Fact Sheet for NPDES Permit WA0023183

City of Cashmere

April 15, 2020

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 Cashmere publicly-owned treatment works (POTW).

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 Cashmere POTW, NPDES permit WA0023183, are available for public review and comment from March 11, 2020 until April 11, 2020. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

The City of Cashmere 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 will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as **Appendix E** - **Response to Comments**, and publish 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 Cashmere is primarily an agriculture community located in Chelan County, approximately 8.5 river miles northwest of confluence of the Wenatchee and Columbia River. The community was incorporated in 1904, and has experienced relatively slow growth. The current population is approximately 3,153 as of 2017. The City is located at a bend in the Wenatchee River, with most of the City situated south and west of the river. The predominant industries are fruit producing, packing, and processing.

The Cashmere POTW discharges treated wastewater to the Wenatchee River.

In June 2007, Ecology issued the *Wenatchee River Watershed Temperature TMDL Report* that documented temperature impairments in the Wenatchee River. The existing and proposed permit contains the approved wasteload allocation (WLA) for effluent temperature.

In August 2009 Ecology issued the *Wenatchee River Watershed Dissolved Oxygen and pH TMDL Report* (TMDL Report) that documented DO and pH impairments. A water quality-based total phosphorus WLA was established which is incorporated into the proposed permit.

The Cashmere POTW lagoon treatment facility lacked current mechanical and technological abilities to efficiently remove pollutants, namely phosphorus. In 2014, the Cashmere POTW finished a substantial facilities upgrade. The Cashmere POTW is fully operational and now capable of removing phosphorus from its discharge.

The proposed permit contains effluent limits for 5-day biochemical oxygen demand ($BOD_{5)}$, total suspended solids (TSS), pH, and fecal coliform. In addition, temperature and total phosphorus effluent limits are included to address the water quality impairments and TMDL requirements. The proposed permit also contains the revised design criteria resulting from the treatment upgrades in 2014.

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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)

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

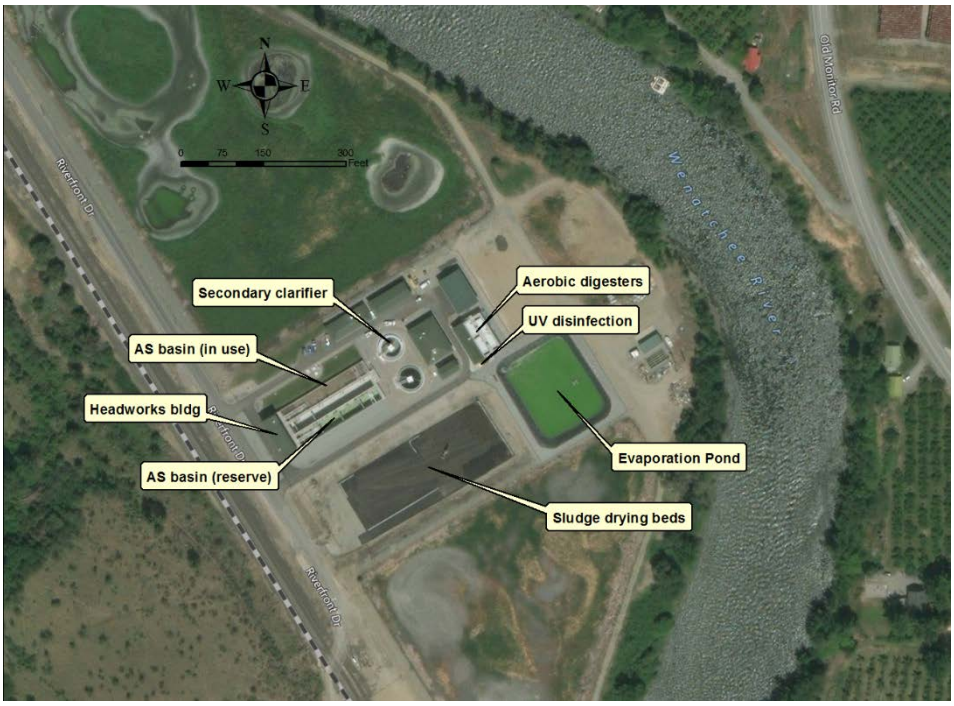
Table 1 General Facility Information

Facility Information	
Applicant	City of Cashmere
Facility Name and Address	City of Cashmere POTW 2 Riverfront Drive Cashmere, WA 98815
Contact at Facility	Name: Bruce Germain Telephone #: 509-782-3513
Responsible Official	Name: Jim Fletcher Title: Mayor Address: 101 Woodring Street Cashmere, WA 98815 Telephone #: 509-782-3513
Type of Treatment	Enhanced Biological Phosphorous Removal: Modified Bardenpho Activated Sludge, UV Disinfection
Facility Location (NAD83/WGS84 reference datum)	Latitude: 47.51063 Longitude: -120.45059
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Wenatchee River Latitude: 47.51056 Longitude: -120.44765

Permit Status	
Issuance Date of Previous Permit	October 21, 2010
Application for Permit Renewal Submittal Date	November 25, 2014
Date of Ecology Acceptance of Application	July 17, 2015

Inspection Status	
Date of Last Non-sampling Inspection Date	March 27, 2019

Figure 1 Facility Location Map



A. Facility description

History

Prior to 2014, the City of Cashmere's POTW consisted of three stabilization ponds that discharged (after chlorine disinfection) to the Wenatchee River downstream of the city. Historically, the stabilization ponds were required to meet less stringent BOD_5 and TSS removal rates than an activated sludge treatment process. Because of seasonal problems with algal blooms and the resultant high pH (>9) in the POTW effluent, the city installed baffles' and a cover. The city also added hydrochloric acid to the POTW effluent in order to comply with the pH limits of the previous NPDES permit.

Also in 2014, a Bulk Volume Fermenter that pretreated fruit processing wastewater from Tree Top, Inc. prior to discharge into the ponds was de-commissioned.

The *Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load- Water Quality Improvement Report* (Publication #08-10-062) was approved by EPA in August 2009. In that report, the nutrient phosphorus was identified as the

limiting factor in the Wenatchee River for aquatic plant growth. Too much phosphorus in the river, results in excessive algae and plant growth, causing large swings in pH and dissolved oxygen concentrations. The TMDL's goal is to control the amount of phosphorus into the Wenatchee River and improve water quality due to low dissolved oxygen (DO) and pH.

Ecology required three local municipalities, including Cashmere, to significantly reduce their discharge of phosphorus to the river. This mandate resulted in the need to design and construct new a treatment plant, or upgrade the existing a treatment plant to utilize advanced wastewater treatment processes.

Cashmere's 2005 NPDES permit contained a Compliance Schedule to address Wenatchee River water quality impairments. In 2010, Ecology re-authorized the 2005 NPDES permit, rather than re-writing a new permit because the city needed time to determine how it would deal with the future stringent total phosphorus effluent limits, detailed in the TMDL. The City determined that it would need a completely new treatment plant.

During the period from 2012 into 2014, the City of Cashmere constructed a new activated sludge POTW. The treatment plant utilizes Enhanced Biological Phosphorus Removal (EBPR), with modified a Bardenpho configuration to remove phosphorus. The new POTW became fully operational on September 17, 2014. The new POTW does not (as of 2019) include tertiary treatment for removing phosphorus. With additional USDA grant funding remaining from the POTW project, the City piloted and purchased a tertiary filter and constructed a building to house the equipment. The City has pursued grant funding to complete the remaining work to install the tertiary system including a lift station, piping, chemical dosing equipment, and electrical and control components. The effluent outfall structure and its location remains the same.

Collection system status

Cashmere's sanitary sewer collection system is separate from the stormwater collection system. Cashmere has a separate municipal stormwater permit.

The basic sanitary sewer collection system consists of 15.5 miles of sewers and three lift stations. The "City" lift station pumps raw wastewater from the collection system to the POTW headworks through either an 8-inch or 12-inch force main. In 1999, the city annexed 96 acres to the west and in 2000 constructed the West Cashmere Lift Station along with an additional 4.5 miles of sanitary sewer.

In 2000, the city also completed a series of improvements that separated a majority of the stormwater connections from the sanitary sewer collection system. Some building roof drains in the older portions of the downtown are still connected to the sewer system.

Treatment processes

In 2009, RH2 Engineering, Inc. (RH2) submitted a *General Sewer Plan and Wastewater Facilities Plan.* The purpose of the plan was to evaluate the wastewater treatment alternatives to meet future surface water discharge permit requirements. The City's previous wastewater treatment facility consisted of sewage treatment lagoons. The 2009 Facilities Plan recommended enhanced biological phosphorus removal (EBPR) activated sludge treatment to meet the phosphorus waste load allocation set forth in the *Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load Water Quality Improvement Report* published in April 2009. The newly constructed treatment facility became fully operational on September 17, 2014 without tertiary treatment. Tertiary treatment may be needed at Cashmere to reliably remove phosphorus to WLA stipulated concentrations.

On May 4, 2015, Ecology received a *2009 General Sewer Plan and Wastewater Facilities Plan Amendment Phosphorus Removal* document (RH2 Engineering, Sept. 2014). Ecology approved the amendment on May 8, 2015. The 2009 Facilities Plan did not provide an alternative analysis or recommendations for the tertiary treatment system. The purpose of the amendment provides the design criteria, alternative analysis, preliminary costs, and recommends an alternative for tertiary treatment. The approved document recommends that a tertiary treatment system would be necessary to further reduce the phosphorus concentration to comply with the Wenatchee River TMDL. The facilities plan amendment concluded, the Aqua-Aerobic AquaDisk cloth media filtration was the preferred alternative for tertiary treatment. Funds remaining from the construction of the new EBPR treatment facility allowed the City of Cashmere to purchase one AquaAerobic AquaDisk unit and construct a tertiary process building. The amendment also states, "The City will complete the procurement, construction, and startup of the Phase I phosphorus removal system in 2017 and 2018 in order to be in compliance with the total maximum daily load (TMDL) by 2020." However, the AquaDisk that was purchased has not been integrated for tertiary treatment at the Cashmere POTW. The City has stated it is pursing grant funding to install the remaining components because additional rate increases are not palatable to the City Council or the citizens. The tertiary treatment is designed not to exceed 0.64 kg/day based on a seasonal average (March – May and July – October) and not to exceed 1.1 kg/day based on a monthly average.

Ecology rates the Cashmere POTW as a Class III wastewater treatment facility. Therefore, the 'operator-in-charge' must be certified by the State of Washington as a Group III operator, or higher. The facility employs three certified operators and operates 24 hours a day, 7 days a week.

In general, treatment begins as wastewater enters the POTW's headworks, which meters, samples, and screens the raw wastewater. The headworks is equipped with a refrigerated automatic composite sampler that samples on a frequency based on flow received by the influent flow meter. The combined influent from the two collection system force mains is screened with two (one per channel) online mechanical fine screens. The screens remove rags, plastics, and other inert material before the influent enters the grit unit. The grit unit settles out the heavy inert solids and grit. Following the headworks, the flow is split prior to entering the two activated sludge basins (one in reserve for future demand).

The Cashmere POTW is designed to accomplish EBPR. The Cashmere POTW's wastewater treatment facility is similar to a Modified Bardenpho configuration. The design stimulates the growth of phosphate accumulating organisms (PAOs).

The treatment facility has two identical activated sludge basins, each with the capacity to treat 1.3 million gallons per day (MGD) of influent. The activated sludge basins are compartmentalized into one anaerobic, three anoxic, and three aerobic zones (or cells). An initial anaerobic (AN) zone is required as the first stage of the Bardenpho process, where oxygen and nitrate are excluded. The presence of either or both of these compounds will deplete the amount of volatile fatty acids available to PAOs. The anaerobic zone effluent then passes through an anoxic zone, where conditions allow the reduction of nitrate (denitrification) by heterotrophic bacteria using readily available BOD as a substrate. PAOs also tend to take up phosphorus and store it internally as polyphosphates in the anoxic and aerobic zones. The third zone of the process is called the swing zone. It can be operated as either anoxic or aerobic depending on how the previous zones have accomplished the removal of BOD and phosphate. The swing zone is normally operated as anoxic to allow for continued removal of nitrate and uptake of phosphorus under anoxic conditions. However, in times of high BOD loading, the swing zone can be operated in an aerobic mode to accommodate these higher loading conditions.

The mixed liquor effluent from the activated sludge basins enters the clarifier flow splitter structure by gravity. The flow enters to one of two circular secondary clarifiers, which separate out biological solids to be used as either waste activated sludge (WAS) or return activated sludge (RAS). The clarified effluent is disinfected

using ultra violet (UV) light and discharged to the outfall located in the Wenatchee River.

Solid wastes/residual solids

The Cashmere POTW removes solids during wastewater treatment at the headworks (grit and screenings). Solids removed at headworks are disposed of as solid waste at the local landfill. Surface wasting apparatus, at the end of the aerobic zone of each basin, convey mixed liquor to a dissolved air floatation (DAF) unit. The DAF unit thickens waste activated sludge prior to entering the aerobic digesters. An Aeromod belt filter press (BFP) dewaters sludge from the aerobic digesters. The BFP increases the solids content of the sludge producing a cake in the range of 16 to 18 percent solids. The biosolids from the BFP are transferred to a dump truck, processed further on the adjacent drying beds and ultimately hauled away for beneficial use/disposal. The filtrate from the BFP is sent to the evaporation pond and any overflow is recycled back into the treatment process at the headworks.

Discharge outfall

The treated and disinfected effluent from the Cashmere POTW is discharged into the Wenatchee River via an 8 inch diameter pipe through a 30-foot long perforated High-density polyethylene (HDPE) diffuser, which is located at Latitude: 47.51056, Longitude: -120.44765. The diffuser is anchored to the river bottom approximately 5-feet below the water surface, and laying perpendicular to the river flow. The perforations are 1-inch and 2-inch diameter holes spaced at 6-inch and 12-inch intervals on centers, respectively.

B. Description of the receiving water

The Cashmere POTW discharges to the Wenatchee River at river mile 8.6. There are no known nearby point source outfalls or significant non-point sources of pollutants. There are no known nearby drinking water intakes. Table 2 below presents the ambient background data used for this permit. Stream flow data is from the long-term USGS Peshastin gage (12459000). Ecology used Peshastin gage stream flow data from January 1, 1997 through December 31, 2018 for calculating the 7Q10 flow rate listed below. Ambient critical season (March-May and July-October) water quality data was obtained from Ecology's Environmental Information Management (EIM) database (45A070, 45A110).

Table 2 Ambient Background Data

Parameter	Value Used
Flow (7Q10)	329 cubic feet second
Width	200 feet
Velocity	0.4 feet/sec
Depth	4.1 feet
Roughness (Manning "n")	0.035
Temperature (90th percentile)	20.1 °C
pH (95th percentile)	8.8 standard units
Total Phosphorus (90th percentile)	16.2 µg/L
Dissolved Oxygen (10th percentile)	9.6 mg/L
Total Ammonia-N (90th percentile)	0.01 mg/L
Fecal Coliform (10th percentile)	1.0 cfu/100ml

C. Wastewater influent characterization

The Cashmere POTW reported the concentration of influent pollutants in discharge monitoring reports. The tabulated data below represents quality of the influent wastewater from January 1, 2016 to December 31, 2018. The influent wastewater is characterized as follows:

Table 3 Wastewater Influent Characterization

Parameter	Units	# of Samples	Average Value	Maximum Value
Flow	MGD	1096	0.367	0.720
Biochemical Oxygen Demand (BOD_5)	mg/L	159	434.4	1110.0
Biochemical Oxygen Demand (BOD_5)	lbs/day	159	1348.3	2892.0

Parameter	Units	# of Samples	Average Value	Maximum Value
Total Suspended Solids (TSS)	mg/L	429	121.3	340.0
Total Suspended Solids (TSS)	lbs/day	424	365.7	965.7

D. Wastewater effluent characterization

The Cashmere POTW reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The tabulated data represents the worst-case (95th percentile) of the wastewater effluent discharged from January 1, 2016 to December 31, 2018, during both the critical season months (Mar-May & Jul-Oct) and non-critical months (Nov-Feb & May-Jun). The wastewater effluent is characterized as follows:

Table 4 Wastewater Effluent Characterization

Parameter	Units	# of Samples	95th Percentile (Mar-May & Jul-Oct)	# of Samples	95th Percentile (Nov-Feb & Jun)
Flow	MGD	645	0.497	451	0.464
BOD_5	mg/L	93	4.0	66	9.3
BOD_5	lbs/day	93	15.0	66	32.0
TSS	mg/L	260	9.1	169	9.0
TSS	lbs/day	260	30.0	169	28.6
Ammonia	mg/L	92	11.5	65	11.28
Ammonia	lbs/day	92	38.9	65	30.2
Phosphorus	mg/L	88	2.55	61	4.29
Phosphorus	lbs/day	88	4.79	61	14.08
Dissolved Oxygen	mg/L	291	5.6	200	5.9
Temperature	°C	643	22.0	449	20.0

pH	standard units	301	7.5	201	7.5

The Cashmere POTW reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The tabulated data represents the wastewater effluent discharged from January 1, 2016 to December 31, 2018. The wastewater effluent is characterized as follows:

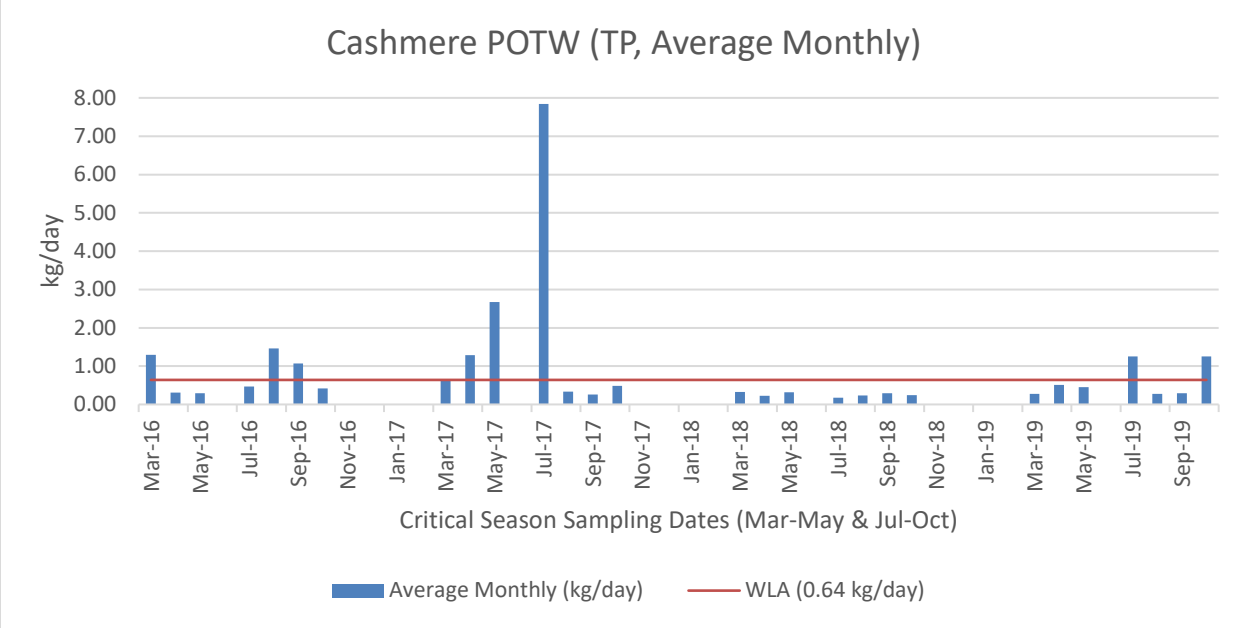
Table 5 Wastewater Effluent Characterization

Parameter	Units	# of Samples	Average Value	Maximum Value
Flow	MGD	1096	0.393	0.727
BOD_5	mg/L	159	3.0	16.0
BOD_5	lbs/day	159	9.3	53.0
TSS	mg/L	417	3.7	16.0
TSS	lbs/day	417	11.1	63.0
Ammonia	mg/L	157	1.9	23.6
Ammonia	lbs/day	157	5.5	75.0
Phosphorus	mg/L	149	0.75	14.10
Phosphorus	lbs/day	149	2.50	41.20
Dissolved Oxygen	mg/L	491	5.0	7.4
Temperature	°C	1092	15.8	23.0
Parameter	**Units**	**# of Samples**	**Maximum Monthly Geometric Mean**	**Maximum Weekly Geometric Mean**
Fecal	cfu/100ml	311	29	44
Parameter	**Units**	**# of Samples**	**Minimum Value**	**Maximum Value**
pH	standard units	494	6.7	7.6

The Cashmere POTW reported the effluent concentration for phosphorus in discharge monitoring reports. Ecology used this data to compare the reported values against the allowed wasteload allocation. Section IIIE provides more detail regarding the water quality impairments identified in the Wenatchee River Watershed TMDL of 2009. Section IIIG. provides Ecology's rationale for proposing a total phosphorus average monthly limit.

The graph below represents the total phosphorus average monthly during the critical season months in 2016 through 2019 (Mar-May & Jul-Oct). From August 2017 through October 2019, the Cashmere POTW worked diligently to optimize the treatment system without the use of tertiary filtration and reduce phosphorus levels below the wasteload allocation of 0.64kg/day. There are two average monthly exceedances of phosphorus in for 2019. Crunch Pak, an Ecology permitted industrial discharger to the Cashmere POTW, incorrectly dosed QuatShield that lowered the biological treatment for removing phosphorus. QuatShield is a liquid concentrate that has the ability to neutralize ammonia compounds. The ammonia compounds can lessen the wastewater treatment processes at the Cashmere POTW from adequately removing phosphorus. In an effort to ensure that adequate amounts of QuatShield is in the wastewater stream, the Cashmere POTW installed a dosing pump system at the City Lift Station. Wastewater operators will inject QuatShield into the City Lift Station wastestream during the critical season. The addition of QuatShield will serve as a preventative measure to protect the conditioned biological activity needed to uptake phosphorus.

Figure 2 Total Phosphorus, Critical Season, Average Monthly kg/day



E. Summary of compliance with previous permit issued

The previous permit placed effluent limits on BOD, TSS, Fecal Coliforms, pH and Total Residual Chlorine.

With a few exceptions, Cashmere POTW has complied with the effluent limits and permit conditions throughout the duration of the permit issued on October 21, 2010. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs) and on inspections.

The following table summarizes the violations that occurred during the permit term.

Table 6 Violations

Begin Date	Parameter	Statistical Base	Units	Value	Maximum Limit	Violation
12/1/2010	Ammonia	-	mg/L	-	-	Frequency of Sampling Violation
12/1/2010	Ammonia	-	lbs/day	-	-	Frequency of Sampling Violation
12/1/2010	BOD_5	-	mg/L	-	-	Frequency of Sampling Violation
12/1/2010	TSS	-	mg/L	-	-	Frequency of Sampling Violation
12/1/2011	TSS	Average Monthly	mg/L	82.8	75.0	Permit Violation
12/1/2011	TSS	Weekly Average	mg/L	120.0	112.0	Permit Violation

The following table summarizes compliance with report submittal requirements over the permit term.

Table 7 Permit Submittals

Submittal Name	Submittal Status	Due Date	Received Date	Approved Date
Engineering Plans and Specs for planned WWTF Upgrade	Received	4/30/13	3/20/12	6/22/12
Engineering Documents for Planned WWTF Upgrade	Received	7/31/17	3/20/12	6/22/12
Quality Assurance Project Plan (QAPP)	Received	-	6/15/12	-
Notice of WWTF Upgrade Completion	Received	11/30/15	9/17/14	-
General Sewer Facilities Plan Amendment Phosphorus Removal	Received	-	9/17/14	-

Submittal Name	Submittal Status	Due Date	Received Date	Approved Date
Infiltration and Inflow Evaluation	Received	11/30/14	11/25/14	-
Wasteload Assessment	Received	11/30/14	11/25/14	-
Application for Permit Renewal	Accepted	11/30/14	11/25/14	-
General Sewer/ Facilities Plan Amendment Phosphorus Removal	Approved	-	5/4/15	5/8/15
O&M- Operation and Maintenance Manual	Reviewed	-	7/29/15	-
O&M- Operation and Maintenance Manual	Approved	-	12/11/18	1/09/19

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 National Toxics Rule (40 CFR 131.36).
- 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 Revised City of Cashmere Operations and Maintenance Manual approved on January 9, 2019 and prepared by RH2 Engineering, Inc. the table below includes design criteria from the referenced manual.

Table 8 Design Criteria for the City of Cashmere POTW

Flow	Design Quantity
Maximum Month Design Flow	1.23 MGD
Maximum Daily Flow	2.60 MGD
Peak Hour Flow	3.46 MGD
Organic Loading	**Design Quantity**
BOD_5 Loading for Maximum Month	5,682 lbs/day
TSS Loading for Maximum Month	2,478 lbs/day
Total Kjeldahl Nitrogen Maximum Month	631 lbs/day

B. Technology-based effluent limits

Federal and state regulations define 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). These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for domestic wastewater.

The table below identifies technology-based limits for pH, fecal coliform, BOD_5, and TSS, as listed in chapter 173-221 WAC. Section III.F of this fact sheet describes the potential for water quality-based limits.

Table 9 Technology-based Limits

Parameter	Average Monthly Limit	Average Weekly Limit
BOD_5 (concentration)	30 mg/L	45 mg/L
BOD_5 (concentration)	In addition, the BOD_5 effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
TSS (concentration)	30 mg/	45 mg/L
TSS (concentration)	In addition, the TSS effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	

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

Technology-based mass limits are based on WAC 173-220-130(3) (b) and 173-221-030(11)(b). Ecology calculated the monthly and weekly average mass limits for BOD_5 and Total Suspended Solids as follows:

Mass Limit = CL x DF x CF

where:

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

DF = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

Ave Monthly BOD	30 x 1.23 x 8.34 = 307.7
Ave Weekly BOD	45 x 1.23 x 8.34 = 461.6
Ave Monthly TSS	30 x 1.23 x 8.34 = 307.7
Ave Weekly TSS	45 x 1.23 x 8.34 = 461.6

Table 10 Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD_5 Monthly Average	30	307.7
BOD_5 Weekly Average	45	461.6
TSS Monthly Average	30	307.7
TSS Weekly Average	45	461.6

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

In 1992, U.S. EPA published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State in its National Toxics Rule (40 CFR (EPA, 1992). Ecology submitted a standards revision for 192 new human health criteria for 97 pollutants to EPA on August 1, 2016. In accordance with requirements of CWA section 303(c) (2) (B), EPA finalized 144 new and revised Washington specific human health criteria for priority pollutants, to apply to waters under Washington’s jurisdiction. EPA approved 45 human health criteria

as submitted by Washington. The EPA took no action on Ecology submitted criteria for arsenic, dioxin, and thallium. The existing criteria for these three pollutants as adopted in the National Toxics Rule (40 CFR 131.36) remain in effect.

These newly adopted criteria, located in WAC 173-201A-240, 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.

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.

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:

1. **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).

2. **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 Cashmere POTW meets the requirements of AKART (see "Technology-based Limits").

3. **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'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 11 Critical Conditions Used to Model the Discharge

Critical Condition (Mar-Apr & Jul-Oct)	Value
The seven-day-average low river flow with a recurrence interval of ten years (7Q10)	329 cfs
Channel width	200 ft
Depth	4.1 ft
River velocity	0.4 ft/sec
Manning roughness coefficient	0.035
Maximum average monthly effluent flow for chronic and human health non-carcinogen	0.450 MGD
Annual average flow for human health carcinogen	0.393 MGD
Maximum daily flow for acute mixing zone	0.727 MGD
7-DAD MAX Effluent temperature	23 degrees °C

4. 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.

5. **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.

6. **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. 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.

7. Maximum size of mixing zone.

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

8. 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 at the ten year low 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.

9. Overlap of mixing zones.

This mixing zone does not overlap another mixing zone.

D. Consideration of the TMDL Phosphorus Wasteload Allocation (WLA) surface water quality-based effluent limits

The *Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load- Water Quality Improvement Report* (Publication #08-10-062) was approved by EPA in August 2009. In that report, the nutrient phosphorus was identified as the limiting factor in the Wenatchee River for aquatic plant growth. Too much phosphorus in the river, results in excessive algae and plant growth, causing large swings in pH and dissolved oxygen concentrations. The TMDL's goal is to control the amount of phosphorus into the Wenatchee River and improve water quality due to low dissolved oxygen (DO) and pH.

The TMDL explains that wasteload allocations were set based on design flow of the treatment facilities but also leaving an allocation for growth up to the current design flow conditions for each facility receiving a WLA. The WLA for the Cashmere POTW was based on projected design flow. Ecology calculated the WLA using the following:

TP	= Total phosphorus
Footnote b (kg/day) equation	= Effluent MGD x TP in mg/L Phosphorus x 3.785
Cashmere POTW Design Flow	= 1.88 MGD
WLA for point sources	= 90 µg/L or 0.09 mg/L
Liters per gallon of water	= 3.785
Calculated WLA (kg/day)	= 1.88 MGD x 0.09 mg/L phosphorus x 3.785 L/gal = 0.64 kg/day phosphorus

The total phosphorous WLA for the Cashmere POTW was established in the 2009 TMDL report as a maximum daily limit. The draft permit takes a different approach, implementing the WLA as an **average monthly limit** to achieve the objectives of the TMDL.

At the beginning of **section H** below it is explained that far-field pollutants whose adverse effects occur 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. For that reason, Ecology determined an average monthly total phosphorus loading is appropriate to be compliant with the WLA. This approach is necessarily different from a WLA needed for a toxic pollutant where a maximum daily limit is more appropriate.

The draft permit determines compliance with the average monthly limit, based on eight monthly phosphorus sampling events, thus providing a sound statistical basis for meeting the WLA. Samples will be taking during the critical months identified in the TMDL (Mar-May, July-Oct).

A longer term averaging approach for a WLA is allowed in federal regulation: 40 CRF122.45 (d) when daily maximum limits are impractical, longer-term averaging alternatives such as monthly, seasonal, or annual limits may be appropriate.

Additionally, the EPA has approved longer term averaging for nutrient-based wasteload allocation in various TMDLs, documents, and memos (see section VII. References for Text and Appendices)

- 2004 EPA Memo: James Hanlon
- 2006 EPA Memo; Benjamin Grumbles

E. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). The tables included below summarize the criteria applicable to the receiving water's designated uses.

The freshwater aquatic life uses and associated criteria of Table 14 are described in pages 9-14 of the *Wenatchee River Watershed Dissolved oxygen and pH* TMDL.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified below.

Table 12 Freshwater Aquatic Life Uses and Associated Criteria

Salmonid Spawning, Rearing, and Migration	
Temperature Criteria – Highest 7-DAD MAX	17.5°C (63.5°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	8.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas must not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	The pH must measure within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- The *recreational uses* for this receiving water are identified below.

Table 13 Recreational Uses and Associated Criteria

Recreational Use	**Criteria**
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not 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 200 colonies /100 mL.

- The *water supply uses* are domestic, agricultural, industrial, and stock watering.
- The *miscellaneous freshwater uses* are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

F. Water quality impairments

The Wenatchee River is listed on the current 303(d) and is impaired for dissolved oxygen and pH. Ecology has completed a Total Maximum Daily Load (TMDL) Analysis. Ecology published the *Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load Water Quality Improvement Report* (Publication # 08-10-062). https://fortress.wa.gov/ecy/publications/documents/0810062.pdf

The TMDL concludes that portions of the Wenatchee River, lower Icicle Creek, and other tributaries were not meeting water quality standards during the critical season (March-May and July-October). The streams were identified to be sensitive to nutrient additions contributed from point and nonpoint sources. These nutrient

contributions cause the Wenatchee River and lower Icicle Creek to violate Washington State water quality standards for dissolved oxygen and pH. Phosphorus was identified as the limiting nutrient in the lower Wenatchee River. The report concludes that the phosphorus levels in the Wenatchee River watershed must be reduced to improve dissolved oxygen levels, protect Endangered Species Act listed fish, and protect other uses.

As a part of the TMDL implementation process, NPDES permits are to include total phosphorus limits designed to reach the loading capacity of the lower Wenatchee River and Icicle Creek.

The TMDL includes waste load allocations (WLA) during the critical period (March-May and July-October) to improve the Wenatchee River watershed.

G. 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.

H. 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_5) 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 30 feet long with a diameter of 8 inches, positioned perpendicular to the river flow. The diffusor is anchored with pier blocks that are buried vertically within the river bottom with the intention of them being less susceptible to flood damage. One inch and two inch diffuser ports were drilled on the downstream side at approximately 45 degree angle off top dead center. The distance between each two inch port are four feet. One inch ports were drilled evenly between each two inch port.

Chronic Mixing Zone--WAC 173-201A-400(7) (a) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body.

The horizontal distance of the chronic mixing zone is 305.5 feet. The mixing zone extends from the bottom to the top of the water column.

Acute Mixing Zone--WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10% of the distance towards the upstream and downstream boundaries of the chronic zone, not use greater than 2.5% of the flow and not occupy greater than 25% of the width of the water body.

The horizontal distance of the acute mixing zone is 30.6 feet. The mixing zone extends from the bottom to the top of the water column. The dilution factor is based on this distance.

Ecology determined the dilution factors that occur within these zones at the critical condition using Cormix Model 11. The dilution factors are listed below.

Table 14 Dilution Factors (DF)

Dilution Factor	Acute	Chronic
Aquatic Life	43.7	83.9

Dissolved Oxygen--BOD_5 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 Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable 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 BOD_5 on the receiving water using Ecology's PermitCalc, at critical condition and with the technology-based effluent limit for BOD_5 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 due to the impacts of biochemical oxygen demand (BOD_5) under critical conditions. Therefore, the proposed permit contains the technology-based effluent limit for BOD_5. The permit also does not contain a limit on ammonia based on dissolved oxygen impacts (ammonia toxicity is examined elsewhere in this fact sheet).

pH— The Wenatchee River Watershed TMDL study detailed modeling conducted in 2002 that predicted the pH criteria would be met at 7Q10 flow levels during August on the Wenatchee River below the Peshastin Creek during natural conditions. No additional capacity for phosphorus can be given if only a maximum natural condition were achieved. Under this condition, discharges with a 0.1 pH unit increase in the downstream pH range during critical conditions would not be allowed. Under critical conditions, modeling predicts a violation of the pH criteria for the receiving water at the edge of the Chronic Mixing Zone with a change in pH of 0.17. Therefore, the proposed permit includes water quality-based effluent limits for pH of 6.5 to 8.5.

The Cashmere POTW has demonstrated it can meet the water quality standards for pH. The minimum reported pH value in the Cashmere POTW's discharge was 6.7 and the 90th percentile for pH being 7.5 from January 1, 2016 to December 31, 2018. The calculations are show in **Appendix D**.

Fecal Coliform-- The Cashmere POTW conducted and reported over 300 fecal coliform analyses from January 1, 2016 to December 31, 2018. The maximum reported single sample value was 55cfu/100ml. Ecology used the 10th percentile reported by the Cashmere POTW during the critical season (Mar-May and Jul-Oct) as a reasonable worst case value.

Under critical conditions, modeling predicts no violation of the water quality criterion for fecal coliform. In this situation, Ecology generally imposes the technology-based effluent limit for fecal coliform bacteria. The Cashmere POTW has demonstrated it can reliably meet the water quality standard for fecal coliforms for primary contact recreation in the discharge. Therefore, the proposed permit includes the primary contact recreation standard for fecal coliform as a performance-based (technology-based) effluent limit for fecal coliform bacteria.

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— 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 only toxic pollutant known to be present in the Cashmere POTW effluent discharge is ammonia. Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater.

To evaluate ammonia toxicity, the Ecology's Environmental Information Management (EIM) database (45A070, 45A110) and Ecology spreadsheet tools were used. Ecology conducted a reasonable potential analysis (See **Appendix D**) on these parameters to determine whether it would require effluent limits in this permit. Using this data and tools, Ecology found no reasonable potential for ammonia to exceed water quality criteria.

Temperature--The state temperature standards [WAC 173-201A-200-210 and 600-612] include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)

- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

- Annual summer maximum and supplementary spawning/rearing criteria

  Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1) (c), 210(1) (c), and Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

  Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.

  The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax). The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

  The Wenatchee River, in the vicinity of the Cashmere POTW discharge, has a 7-DADMax temperature criterion of 17.5°C that protects salmonid spawning and rearing by controlling the effect of human actions on summer temperatures. The temperature criterion is applied at the edge of the chronic mixing zone.

  The Wenatchee River also has a more stringent 7-DADMax temperature criterion of 13°C from October 1 through May 15 that protects the spawning and incubation of salmon and trout.

- Incremental warming criteria

  The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1) (c) (I)-(ii), 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. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3°C above the naturally warm condition.

When Ecology has not yet completed a TMDL, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- Protections for temperature acute effects

  Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C, unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.

  The POTW effluent temperature are limited by a TMDL to no greater than 33°C. The 95th percentile of the 7DADMax critical condition effluent temperature reported by the Cashmere POTW was calculated to be 22.0°C.

  General lethality and migration blockage: The incremental temperature increase in the Wenatchee River caused by the POTW effluent is considered “de minimus” (<0.1°C). However, a temperature TMDL was conducted for the watershed and a WLA (33°C) was determined for the City of Cashmere POTW. The proposed permit contains that WLA as a temperature effluent limit.

Temperature Reasonable Potential Analysis

Ecology conducted a reasonable potential analysis for temperature (See **Appendix D**) and determined that at the edge of the Chronic Mixing Zone there would be no change in temperature to exceed the 0.3°C allowed by state regulations for human sources.

I. Human health

Washington's water quality standards include numeric human health-based criteria for 97 priority pollutants that Ecology must consider when writing NPDES permits.

Ecology determined the applicant's discharge does not contain chemicals of concern based on existing effluent data or knowledge of discharges to the wastewater treatment system. Ecology will reevaluate this discharge for impacts to human health at the next permit reissuance.

J. 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

Through a review of the discharger characteristics and of the effluent characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards.

K. 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.

- *Acute toxicity tests measure mortality as the significant* response to the toxicity of the effluent. Dischargers who monitor their wastewater using 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.

Using the screening criteria in WAC 173-205-040, Ecology determined the Cashmere POTW's effluent has the potential to cause aquatic toxicity. The proposed permit contains WET testing requirements as authorized by RCW 90.48.520 and 40 CFR 122.44, using procedures from WAC 173-205. The proposed permit requires the facility to conduct WET testing at prescribed intervals for one year, to characterize both the acute and chronic toxicity of the effluent.

If the year of WET testing shows acute or chronic toxicity levels that have a reasonable potential to cause receiving water toxicity, then the proposed permit will:

- Set a limit on acute or chronic toxicity.
- Require this facility operator to conduct WET testing to monitor compliance with an acute toxicity limit, a chronic toxicity limit, or both.
- Specify the procedures the facility operator must use to come back into compliance if toxicity exceeds the limits.

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 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://fortress.wa.gov/ecy/publications/documents/9580.pdf), which is referenced in the permit. Ecology recommends that each regulated facility send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

If the WET tests performed for effluent characterization indicate no reasonable potential to cause receiving water toxicity, the proposed permit will not include WET limits, but will require rapid screening tests to detect any toxicity that may appear.

- If a rapid screening test indicates apparent effluent toxicity, the facility operator must investigate immediately, take appropriate action, and report to Ecology.
- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization. The Cashmere POTW may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing and or chemical analyses after the process or material changes have been made. Ecology recommends that the Permittee check with it

first to make sure that Ecology will consider the demonstration adequate to support a decision to not require an additional effluent characterization.

- If WET testing conducted as a follow-up to rapid screening tests fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased.

L. 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).

The Cashmere POTW does not discharge wastewater to the ground. No permit limits are required to protect groundwater.

M. Comparison of effluent limits with the previous permit issued on October 21, 2010

Table 15 Comparison of Previous and Proposed Effluent Limits

		Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand (5-day)	Technology	45 mg/L 354 lbs/day 65% minimum removal rate	65 mg/L 511 lbs/day	30 mg/L 307.7 lbs/day	45mg/L 461.6 lbs/day
Total Suspended Solids	Technology	75mg/L 590 lbs/day	112 mg/L 880 lbs/day	30mg/L 307.7 lbs/day	45mg/L 461.6 lbs/day

Parameter	**Basis of Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**
Fecal Coliform Bacteria	Technology	200/100 mL	400/100 mL	100/100 mL	200/100 mL
Parameter	**Basis of Limit**	**Maximum Daily**		**Mar-May & Jul-Oct Average Monthly**	
Total Phosphorus	TMDL WLA	n/a		640.4 g/day	
Temperature	TMDL WLA	33°C		n/a	

Parameter	Units	Limit	Limit
pH	Standard Units	6 to 9 (Technology Based)	6.5 to 8.5 (Water Quality Based)

The proposed permit contains the temperature and total phosphorus effluent limits as a result of the TMDLs for the Wenatchee River watershed.

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 a non-delegated POTW.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Biosolids monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503.

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 are included in the table below.

Table 16 Accredited Parameters

Parameter Name	Category	Method Name	Matrix Description
Solids, Total Suspended	General Chemistry	SM 2540 D-2011	Non-Potable Water
pH	General Chemistry	SM 4500-H+ B-2011	Non-Potable Water
Dissolved Oxygen	General Chemistry	SM 4500-O G-2011	Non-Potable Water
Biochemical Oxygen Demand (BOD)	General Chemistry	SM 5210 B-2011	Non-Potable Water
Fecal coliform-count	Microbiology	SM 9222 D (mFC)-06	Non-Potable Water

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 the Cashmere POTW 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.

If a municipality intends to apply for Ecology-administered funding for the design or construction of a facility project, the plan must meet the standard of a “Facility Plan”, as defined in WAC 173-98-030. A complete “Facility Plan” includes all elements of

an “Engineering Report” along with State Environmental Review Process (SERP) documentation to demonstrate compliance with 40 CFR 35.3140 and 40 CFR 35.3145, and a cost effectiveness analysis as required by WAC 173-98-730. The municipality should contact Ecology’s regional office as early as practical before planning a project that may include Ecology-administered funding.

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 the Cashmere POTW 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.

Federal and state pretreatment program requirements

Ecology administers the Pretreatment Program under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986) and 40 CFR, part 403. Under this delegation of authority, Ecology issues wastewater discharge permits for significant industrial users (SIUs) discharging to POTWs which have not been delegated authority to issue wastewater discharge permits. Ecology must approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) [40 CFR 403.8 (f) (1) (I) and (iii)].

Industrial dischargers must obtain a permit from Ecology before discharging waste to the Cashmere POTW [WAC 173-216-110(5)]. Industries discharging wastewater that is similar in character to domestic wastewater do not require a permit.

Routine identification and reporting of industrial users

The permit requires non-delegated POTWs to take "continuous, routine measures to identify all existing, new, and proposed significant industrial users (SIUs) and potential significant industrial users (PSIUs)" discharging to their sewer system. Examples of such routine measures include regular review of water and sewer billing records, business license and building permit applications, advertisements, and personal reconnaissance. System maintenance personnel should be trained on what to look for so they can identify and report new industrial dischargers in the course of performing their jobs. The POTW may not allow SIUs to discharge prior to receiving a permit, and must notify all industrial dischargers (significant or not) in writing of their responsibility to apply for a State Waste Discharge Permit. The POTW must send a copy of this notification to Ecology.

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 70.95J 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 Chelan-Douglas 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.

I. Outfall evaluation

The proposed permit requires the Cashmere POTW to conduct an outfall inspection and submit a report detailing the findings of that inspection (Special Condition S.9). The inspection must evaluate the physical condition of the discharge pipe and diffusers, and evaluate the extent of sediment accumulations in the vicinity of the outfall.

K. 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

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.

2004. Memo from J. Hanlon to J. Capacasa. Annual Permit Limits for Nitrogen and Phosphorus for Permits designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System. March 3, 2004

2006. Benjamin Grumbles Memo: Establishing TMDL “Daily” Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. V. EPA, et al., No. 05-5015, and Implications, for NPDES Permits

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.

January 2015. *Permit Writer's Manual*. 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*. 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*. 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)

Permit and Wastewater Related Information

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 National Pollutant Discharge Elimination System (NPDES) permit to City of Cashmere POTW. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on March 11, 2020 in the Cashmere Valley Record 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.

NOTICE: ANNOUNCEMENT OF AVAILABILITY OF DRAFT PERMIT

PERMIT NO.: WA0023183

APPLICANT: City of Cashmere

The City of Cashmere has applied for renewal of National Pollutant Discharge Elimination System (NPDES) Permit No. WA0023183 in accordance with the provisions of Chapter 90.48 Revised Code of Washington (RCW) and Chapter 173-220 Washington Administrative Code (WAC), and the Federal Clean Water Act.

The City of Cashmere presently owns or operates a wastewater treatment plant which is designed to handle an maximum month design flow of 1.23 million gallons per day. The wastewater, following treatment, must meet the requirements of the Washington State Water Pollution Control Act and applicable regulations for a permit to be issued.

Following evaluation of the application and other available information, a draft permit has been developed which would allow the discharge of treated domestic wastewater from 2 Riverfront Drive, Cashmere, WA to Wenatchee River, River Mile 8.6. All discharges to be in compliance with the Department of Ecology's Water Quality Standards for a permit to be issued.

A tentative determination has been made on the effluent limitations and special permit conditions that will prevent and control pollution. A final determination will not be made until all timely comments received in response to this notice have been evaluated.

PUBLIC COMMENT AND INFORMATION

The draft permit and fact sheet may be viewed at the Department of Ecology (Department) website: https://apps.ecology.wa.gov/paris/DocumentSearch.aspx?PermitNumber=WA0023183&FacilityName=&City=&County=&Region=0&PermitType=0&DocumentType=0 . The application, fact sheet, proposed permit, and other related documents are also available at the Department's Central Regional Office for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m., weekdays. To obtain a copy or to arrange to view copies at the Central Regional Office, please e-mail publicrecordsofficer@ecy.wa.gov or write to Public Records Officer, Department of Ecology, PO Box 47600, Olympia, WA 98504.

Interested persons are invited to submit written comments regarding the proposed permit. All comments must be submitted by April 11, 2020 to be considered for the final determination.

Submit comments online at: http://wq.ecology.commentinput.com/?id=CBDsp . Written comments should be sent to: Cynthia Huwe, WQ Permit Coordinator, Department of Ecology, Central Regional Office, 1250 West Alder Street, Union Gap, WA 98903-0009.

Any interested party may request a public hearing on the proposed permit within 30 days of the publication date of this notice. The request for a hearing shall state the interest of the party and the reasons why a hearing is necessary. The request should be sent to the above address. The Department will hold a hearing if it determines that there is significant public interest. If a hearing is to be held, public notice will be published at least 30 days in advance of the hearing date. Any party responding to this notice with comments will be mailed a copy of a hearing public notice.

Please bring this public notice to the attention of persons who you know would be interested in this matter. To request an ADA accommodation, contact Ecology by phone at 360-407-6831 or email at ecyadacoordinator@ecy.wa.gov. For Washington

Relay Service or TTY call 711 or 877-833-6341. Visit https://ecology.wa.gov/About-us/Accountability-transparency/Accessibility for more information.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting,* 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, (509) 457-7105, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
1250 West Alder Street
Union Gap, WA 98903

The primary author of this permit and fact sheet is Erik Van Doren.

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.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503 **Pollution Control Hearings Board** 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **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 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 (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs 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.

BOD5 -- 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 BOD5 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_5 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 173-240-130.

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 507, 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,or 5) x 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_5 -- 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_5 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_5 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 on Ecology's webpage at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance.

Cormix Session Report- Acute Dilution Factor

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXX
                CORMIX MIXING ZONE EXPERT SYSTEM
                   CORMIX Version 11.0GTD
                 HYDRO2:Version-11.0.1.0  August,2019
SITE NAME/LABEL:
  DESIGN CASE:
  FILE NAME:              C:\Users\erva461\Desktop\Cashmere POTW-Acute-Chronic.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:          10/28/2019--13:05:23
*******************************************************************************
SUMMARY OF INPUT DATA:
-------------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                    = bounded
  Width                    BS     = 60.96 m
  Channel regularity             ICHREG = 1
  Ambient flowrate                QA     = 9.29 m^3/s
  Average depth                   HA     = 1.25 m
  Depth at discharge              HD     = 1.16 m
  Ambient velocity                UA     = 0.1219 m/s
  Darcy-Weisbach friction factor  F      = 0.0892
    Calculated from Manning's n          = 0.035
  Wind velocity                   UW     = 1.79 m/s
  Stratification Type            STRCND = U
  Surface temperature                    = 23 degC
  Bottom temperature                     = 23 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density                 RHOAS  = 997.5393 kg/m^3
  Bottom density                  RHOAB  = 997.5393 kg/m^3
-------------------------------------------------------------------------------
DISCHARGE PARAMETERS:          Submerged Multiport Diffuser Discharge
  Diffuser type                DITYPE = unidirectional perpendicular
  Diffuser length                 LD     = 9.14 m
```

```
  Nearest bank                      = right
  Diffuser endpoints            YB1    = 6.1 m;    YB2 = 15.24 m
  Number of openings             NOPEN  = 13
  Number of Risers              NRISER = 13
  Ports/Nozzles per Riser        NPPERR  = 1
  Spacing between risers/openings SPAC   = 0.76 m
  Port/Nozzle diameter           D0     = 0.0482 m
    with contraction ratio             = 1
  Equivalent slot width          B0     = 0.002396 m
  Total area of openings         TA0    = 0.0237 m^2
  Discharge velocity             U0     = 1.34 m/s
  Total discharge flowrate       Q0     = 0.031852 m^3/s
  Discharge port height          H0     = 0.15 m
  Nozzle arrangement             BETYPE = unidirectional without fanning
  Diffuser alignment angle       GAMMA  = 90 deg
  Vertical discharge angle       THETA  = 45 deg
  Actual Vertical discharge angle THEAC  = 45 deg
  Horizontal discharge angle     SIGMA  = 0 deg
  Relative orientation angle     BETA   = 90 deg
  Discharge temperature (freshwater)     = 23 degC
  Corresponding density          RHO0   = 997.5393 kg/m^3
  Density difference             DRHO   = 0 kg/m^3
  Buoyant acceleration           GP0    = 0 m/s^2
  Discharge concentration        C0     = 100 %
  Surface heat exchange coeff.   KS     = 0 m/s
  Coefficient of decay           KD     = 0 /s
------------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)        q0     = 0.003485 m^2/s
  Momentum flux
     (based on slot width B0)    m0 =U0^2*B0   = 0.004319 m^3/s^2
     (based on volume flux q0)   m0 =U0*q0     = 0.004679 m^3/s^2
  Buoyancy flux
     (based on slot width B0)    j0 =U0*GP0*B0 = 0 m^3/s^3
     (based on volume flux q0)   j0 =q0*GP0    = 0 m^3/s^3
------------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m        Lm  = 0.31 m        LM  = 99999 m
  lm' = 99999 m       Lb' = 99999 m       La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
------------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
```

Slot Froude number FR0 = 99999
Port/nozzle Froude number FRD0 = 99999
Velocity ratio R = 11.01

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
Toxic discharge = no
Water quality standard specified = yes
Water quality standard CSTD = 100 %
Regulatory mixing zone = yes
Regulatory mixing zone specification = distance
Regulatory mixing zone value = 9.27 m (m^2 if area)
Region of interest = 1000 m
****
HYDRODYNAMIC CLASSIFICATION:

| FLOW CLASS = MU2 |

This flow configuration applies to a layer corresponding to the full water depth at the discharge site.
Applicable layer depth = water depth = 1.16 m

Limiting Dilution S = (QA/Q0)+ 1.0 = 292.6

****
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:
Origin is located at the BOTTOM below the port/diffuser center:
10.67 m from the right bank/shore.
Number of display steps NSTEP = 10 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing. It has no regulatory implication. However, this information may be useful for the discharge designer because the mixing in the NFR is usually sensitive to the discharge design conditions.
Pollutant concentration at NFR edge c = 2.3217 %
Dilution at edge of NFR s = 43.1
NFR Location: x = 4.57 m
(centerline coordinates) y = 0 m
z = 1.16 m

NFR plume dimensions: half-width (bh) = 4.11 m
thickness (bv) = 1.16 m
Cumulative travel time: 29.8506 sec.

Buoyancy assessment:
The effluent density is equal or about about equal to the surrounding ambient water density at the discharge level.
Therefore, the effluent behaves essentially as NEUTRALLY BUOYANT.

Near-field instability behavior:
The diffuser flow will experience instabilities with full vertical mixing in the near-field.
There may be benthic impact of high pollutant concentrations.

FAR-FIELD MIXING SUMMARY:
Plume becomes vertically fully mixed ALREADY IN NEAR-FIELD at 0 m downstream and continues as vertically mixed into the far-field.

PLUME BANK CONTACT SUMMARY:
Plume in bounded section contacts one bank only at 947.38 m downstream.

********** TOXIC DILUTION ZONE SUMMARY **********

No TDZ was specified for this simulation.

********** REGULATORY MIXING ZONE SUMMARY **********

The plume conditions at the boundary of the specified RMZ are as follows:
Pollutant concentration c = 2.297115 %
Corresponding dilution s = 43.7
Plume location: x = 9.27 m
(centerline coordinates) y = 0 m
z = 1.16 m
Plume dimensions: half-width (bh) = 4.88 m
thickness (bv) = 1.16 m
Cumulative travel time: 68.2354 sec.

Cormix Session Report- Chronic Dilution Factor

CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

CORMIX MIXING ZONE EXPERT SYSTEM
CORMIX Version 11.0GTD
HYDRO2:Version-11.0.1.0 August,2019

SITE NAME/LABEL:
DESIGN CASE:
FILE NAME: C:\Users\erva461\Desktop\Cashmere POTW-acute-chronic.prd
Using subsystem CORMIX2: Multiport Diffuser Discharges
Start of session: 10/28/2019--13:10:39

****

SUMMARY OF INPUT DATA:

AMBIENT PARAMETERS:
Cross-section = bounded
Width BS = 60.96 m
Channel regularity ICHREG = 1
Ambient flowrate QA = 9.29 m^3/s
Average depth HA = 1.25 m
Depth at discharge HD = 1.16 m
Ambient velocity UA = 0.1219 m/s
Darcy-Weisbach friction factor F = 0.0892
Calculated from Manning's n = 0.035
Wind velocity UW = 1.79 m/s
Stratification Type STRCND = U
Surface temperature = 23 degC
Bottom temperature = 23 degC
Calculated FRESH-WATER DENSITY values:
Surface density RHOAS = 997.5393 kg/m^3
Bottom density RHOAB = 997.5393 kg/m^3

DISCHARGE PARAMETERS: Submerged Multiport Diffuser Discharge
Diffuser type DITYPE = unidirectional perpendicular
Diffuser length LD = 9.14 m
Nearest bank = right
Diffuser endpoints YB1 = 6.1 m; YB2 = 15.24 m
Number of openings NOPEN = 13
Number of Risers NRISER = 13
Ports/Nozzles per Riser NPPERR = 1
Spacing between risers/openings SPAC = 0.76 m

Port/Nozzle diameter D0 = 0.0482 m
with contraction ratio = 1
Equivalent slot width B0 = 0.002396 m
Total area of openings TA0 = 0.0237 m^2
Discharge velocity U0 = 0.83 m/s
Total discharge flowrate Q0 = 0.019716 m^3/s
Discharge port height H0 = 0.15 m
Nozzle arrangement BETYPE = unidirectional without fanning
Diffuser alignment angle GAMMA = 90 deg
Vertical discharge angle THETA = 45 deg
Actual Vertical discharge angle THEAC = 45 deg
Horizontal discharge angle SIGMA = 0 deg
Relative orientation angle BETA = 90 deg
Discharge temperature (freshwater) = 23 degC
Corresponding density RHO0 = 997.5393 kg/m^3
Density difference DRHO = 0 kg/m^3
Buoyant acceleration GP0 = 0 m/s^2
Discharge concentration C0 = 100 %
Surface heat exchange coeff. KS = 0 m/s
Coefficient of decay KD = 0 /s

FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
Discharge (volume flux) q0 = 0.002157 m^2/s
Momentum flux
(based on slot width B0) m0 =U0^2*B0 = 0.001655 m^3/s^2
(based on volume flux q0) m0 =U0*q0 = 0.001793 m^3/s^2
Buoyancy flux
(based on slot width B0) j0 =U0*GP0*B0 = 0 m^3/s^3
(based on volume flux q0) j0 =q0*GP0 = 0 m^3/s^3

DISCHARGE/ENVIRONMENT LENGTH SCALES:
LQ = 0.00 m Lm = 0.12 m LM = 99999 m
lm' = 99999 m Lb' = 99999 m La = 99999 m
(These refer to the actual discharge/environment length scales.)

NON-DIMENSIONAL PARAMETERS:
Slot Froude number FR0 = 99999
Port/nozzle Froude number FRD0 = 99999
Velocity ratio R = 6.82

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
Toxic discharge = no

```
  Water quality standard specified       = yes
  Water quality standard         CSTD   = 100 %
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 92.69 m (m^2 if area)
  Region of interest                     = 1000 m
*******************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *----------------------*
  | FLOW CLASS   = MU2 |
  *----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 1.16 m

  Limiting Dilution S = (QA/Q0)+ 1.0 = 472.1

*******************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

--------------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    10.67 m from the right bank/shore.
  Number of display steps NSTEP = 10 per module.
--------------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 1.5103 %
  Dilution at edge of NFR              s = 66.2
  NFR Location:                        x = 4.57 m
    (centerline coordinates)           y = 0 m
                                       z = 1.16 m
  NFR plume dimensions:  half-width (bh) = 4.36 m
                         thickness (bv) = 1.16 m
  Cumulative travel time:       33.9845 sec.
--------------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is equal or about about equal to the surrounding
```

ambient water density at the discharge level.
Therefore, the effluent behaves essentially as NEUTRALLY BUOYANT.

Near-field instability behavior:
The diffuser flow will experience instabilities with full vertical mixing in the near-field.
There may be benthic impact of high pollutant concentrations.

FAR-FIELD MIXING SUMMARY:
Plume becomes vertically fully mixed ALREADY IN NEAR-FIELD at 0 m downstream and continues as vertically mixed into the far-field.

PLUME BANK CONTACT SUMMARY:
Plume in bounded section contacts one bank only at 968.66 m downstream.

********** TOXIC DILUTION ZONE SUMMARY **********

No TDZ was specified for this simulation.

********** REGULATORY MIXING ZONE SUMMARY **********

The plume conditions at the boundary of the specified RMZ are as follows:

Pollutant concentration	c = 1.197848 %
Corresponding dilution	s = 83.9
Plume location:	x = 92.69 m
(centerline coordinates)	y = 0 m
	z = 1.16 m
Plume dimensions:	half-width (bh) = 5.45 m
	thickness (bv) = 1.24 m
Cumulative travel time:	755.2201 sec.

Log-Pearson Type III Distribution Analysis-7Q10

LOW FLOW [] Frequency Analysis Calculator: Log-Pearson Type III Distribution; EPA 1986[a] Frequency Factors

USGS Gaging Station Name: Peshastin USGS Site ID: 12459000

RANK	YEAR OF 7DAvg_Low FLOW	LOW_FLOW_VALUE_ Q(cfs)	LN [Log base e, natural] Q_cfs	[Tr]Return Period (n+1)/m	Exceedence Probability (1/Tr)
1	2005	296	5.689	22.00	0.045
2	2002	326	5.786	11.00	0.091
3	2001	335	5.813	7.33	0.136
4	2006	361	5.888	5.50	0.182
5	2015	379	5.938	4.40	0.227
6	2018	393	5.974	3.67	0.273
7	2007	405	6.004	3.14	0.318
8	2003	410	6.017	2.75	0.364
9	1998	411	6.018	2.44	0.409
10	2009	422	6.044	2.20	0.455
11	2000	436	6.077	2.00	0.500
12	2012	454	6.117	1.83	0.545
13	2017	471	6.156	1.69	0.591
14	2016	495	6.205	1.57	0.636
15	2008	543	6.296	1.47	0.682
16	2014	562	6.332	1.38	0.727
17	2011	695	6.543	1.29	0.773
18	2004	727	6.589	1.22	0.818
19	1999	768	6.644	1.16	0.864
20	2010	770	6.646	1.10	0.909
21	2013	786	6.666	1.05	0.955

[a] *EPA Frequency Factors according to: Technical Guidance Manual for Performing Wasteload Allocations*

Book VI: Design Conditions
Chapter 1: Stream Design Flow for Steady-State Modeling
EPA Doc # EPA440/4/86-014
Date: 1986

Water Quality D-Flow App (Steve Hummel and Pat Hallinan) -7Q10 Analysis

https://water-quality.shinyapps.io/D-Flow-Update/

Ammonia Criteria Calculation

Freshwater Un-ionized Ammonia Criteria Calculation
Based on Chapter 173-201A WAC, amended November 20, 2006

		mixed @ Acute Boundary	mixed @ Chronic Boundary	mixed @ Whole River
INPUT				
1. Receiving Water Temperature (deg C):	20.1	#DIV/0!	#DIV/0!	#DIV/0!
2. Receiving Water pH:	8.8	#DIV/0!	#DIV/0!	#DIV/0!
3. Is salmonid habitat an existing or designated use?	Yes	Yes	Yes	Yes
4. Are non-salmonid early life stages present or absent?	Present	Present	Present	Present
OUTPUT				
Using mixed temp and pH at mixing zone boundaries?	no			
Ratio	13.500	#DIV/0!	#DIV/0!	#DIV/0!
FT	1.400	#DIV/0!	#DIV/0!	#DIV/0!
FPH	1.000	#DIV/0!	#DIV/0!	#DIV/0!
pKa	9.399	#DIV/0!	#DIV/0!	#DIV/0!
Unionized Fraction	0.201	#DIV/0!	#DIV/0!	#DIV/0!
Unionized ammonia NH3 criteria (mg/L as NH_3)				
Acute:	0.301	#DIV/0!	#DIV/0!	#DIV/0!
Chronic:	0.042	#DIV/0!	#DIV/0!	#DIV/0!
RESULTS				
Total ammonia nitrogen criteria (mg/L as N):				
Acute:	1.232	#DIV/0!		#DIV/0!
Chronic:	0.173		#DIV/0!	#DIV/0!

Reasonable Potential Analysis-Ammonia, Criteria as Total NH_3

Reasonable Potential Calculation

Facility	Cashmere POTW
Water Body Type	Freshwater
Rec. Water Hardness	

Dilution Factors:	Acute	Chronic
Aquatic Life	43.7	83.9
Human Health Carcinogenic		
Human Health Non-Carcinogenic		

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3										
Effluent Data	# of Samples (n)		157										
	Coeff of Variation (Cv)		2.2	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)		11,540										
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L		10										
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	1,232										
		Chronic	173										
	WQ Criteria for Protection of Human Health, ug/L		-										
	Metal Criteria Translator, decimal	Acute	-										
		Chronic	-										
	Carcinogen?		N										

Aquatic Life Reasonable Potential

Effluent percentile value			0.950
s	$s^2=\ln(CV^2+1)$		1.328
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.981
Multiplier			1.00
Max concentration (ug/L) at edge of...		Acute	274
		Chronic	147
Reasonable Potential? Limit Required?			**NO**

Chronic Mixing Zone Calculation- Dissolved Oxygen and Fecal Coliform

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	83.9
Receiving Water Fecal Coliform, #/100 ml	1
Effluent Fecal Coliform - worst case, #/100 ml	10
Surface Water Criteria, #/100 ml	*100*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**1**
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.

Calculation of Dissolved Oxygen at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	43.7
Receiving Water DO Concentration, mg/L	9.6
Effluent DO Concentration, mg/L	4.5
Effluent Immediate DO Demand (IDOD), mg/L	0
Surface Water Criteria, mg/L	*8*
OUTPUT	
DO at Mixing Zone Boundary, mg/L	**9.48**
DO decrease caused by effluent at chronic boundary, mg/L	**0.12**

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

References: EPA/600/6-85/002b and EPA/430/9-82-011

Freshwater Temperature Reasonable Potential and Limit Caclulation

Freshwater Temperature Reasonable Potential and Limit Calculation

Based on WAC 173-201A-200(1)(c)(i)--(ii) and the Water Quality Program Guidance. All data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at: https://fortress.wa.gov/ecy/publications/summarypages/0610100.html

	Core Summer	Non Core Summer
INPUT		
1. Chronic Dilution Factor at Mixing Zone Boundary	83.9	83.9
2. 7DADMax Ambient Temperature (T) (Upstream Background 90th percentile)	20.1 °C	20.1 °C
3. 7DADMax Effluent Temperature (95th percentile)	22.0 °C	20.0 °C
4. Aquatic Life Temperature WQ Criterion in Fresh Water	17.5 °C	13.0 °C
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	20.1 °C	20.1 °C
6. Incremental Temperature Increase or decrease:	0.0 °C	0.0 °C
7. Maximum Allowable Incremental Temperature Increase:	0.3 °C	0.3 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	20.4 °C	20.4 °C
A. If ambient temp is warmer than WQ criterion		
9. Does temp fall within this warmer temp range?	YES	YES
10. Temperature Limit if Required:	NO LIMIT	NO LIMIT
B. If ambient temp is cooler than WQ criterion but within 28/(T +7) and within 0.3 °C of the criterion		
11. Does temp fall within this incremental temp. range?	---	---
12. Temp increase allowed at mixing zone boundary, if required:	---	---
C. If ambient temp is cooler than (WQ criterion-0.3) but within 28/(T +7) of the criterion		
13. Does temp fall within this incremental temp. range?	---	---
14. Temp increase allowed at mixing zone boundary, if required:	---	---
D. If ambient temp is cooler than (WQ criterion - 28/(T +7))		
15. Does temp fall within this incremental temp. range?	---	---
16. Temp increase allowed at mixing zone boundary, if required:	---	---
RESULTS		
17. Do any of the above cells show a temp increase?	**NO**	**NO**
18. Temperature Limit if Required?	**NO LIMIT**	**NO LIMIT**

Calculation of pH of a Mixture of Two Flows- pH at the Chronic Mixing Zone Boundary

Calculation of pH of a Mixture of Two Flows

Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

INPUT		
	@ Acute Boundary	**@ Chronic Boundary**
1. Dilution Factor at Mixing Zone Boundary	43.7	83.9
2. Ambient/Upstream/Background Conditions		
Temperature (deg C):	20.10	20.10
pH:	8.80	8.80
Alkalinity (mg CaCO3/L):	41.40	41.40
3. Effluent Characteristics		
Temperature (deg C):	22.00	22.00
pH:	6.30	6.30
Alkalinity (mg CaCO3/L):	100.00	100.00
4. Aquatic Life Use Designation	Char spawning & rearing and/or core summer habitat	
OUTPUT		
1. Ionization Constants		
Upstream/Background pKa:	6.38	6.38
Effluent pKa:	6.37	6.37
2. Ionization Fractions		
Upstream/Background Ionization Fraction:	1.00	1.00
Effluent Ionization Fraction:	0.46	0.46
3. Total Inorganic Carbon		
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	42	42
Effluent Total Inorganic Carbon (mg CaCO3/L):	217	217
4. Condtions at Mixing Zone Boundary		
Temperature (deg C):	20.14	20.12
Alkalinity (mg CaCO3/L):	42.74	42.10
Total Inorganic Carbon (mg CaCO3/L):	45.57	43.65
pKa:	6.38	6.38
5. Allowable pH change	NA	0.20
RESULTS		
pH at Mixing Zone Boundary:	**7.56**	**7.81**
pH change at Mixing Zone Boundary:	1.24	0.99
Is permit limit needed?	NO	YES

Appendix E—Response to Comments

The Department of Ecology received no comments.