% 27% 50%	100% 50% >50%	N/A	Yes
2017 November	Chronic	Mysis bahia Shrimp	7 Day Survival 7 Day Biomass 7 Day Weight	50% 6.25% 50%	100% 27% >50%	N/A	Yes
2018 January	Acute	Atherinops affinis Topsmelt	96-Hour Survival	100%	>100%	95.0%	Yes
2018 May	Acute	Mysis bahia Shrimp	48-Hour Survival	100%	>100%	90.0%	Yes
2018 May	Chronic	Atherinops affinis Topsmelt	7 Day Survival 7 Day Biomass 7 Day Weight	27% 27% 27%	50% 50% 50%	N/A	Yes
2018 May	Acute	Atherinops affinis Topsmelt	96-Hour Survival	100%	>100%	95.0%	Yes
2018 May	Chronic	Mysis bahia Shrimp	7 Day Survival 7 Day Biomass 7 Day Weight	50% 6.25% 6.25%	100% 27% 27%	N/A	Yes

Scheduled	Duration	Organism	Endpoint	NOEC	LOEC	Effluent Survival (100%)	Met Performance Standard?
2018 July	Acute	Mysis bahia Shrimp	48-Hour Survival	50%	100%	42.5%	No*
2018 July	Acute	Atherinops affinis Topsmelt	96-Hour Survival	100%	>100%	90.0%	Yes
2019 July	Acute	Mysis bahia Shrimp	48-Hour Survival	100%	>100%	87.5%	Yes

\*The acute test result showed less than 65% survival in 100% effluent. An acute WET limit is needed if the testing was for effluent characterization (WAC 173-205-050(2)(a)(ii)) or compliance monitoring (WAC 173-205-120(1)(a)). Another effluent characterization for acute WET (WAC 173-205-060(3)(a)) is needed if the testing was an end of permit term check (WAC 173-205-030(8)). Note: This does not necessarily mean that the asterisked test was out of compliance with the effluent limits set forth in the permit.

**Table D9 - Discharge Ranking system for WET sample frequency**

Discharge Ranking System	Description
A. Toxicity Likelihood	NA
A.1. 5	Uses, stores, produces as a product or waste, or transfers hazardous substances listed in 40 CFR 302.4 with a statutory code of 1 or 2 with adequate Best Management Practices (adequate secondary containment, good housekeeping, good employee training, thorough self-inspection, sufficient emergency planning and spill control equipment, etc.)
A.2. 20	Uses, stores, produces as a product or waste, or transfers hazardous substances listed in 40 CFR 302.4 with a statutory code of 1 or 2 with inadequate Best Management Practices (no or undersized secondary containment, poor house-keeping, little employee training, poor self-inspection, little emergency planning, insufficient spill control equipment, history of spills which have reached receiving water, etc.)
A.3. 15	Discharges in the effluent any toxic pollutant listed in Appendix D of 40 CFR Part 122
A.4. 15	Discharger belongs in an industry category identified in 40 CFR Part 122, Appendix A
A.5. 15	Discharger is a municipal facility which receives a discharge from any industry category identified in 40 CFR, Parts 405-471, unless the municipality has an adequate pretreatment program which establishes and enforces local limits
<b>A.6. 10</b>	Any facility with toxicity detected during past acute toxicity testing based on less than 80% survival in 100% effluent
A.7. 15	Any facility with known or suspected receiving water impacts
<b>10</b>	Total Part A

Discharge Ranking System	Description
B. Potential for impact	NA
B.1. Average Annual Discharge Flow Volume	NA
B.1.a. 5	Flow < 0.5 mgd
<b>B.1.b. 10</b>	Flow 0.5 mgd to 12.5 mgd
B.1.c. 15	Flow 12.5 mgd to 25 mgd
B.1.d. 20	Flow 25 mgd to 37.5 mgd
B.1.e. 25	Flow 37.5 mgd to 50 mgd
B.1.f. 30	Flow > 50 mgd
B2. Chronic Critical Effluent Concentration at edge fo Mixing Zone	NA
B.2.a. 1	CCEC < 0.1% effluent
<b>B.2.b. 5</b>	CCEC = 0.1% effluent to 2% effluent
B.2.c. 10	CCEC = 2% effluent to 4% effluent
B.2.d. 15	CCEC = 4% effluent to 6% effluent
B.2.e. 20	CCEC = 6% effluent to 8% effluent
B.2.f. 25	CCEC = 8% effluent to 10% effluent
B.2.g. 30	CCEC > 10% effluent
<b>15</b>	Total Part B
=====	=====
<b>150</b>	Part A times Part B

Discharge Ranking System	Description
<b>Rank 4</b>	Continue twice a year sampling. This decision was made in consultation between permit writer and Ecology's WET coordinator

Heavy box outline and bold text indicate selections and subtotals. Indented titles are not selected.

## Appendix E — Response to Comments

Ecology received comments during the public comment period from the City of Bellingham Public Works Department via letter dated December 19, 2022. The following table summarizes the comments and Ecology's responses. A copy of the complete comment letter is also included following the table.

Num	COB comment	Ecology Response
1	Permit: First submittal for S3.4 not amenable	Adjusted date based on permit effective date of March 1, 2023
2	Permit: Incorrect coordinates for OF 002	Updated table 3 and figure 4
3 and 4	Permit: Formatting errors on page 7 of 54	Formatting corrected
5	Permit: Dilution factors for OF 002 not based on field data	Ecology based DF on data from Engineering report prepared before OF 002 upgrade. If Ecology receives new data, new dilution factors may be calculated and placed in future permits.
6	Permit: Table 6 BOD requirements in conflict with Fact Sheet	Fact Sheet Corrected
7	Permit: Suggested alternative to monitor if main measurement is incapacitated of composites	Ecology amended footnote to allow alternatives with notification if calibrated and made 3 grabs a minimum.
8	Permit: Questioned capacity of SAW to accept documents > 1MB	The Water Quality Portal can accept files up to at least 15MB in size. If size is exceeded, or if the city has difficulty uploading a file, Ecology will work with the city for alternative submittal options.
9	Permit: Related to #1	Same as #1
10	Permit: item 5 is the same as item 3	Item 5 removed
11	Permit: formatting in Appendix A	Formatting adjusted

12	Fact Sheet: discrepancy of coordinates of 001 and 002	Permit adjusted to FS values and 002 updated to data provided by COB
13	Fact Sheet: Clarify duration of Averaging period	Annual Average added
14	Fact Sheet: Encogen should be mentioned in table 4	Encogen listed as PSE Encogen on page 2.
15	Fact Sheet: Sample count does not match duration	Data downloaded data anew and recalculated. Count now matches and small changes made summary statistics
16	Fact Sheet: No explanation on why DF for 2035 used instead of 2035, and error converting to % of flow of ACEC	Explanation for conservative choice added, and ACEC corrected
17	Fact Sheet: New accreditation for Nitrate + Nitrite identified	Added to table 21

Public Works Department  
City of Bellingham



Mr. Steve Hood  
c/o Department of Ecology  
913 Squalicum Way #101  
Bellingham, WA 98225  
[steve.hood@ec.wa.gov](mailto:steve.hood@ec.wa.gov)

December 19, 2022

RE: Permittee Comments Draft NPDES WA 0023744

Dear Mr. Hood-

We appreciate the Department of Ecology provided public notice period to review and provide comments on the final draft permit and fact sheet for NPDES WA 0023744. Our comments follow. Please let me know if you need any additional information or clarification.

**Comments draft NPDES Permit #WA 0023744**

Page 4 of 54

The First Submittal date for S3.A for Quarterly Frequency of April 15, 2023 is not amenable to an assumed March 15, 2023 start date. Can this please be changed to July?

#1 - Adjusted

Page 6 of 54

Table 3 Outfall 002 coordinates are the coordinates for outfall 001. This should read: 48.7203 -122.5183

#2 - correction

Page 7 of 54

'Mixing Zone for Outfall 002' should be formatted for space between the table above, The '2' set to bold, and set as a header for the following sentence.

#3- format

Acute mixing zone should be in bold.

#4- format

The Table 5 dilution factors for Outfall 002 were derived with no actual information on critical receiving water characteristics, site ambient field data, dilution modeling, or tracer studies. If outfall 002 was assessed in a future mixing zone study, would the 3.7 acute and 14.7 chronic values be allowed to change to represent more accurate values even if they were lower than those presented here?

#5 - question

Table 6

The Fact Sheet (page 1) indicates that BOD will only apply for the first year. It would make sense to include this in the footnote "a".

#6 - FS error corr

**Engineering**  
104 W. Magnolia Street, Suite 109  
Bellingham, WA 98225  
Phone: (360) 778-7900  
Fax: (360) 778-7901  
TTY: (360) 778-8382  
Email: [pw@cob.org](mailto:pw@cob.org)

**Natural Resources**  
104 W. Magnolia Street, Suite 109  
Bellingham, WA 98225  
Phone: (360) 778-7800  
Fax: (360) 778-7801  
Email: [pw@cob.org](mailto:pw@cob.org)

**Operations**  
2221 Pacific Street  
Bellingham, WA 98229  
Phone: (360) 778-7700  
Fax: (360) 778-7701  
Email: [pw@cob.org](mailto:pw@cob.org)

Fact Sheet for NPDES Permit WA0023744  
Bellingham Sewage Treatment Plant Treatment Plant  
Page 69 of 70

Page 8 of 54

Table 7 Flow has a footnote of "c" which includes the final sentence that "The permittee must sample #7 - alternate every six hours when continuous monitoring is not possible." This would be problematic for flow -- if our primary flow monitoring system (Parshall flume on the final effluent channel) failed to communicate to SCADA, Bellingham would prefer to utilize a different stand-alone flow monitoring system that exists, either the submerged ultrasonic sensor in a 60" pipe at the chlorine contact basin, or the flow monitoring sensors in the headworks at the Post Point Wastewater Treatment plant.

Page 14 of 54

Will SAW have sufficient ability to allow for a > 1 MB upload of the electronic data request in item 3? #8 - question

S3 A. b. The First Submittal date for S3.A for Quarterly Frequency of April 15, 2023 is not amenable to an assumed March 15, 2023 start date. Can this please be changed to July? (see first comment).

#9 - adjust

Page 26 of 54

Items 3. and 5. are redundant.

#10 - remove duplicate 5

Page 47 of 54

Appendix A

There appears to be a typo in the headers of tables pages 47-53. I believe the "1"s and "2"s in the headers were intended to be superscript that reference the footnotes on page 54. You can see evidence of this in the first sentence on pg. 46, the header of Table 1 on pg. 46, and the footnotes on pg. 54

#11 - formatting correction made

#### Comments Fact Sheet for NPDES Permit #WA0023744

Page 4 of 70

The coordinates for outfalls 001 and 002 listed here are different than those indicated in the NPDES permit. We should probably sync those up!

#12 - Accept FS for 001  
accept COB for 002

Page 8 of 70

Table 4 should indicate these are averages per event.

#13 - added "Annual Averages"

The power plant (Encogen) should probably be mentioned along with the other significant industrial dischargers.

#14 - PSE Engogen on second page  
of table organized alphabetically

Page 13 of 70

Table 7 and Table 8

If data from 1/1/14 to 12/31/19 were used for averages, the # of samples cannot be right—this must be months of data used?

#15 - Data for period downloaded again. More samples  
present and small changes in mean

Page 34 of 70

There appears to be no mention that the more conservative use of the mixing zone established for 2035 vs. the one representing 2025 projections. Also, the ACEC using the 2035 projections is 2.1% not the 3% indicated at the bottom of page 34.

Water Quality Criteria Discharge Conditions	Dilution Factors at AZB (27.6 feet)	Dilution Factors at RMZ (276 feet)
	2015 / 2025 / 2035	2015 / 2025 / 2035
Acute Criteria	52 / 49 / 47	
Chronic Criteria		89 / 73 / 65
Human Health- Carcinogen		107 / 91 / 81
Human Health Non-Carc.		89 / 73 / 65

Page 38 of 70

#17 - added to table

The lab recently also received provisional accreditation (pending inspection) for Nitrate+Nitrite via SM 4500-NO3<sup>-</sup> F-2011.

Once again, thank you for the opportunity to submit comments on the revised NPDES permit WA0023744. If you would prefer to receive this communication via the USPS, please let me know and I'll mail you a hard copy of these comments.

Sincerely,



Steve Bradshaw  
Superintendent of Plants  
City of Bellingham Operations Division