Fact Sheet for NPDES Permit WA0024961
Grays Harbor Energy Center

April 19, 2019

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Energy Facility Site Evaluation Council (EFSEC) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for Grays Harbor Energy Center (GHEC).

This fact sheet complies with Section 463-76-034 of the Washington Administrative Code (WAC), which requires EFSEC to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

EFSEC 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 GHEC, NPDES permit WA0024961, are available for public review and comment from April 22, 2019 until May 21, 2019. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

GHEC reviewed the draft permit and fact sheet for factual accuracy. EFSEC corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, EFSEC will summarize substantive comments and provide responses to them. EFSEC will include the summary and responses to comments in this fact sheet as **Appendix G - Response to Comments**, and publish it when issuing the final NPDES permit. EFSEC 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

Grays Harbor Energy Center (GHEC) is an electrical power generating plant capable of producing a maximum output of 650 megawatts. GHEC runs intermittently as a peaking plant, whenever market conditions are economically advantageous. GHEC treats wastewater generated onsite and discharges it to the Chehalis River. EFSEC issued the previous permit for this facility on May 13, 2008 and modified it on November 1, 2010 to address compliance concerns that had arisen after construction was completed.

The proposed permit retains the effluent limits for temperature, Total Suspended Solids (TSS), Oil and Grease (O&G), chromium, and pH from the previous permit. The proposed permit modifies the limits for Free Available Chlorine and removes the limits for ammonia and iron; and reduces the monitoring frequencies for chromium, turbidity, ammonia, and iron. The proposed permit includes monitoring and pollutant minimization requirements for arsenic; a Whole Effluent Toxicity characterization study at Outfall 001; and a requirement to conduct a new receiving water study.

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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 for energy facilities to EFSEC [Revised Code of Washington (RCW) 90.48.262(2)]. The Legislature defined EFSEC's authority and obligations for the wastewater discharge permit program in RCW 80.50 and RCW 90.48.

The following regulations apply to industrial NPDES permits:

- Procedures EFSEC follows for issuing NPDES permits [chapter 463-76 of the Washington Administrative Code (WAC)]
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for ground waters (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 industrial 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 performance requirements imposed by the permit.

Under the NPDES permit program, and in response to a complete and accepted permit application, EFSEC must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. EFSEC must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a minimum thirty-day comment period (WAC 463-76-041). (See **Appendix A-Public Involvement Information** for more detail about the public notice and comment procedures). After the public comment period ends, EFSEC may make changes to the draft NPDES permit in response to comments. EFSEC will summarize the responses to comments and any changes to the permit in **Appendix G**.

II. Background Information

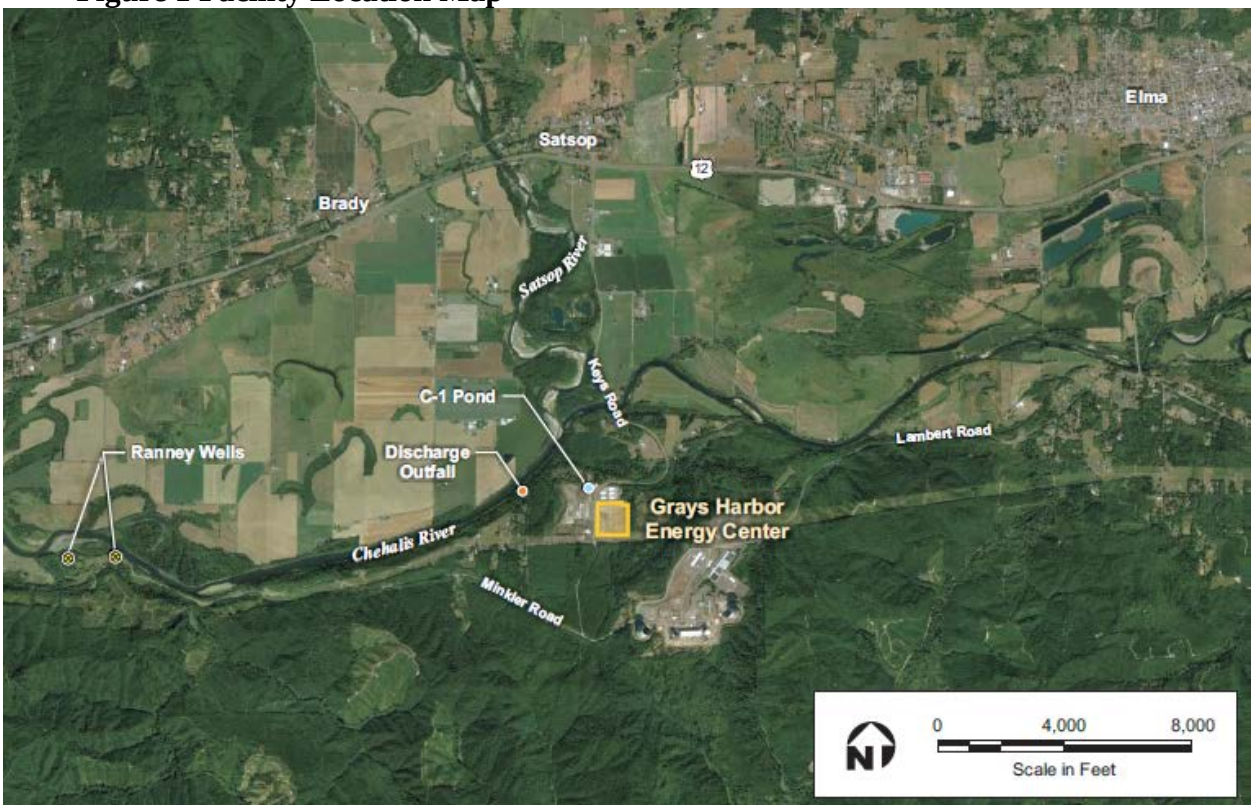
Table 1 General Facility Information

Facility Information	
Applicant	Grays Harbor Energy, LLC
Facility Name and Address	Grays Harbor Energy Center 401 Keys Road Elma, WA 98541
Contact at Facility	Name: Christopher Sherin Telephone #: (360) 482-4349
Responsible Official	Name: Christopher Sherin Title: Plant Manager Telephone #: (360) 482-4349 FAX #: (360) 482-4376
Industry Type	Electrical Power Generation
Type of Treatment	Multimedia Filtration, Dechlorination, and Neutralization
SIC Codes	4911
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	**Outfall 001**: Chehalis River Latitude: 46.972056 Longitude: - 123.490528 **Outfall 002B**: Infiltrated into ground Latitude: 46.972183 Longitude: - 123.482778

Permit Status	
Issuance Date of Previous Permit	May 13, 2008
Issuance Date of Modified Permit	November 1, 2010
Application for Permit Renewal Submittal Date	November 13, 2017
Date of EFSEC Acceptance of Application	December 14, 2017

Inspection Status	
Date of Last Sampling Inspection	April 16, 2018
Date of Last Non-Sampling Inspection	March 4, 2019

Figure 1 Facility Location Map



A. Facility Description

History

The Grays Harbor Energy Center (GHEC) formerly known as the Satsop Combustion Turbine Project is located on an approximately 22-acre site south of the Chehalis River near the town of Elma. The construction of the facility was completed in spring of 2008 and the facility became operational in July 2008. The facility is owned and operated by Grays Harbor Energy LLC.

Cooling Water Intakes

CWA § 316(b) requires the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. Since July 2013, Ecology has required a supplemental application for all applicants using EPA Form 2-C. GHEC selected "No" on this form when asked if a cooling water intake is associated with the facility.

Industrial Processes

Grays Harbor Energy Center is an electrical power generating plant consisting of two natural gas-fired turbines on a 2-on-1 configuration with a single steam turbine. Each gas turbine

powers a generator capable of producing 175 megawatts (MW). The gas turbine's exhaust energy is reclaimed in a closed system called Heat Recovery Steam Generator (HRSG) producing steam to drive a steam turbine. The steam turbine powers a generator capable of producing 300 MW. GHEC is capable of producing a maximum output of 650 MW. The electric power produced is transmitted to the Bonneville Power Administration (BPA) transmission grid.

Wastewater Treatment Processes

The facility withdraws ground water at a rate of approximately 1,900 gallons per minute (gpm) from a Ranney well for process water supply. The well is located on the southern bank of the Chehalis River, approximately 4 miles downriver of the plant site near the river's confluence with Elizabeth Creek.

The facility has two wastewater streams generated from cooling tower blowdown and an oil/water separator. The cooling system at the plant consists of a circulating cooling water system, a condenser, and a 9-cell mechanical draft cooling tower. The circulating cooling water system routes the cooling water to the condenser at approximately 175,000 gpm to condense the steam. The cooling tower continuously receives heated cooling water from the condenser where it is cooled by an evaporative process. Cooling tower evaporation and "drift" losses average approximately 1,400 gpm. The temperature of the cooling water has been reduced when it reaches the cooling tower basin, where it is collected and returned to the cooling system.

This cooling cycle is repeated and the dissolved salts in the remaining cooling water become more concentrated as a result of the evaporative process. When the concentration of the dissolved salts nears their solubility limit, scale formation can occur on the condenser tubes and hinder heat transfer. Therefore, a portion of the cooling water, called blowdown, is removed from the system and discharged to address this concentration effect. Fresh cooling water is continuously added to the process to offset evaporation losses and blowdown discharges. The facility uses a heat exchanger to cool the discharge temperature before it enters the Chehalis River. Raw supply water passes through the heat exchanger to cool the discharge prior to entering the facility.

Sodium hypochlorite is added to the cooling tower to prevent microbial growth. If chlorine is detected in the cooling tower blowdown, sodium bisulfite is added to neutralize the residual chlorine.

The oil/water separator (OWS) collects water from wastewater streams in the plant that may potentially contain oil, grease, and suspended solids. Sources of these constituents are the steam turbine lube oil purification system and equipment and floor drains. The OWS is continually processing wastewater at a rate of approximately 5 gpm. The wastewater from the OWS is mixed with the cooling tower blowdown water before entering the blowdown line. A reservoir connected to the OWS collects any recovered oil for offsite recycling. The facility discharges treated cooling tower blowdown and oil/water separator water through Outfall 001 to the Chehalis River at an annual average flow rate of 0.44 MGD.

Stormwater

Stormwater from the facility is collected in a storm drain system (designated as Outfall 002B), conveyed through a pipe beneath Keys Road, and discharged to a stormwater detention pond (C-1 pond) that is adjacent to the facility. This pond is located on property owned by the Port of Grays Harbor and is designed to handle a 100-year storm event. The pond also receives stormwater discharges from the surrounding properties that are not under the control of the GHEC.

Sanitary Waste

Sanitary sewage from the facility is treated in a septic tank system and discharged to a drain field onsite. The sanitary waste stream flow to the onsite system is less than 3,500 gallons per day, which is regulated by the Grays Harbor County Health Department. Grays Harbor County approved the sanitary waste facility design for GHEC on June 13, 2002.

Solid Wastes

GHEC generates various solid wastes onsite including: general refuse, wood products, scrap metal, metal drums, petroleum products, oil and solvent rags, worn tires, spent batteries, and light bulbs. These solid wastes are disposed of and recycled in accordance with the solid waste regulations.

Discharge Outfalls

The treated and disinfected effluent from the plant is discharged to the Chehalis River through Outfall 001. The conveyance pipe to the outfall consists of a combination of 21-inch diameter reinforced concrete pipe, 20-inch diameter carbon steel pipe, and 18-inch diameter carbon steel pipe that extends north of the plant and below the Chehalis River to a diffuser structure.

Stormwater is collected in a stormwater drainage system and is discharged to a stormwater detention pond (C-1) through a pipe beneath Keys Road. The stormwater outfall is designated as Outfall 002B. C-1 pond is designed to handle a 100-year storm event and is unlined. The stormwater in the pond evaporates and infiltrates into the ground. If stormwater exceeds the C-1 pond design capacity, the stormwater is discharged to a drainage area leading to the Chehalis River. Stormwater in this pond has never exceeded the design capacity, even during a 100-year rainfall event.

B. Description of the Receiving Water

GHEC discharges to the Chehalis River. This section of the river is tidally influenced because of the proximity to Grays Harbor. Other nearby point source outfalls include the Elma Sewage Treatment Plant. Significant nearby non-point sources of pollutants include agricultural activities.

The ambient background data used in preparing this permit were obtained from the 2018 GHEC Wastewater Engineering Report prepared by AECOM, which included data from the 2003 Receiving Water Study undertaken by Duke Energy to meet the requirements of the 2008 NPDES permit.

Table 2 includes the data from Sampling Points 1, 2, 4, and 5 from this study. Sampling Point 3 was located within the discharge area of GHEC's Outfall 001. The data collected at Sampling Point 3 is not considered ambient background data.

The 2018 Engineering Report also includes data from a 2012 Receiving Water Study conducted by URS. There were three sampling points in this study – one downstream, one upstream, and one at the outfall. The results of the study showed a number of parameters in the receiving water that exceeded water quality standards including iron, Total Residual Chlorine, temperature, and Dissolved Oxygen.

The proposed permit requires GHEC to conduct a new receiving water study following guidelines for preparing Quality Assurance Project Plans and clean sampling techniques. The ambient background data from the new study will be used to verify the results of the 2012 study and to perform an updated reasonable potential analysis to determine compliance with water quality standards.

Table 2 Ambient Background Data

Parameter	Maximum Value	No. of Samples
Temperature	12.82 °C	4
pH	7.62 standard units	4
Dissolved Oxygen	8.66 mg/L	4
Total Ammonia-N	0.0.028 mg/L	4
BOD	1 mg/L	4
TSS	30.4 mg/L	4
Hardness	33 mg/L as CaCO3	4
Arsenic, Total	0.29 µg/L	4
Cadmium, Total	0.03 µg/L	4
Chromium, Total	1.17 µg/L	4
Copper, Total	2.34 µg/L	4
Lead, Total	0.18 µg/L	4
Mercury, Total	0.00 µg/L	4
Nickel, Total	1.1 µg/L	4
Selenium, Total	0.24 µg/L	4
Silver, Total	0.05 µg/L	4
Zinc, Total	2.28 µg/L	4

C. Wastewater Characterization

GHEC reported the concentration of pollutants in the discharge at Outfall 001 in the permit renewal application dated November 13, 2017 and in monthly discharge monitoring reports.

The tabulated data below represents the quality of the wastewater effluent discharged from January 2015 through September 2017 except for metals (arsenic, chromium copper, zinc, mercury, and hexavalent chromium). The metals data are from August through September 2017 and reflect the quality of the wastewater effluent discharged following the implementation of the AKART pollution prevention measures. The wastewater effluent at Outfall 001 is characterized as follows:

Table 3 Outfall 001 Wastewater Characterization

Parameter	Units	No. of Samples	Maximum Value
Biochemical Oxygen Demand (BOD_5)	mg/L	1	<2
Total Suspended Solids (TSS)	mg/L	30	12
Ammonia (as N)	mg/L	35	0.11
Chlorine, Free Available	mg/L	658	0.075*
Nitrate-Nitrite (as N)	mg/L	3	7.56
Oil and Grease	mg/L	35	1.9
Iron, Total**	µg/L	19	39
Aluminum, Total	µg/L	3	11.1
Antimony, Total	µg/L	3	1.49
Arsenic, Dissolved**	µg/L	18	3.46
Chromium, Total**	µg/L	19	2.69
Copper, Total**	µg/L	19	1.18
Lead, Total	µg/L	3	0.057
Manganese, Total	µg/L	3	1.12
Mercury, Total**	µg/L	19	0.0101
Nickel, Total	µg/L	3	1.16
Selenium, Total	µg/L	3	1.3
Zinc, Total**	µg/L	17	2.7
Cyanide	µg/L	3	3
Chloroform	µg/L	3	1.6
Diethyl Phthalate	µg/L	3	0.068
Di-N-Butyl Phthalate	µg/L	3	0.083
Temperature	°C	273	16
* Used 95th percentile ** Data from 2018 Updated Wastewater Engineering Report			

Parameter	Units	No. of Samples	Minimum Value	Maximum Value
pH	Standard Units	661	8.4	8.8

GHEC reported the concentration of pollutants in the discharge at Outfall 002B in the permit. Renewal application dated November 13, 2017 and in quarterly discharge monitoring reports. The tabulated data below represents the quality of the stormwater discharged from January 2016 through June 2018.

Table 4 Stormwater Monitoring Data for Outfall 002B

Parameter	Units	No. of Samples	Average Value	Maximum Value	Ground Water Criteria
pH	SU	9	6.4*	7.6	6.5 - 8.5
Turbidity	NTU	9	5.8	19.2	--
Copper	µg/L	9	5.1	12.2	1,000
Zinc	µg/L	9	5.4	14.5	5,000
Oil & Grease	mg/L	9	NVS	NVS	--
* minimum value NVS - No Visible Sheen					

D. Summary of Compliance with Previous Permit Issued

The previous permit issued on May 13, 2008 and modified on November 1, 2010 placed effluent limits on temperature, ammonia, Free Available Chlorine, pH, Total Suspended Solids, Oil and Grease, total chromium, and total iron.

GHEC has not consistently complied with the effluent limits and permit conditions throughout the duration of the permit issued on May 13, 2008. EFSEC assessed compliance based on its review of the facility's discharge monitoring reports (DMRs).

EFSEC drafted the permit conditions while GHEC was still under construction. GHEC began operations in July 2008. Immediately after the start of operations, several compliance issues emerged that resulted in routine exceedances of the effluent limits for pH and iron and a failure to monitor the discharge at Outfall 001 between July 1, 2008 and September 30, 2008. In response to these compliance issues, EFSEC issued a Notice of Incident (NOI) to GHEC on November 13, 2008. During subsequent investigations of the pH exceedances, GHEC found a dysfunctional pH neutralization system and replaced the entire system soon after. GHEC has since complied with the pH limit. GHEC has complied with the effluent limits and conditions of the permit since 2008.

The previous permit included a schedule of compliance that required GHEC to demonstrate application of all known, available and reasonable methods of prevention, control and treatment (AKART) and compliance with applicable water quality standards for all discharges to the environment. Demonstration of compliance was to be accomplished through completion of an engineering report. The schedule of compliance was approved by EFSEC on April 2014 and required compliance with AKART and water quality standards by August 1, 2016.

GHEC submitted a draft engineering report to EFSEC on September 9, 2015. EFSEC provided this engineering report to Ecology (EFSEC's compliance contractor) for review and comment. Based on Ecology's recommendation, EFSEC did not approve the draft engineering report. Ecology's recommendation was based on GHEC's incomplete analysis of AKART and the uncertainty of complying with state water quality standards at Outfall 001 after implementation of the proposed pollution measures in the engineering report.

Further, Ecology recommended that EFSEC authorize GHEC to implement pollution prevention measures and re-evaluate its discharge for compliance with state water quality standards. The pollution prevention measures included the following:

1. Replacing the arsenic treated timbers used in the cooling towers with fiberglass reinforced plastic (FRP) structural members to reduce arsenic in the discharge.
2. Replacing the sulfuric acid used in the process with a high-purity sulfuric acid with a mercury content of less than 1µg/L to reduce mercury in the discharge.
3. Working with GHEC's chemical service provider to minimize dosing of the NALCO 3DT185 product to reduce phosphorous in the discharge.

GHEC implemented these pollution prevention measures in 2015 and 2017 and submitted the final engineering report to EFSEC on January 16, 2018. The engineering report stated that the mercury, arsenic, and phosphorous concentrations had been reduced by 95%, 86%, and 67%, respectively at Outfall 001. Although pollution prevention measure #1 above effectively reduces the arsenic concentration in the discharge but it still does not meet the human health water quality criteria of 0.018 µg/L. Based on Ecology's recommendation, EFSEC approved the engineering report except for the part of the engineering report on arsenic. The requirement for further monitoring of arsenic is discussed in Section III.H of this factsheet.

During the previous permit term, there was only one benchmark exceedance at Outfall 002B. The sampling result of copper in September 2013 was 24.5 µg/L. Stormwater benchmarks are not limits but rather action levels that when exceeded require GHEC to take actions defined in the permit. GHEC's investigation determined that the copper result of 24.5 µg/L was an anomaly.

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

Table 5 Permit Submittals

Submittal	Date Required	Date Received
Outfall Inspection	9/13/2017	9/13/2017
Acute Toxicity Testing	9/28/2012	9/28/2012
Chronic Toxicity Testing	9/28/2012	9/28/2012
Solid Waste Control Plan	11/10/2012	11/10/2012
Engineering Report (original)	8/2015	8/2015
Engineering Report (updated)	12/31/2017	12/28/2017

E. 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 EFSEC 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).
- EFSEC 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 permit renewal application dated November 13, 2017 and from supporting reports (engineering, hydrogeology, etc.). EFSEC evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. EFSEC 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.

EFSEC 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 EFSEC if significant changes occur in any constituent [40 CFR 122.42(a)]. Until EFSEC 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. The proposed permit requires that GHEC submit an O&M manual that includes design criteria for wastewater treatment processes used onsite to EFSEC for review and approval. EFSEC will impose an appropriate design criteria in the next permit cycle to ensure that GHEC operates and maintains the facilities or systems of control at all times to achieve compliance with the terms and conditions of the NPDES permit.

B. Technology-Based Effluent Limits

Technology-based limitations are set by regulation in the federal effluent guidelines or on a case-by-case basis using Best Professional Judgment (BPJ) when no effluent guidelines exist for an industrial category. Technology-based effluent limits represent the best treatment a facility can achieve consistent with the economic means of the industry as a whole (in the

case of effluent guidelines) of the specific facility being permitted (in the case of BPJ). Technology-based effluent limits are process control parameters or numbers which indicate that a process, which in this case is wastewater treatment, is not functioning properly.

The Environmental Protection Agency (EPA) promulgated the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (40 CFR 423 Part 423.15) in 1974 and amended the regulations in 1977, 1978, 1980, 1982, and 2015. EFSEC must ensure that facilities provide all known, available, and reasonable methods of prevention, control, and treatment (AKART) when it issues a permit. EFSEC determined that the federal effluent guidelines constitute AKART.

The New Source Performance Standards (NSPS) for the pertinent waste streams produced by GHEC are summarized in the table below.

Table 6 NSPS Guidelines

Parameter	Average Monthly Limit	Maximum Daily Limit
Priority Pollutants [a] and PCBs	ND [b]	ND [b]
Low Volume Waste Sources		
Total Suspended Solids (TSS)	30 mg/L	100 mg/L
Oil and Grease	15 mg/L	20 mg/L
Chemical Metal Cleaning Wastes		
Copper, Total	1 mg/L	1 mg/L
Iron, Total	1 mg/L	1 mg/L
Cooling Water Blowdown		
Zinc, Total	1 mg/L	1 mg/L
Chromium, Total	0.2 mg/L	0.2 mg/L
Free Available Chlorine	0.2 mg/L	0.5 mg/L
Total Residual Chlorine [c]	--	0.2 mg/L

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

Notes:
[a] The priority pollutants contained in chemicals added for cooling tower maintenance, except for copper and zinc.
[b] No detectable amount
[c] Total Residual Chlorine may not be discharged from any unit for more than two hours in any one day and no more than one unit in any plant may discharge Total Residual Chlorine at any one time unless the facility can demonstrate to EFSEC that the facility cannot operate at or below this level of chlorination.

The federal effluent limitations for this category give the permit writer the discretion to express the allowable discharge quantity as a concentration-based limit rather than a mass-based limit. The technology-based concentration values and other requirements in the NSPS section of the

federal effluent guidelines were used to establish limits in the proposed permit except as indicated in the following discussion.

PCBs are commonly found in transformer fluid in the steam electric power generating industry. PCBs were not detected in the facility's final effluent. EFSEC has included the same effluent limit for PCBs in the proposed permit as the effluent limit for priority pollutants from federal effluent guidelines.

GHEC generated metal cleaning process waste during a one-time event to clean piping during construction. None of this waste was discharged to Outfall 001. The metal cleaning process waste was collected and transported off-site for disposal. Based on this information, the NSPS effluent limitations for Chemical Metal Cleaning Wastes are not applicable.

The inclusion of zinc in the federal effluent guidelines was due to the common use of cooling tower biocides and corrosion and scaling control chemicals containing zinc chloride, zinc dichromate, zinc oxides, zinc sulfate, calcium zinc polyphosphate, potassium zinc polyphosphate, and zinc chloride. These chemicals are no longer used at the GHEC facility. There are no other sources of zinc at the facility. The proposed permit does not include a technology-based limit for zinc.

The previous permit included the federal effluent limitations for free available chlorine but not the limit for total residual chlorine. The quantity of free available chlorine is either equal to or less than total residual chlorine in a sample depending upon the chemistry of the sample. In many cases, total chlorine is essentially equal to free chlorine. The proposed permit replaces the technology-based effluent limits for free available chlorine with the more stringent daily maximum limit from the federal effluent limitation guidelines for total residual chlorine. The new daily maximum daily limit applies to free available chlorine. GHEC is not required to replace the existing meter used to continuously monitor for free available chlorine but the free available chlorine results must be compared to the total residual chlorine limit to determine compliance.

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. EFSEC 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 143 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); 2006) 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, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

Description--The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) 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. EFSEC 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.

EFSEC'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. EFSEC 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 EFSEC 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)].

EFSEC uses modeling to estimate the amount of mixing within the mixing zone. Through modeling EFSEC 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. EFSEC 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. EFSEC 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.

Each aquatic life *acute* criterion is 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. Each aquatic life *chronic* criterion is 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. EFSEC 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.

EFSEC has determined that the treatment provided at GHEC meets the requirements of AKART (see "Technology-based Limits").

3. EFSEC 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/SummaryPages/92109.html.

Table 7 Critical Conditions Used to Model the Discharge

Critical Condition	Value
The seven-day-average low river flow with a recurrence interval of ten years (7Q10)	522 cfs
The thirty-day low river flow with a recurrence interval of five years (30Q5)	731 cfs
River depth at the 7Q10 period	3 feet
River velocity	0.2 ft/s
Manning roughness coefficient	0.04
Slope	0.001 ft/ft
Channel width	260 feet
Maximum average monthly effluent flow for chronic and human health non-carcinogen	0.56 MGD
Annual average flow for human health carcinogen	0.44 MGD
Maximum daily flow for acute mixing zone	0.98 MGD
7-DAD MAX Effluent temperature	14.6 degrees C

EFSEC obtained ambient data at critical conditions in the vicinity of the outfall from **Table 1-4** in the Mixing Zone Analysis prepared by URS Corporation and submitted to EFSEC in February 2014.

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. EFSEC 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.

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

EFSEC 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, EFSEC 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.

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

EFSEC 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.

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

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

EFSEC 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, EFSEC 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, EFSEC has effectively minimized the size of the mixing zone authorized in the proposed permit.

6. Maximum size of mixing zone.

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

7. Acute mixing zone.

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

EFSEC determined the acute criteria will be met at 10% of the distance of the chronic mixing zone.

- **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.

8. Overlap of mixing zones.

This mixing zone does not overlap another mixing zone.

D. Designated uses and surface water quality criteria

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

- 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 8 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 9 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.

E. Water Quality Impairments

The Lower Chehalis River is not listed on the current 303(d) impaired surface water body (Ecology 2002a). However, the Lower Chehalis River has been assessed as having Category 2 (water of concern) impairment for temperature and Category 4a (polluted waters that do not require a Total Maximum Daily Load (TMDL) Analysis for excursions of bacteria. The Upper Chehalis River has been assessed as having Category 5 impairment for turbidity, Category 4a impairment for dissolved oxygen, temperature, and bacteria, and Category 2 for impairment for pH, dissolved oxygen, bacteria, and turbidity. The TMDL analyses have been submitted for Upper Chehalis River for the following parameters: fecal coliform, bacteria, and temperature. The TMDL summary is located on the following website, http://www.ecy.wa.gov/programs/wq/tmdl/ChehalisRvrTMDLSummary.html

F. Evaluation of Surface Water Quality-Based Effluent Limits for Narrative Criteria

EFSEC 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.

EFSEC 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 EFSEC 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, EFSEC 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. EFSEC's analysis of the need for WET testing for this discharge is described later in the fact sheet.

G. Evaluation of Surface Water Quality-Based Effluent Limits for Numeric Criteria

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biological oxygen demand (BOD) 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. EFSEC 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 buried diffuser manifold at Outfall 001 is approximately 30 feet long with a diameter of 18 inches. The diffuser has a total of two 8 inch diameter ports. The distance between ports is approximately 10 feet. The diffuser depth is 5 feet. The mean lower low water (MLLW) depth is approximately 8 feet.

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 downstream is 303 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 30.3 feet. The mixing zone extends from the bottom to the top of the water column. The dilution factor is based on this distance.

EFSEC determined the dilution factors for Outfall 001 that occur within these zones at the critical condition from the Mixing Zone Analysis Summary prepared by URS dated February 27, 2014 (Appendix L of the 2018 Engineering Report). These are the same dilution factors from the modified permit dated November 1, 2010. The dilution factors for Outfall 001 are listed in Table 10 below.

Table 10 Dilution Factors for Outfall 001

Criteria	Acute	Chronic
Aquatic Life	4	51
Human Health, Carcinogen		67
Human Health, Non-carcinogen		67

EFSEC determined the impacts of pH, turbidity, total residual chlorine, ammonia, metals, other toxics, and temperature as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

EFSEC reviewed data submitted in GHEC's permit renewal application dated November 13, 2017 (Appendix A of the 2018 Engineering Report) and discharge monitoring reports from October 2014 through April 2018 (See **Appendix E**) to make the following determinations regarding the discharges at Outfalls 001 and 002B.

pH-- EFSEC predicts no violation of the pH criteria under critical conditions. The proposed permit includes technology-based effluent limits for pH of 6.0 to 9.0.

Turbidity-- EFSEC evaluated the impact of turbidity based on the range of turbidity in the effluent and the turbidity of the receiving water. Based on the surface water criteria and the DMR data (See **Appendix E)**, EFSEC determined that there will be no violations of the turbidity criteria outside of the designated mixing zone.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require EFSEC 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. EFSEC does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

The following toxic pollutants are present in the discharge at Outfall 001: ammonia, aluminum, antimony, arsenic, free available chlorine, chloroform, copper, cyanide, diethylphthalate, di-n-buthyl phthalate, iron, lead, manganese, mercury, nickel, nitrate-nitrite, selenium, and zinc. EFSEC conducted a reasonable potential analysis (See **Appendix F**) on these parameters to determine whether it would require effluent limits in this permit. Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. To evaluate ammonia toxicity, EFSEC used the available receiving water information and Ecology spreadsheet tools.

Valid ambient background data were available for the list of pollutants in the 2003 Receiving Water Study (Appendix E of the 2018 Engineering Report). EFSEC used this ambient data and all applicable effluent data to evaluate reasonable potential for the discharge at Outfall 001 to cause a violation of water quality standards. EFSEC chose not to use the ambient data from the 2012 Receiving Water Study in this evaluation. See Section II.B. Description of Receiving Water for a more detailed discussion of ambient conditions.

EFSEC determined that ammonia, aluminum, antimony, arsenic, chloroform, copper, chlorine, cyanide, diethylphthalate, di-n-buthyl phthalate, iron, lead, manganese, mercury, nickel, nitrate-nitrite, selenium, and zinc pose no reasonable potential to exceed the water quality criteria at the critical condition, using procedures given in EPA, 1991 and as described above. EFSEC's determination assumes that this facility meets the other effluent limits of this permit.

EFSEC used free available chlorine data for the discharge at Outfall 001 in the reasonable potential analysis to compare to the water quality standards for total residual chlorine. There was no total residual chlorine data available for the discharge. The proposed permit requires GHEC to monitor for total residual chlorine at Outfall 001 at least annually with other priority pollutants.

Water quality criteria for most metals published in chapter 173-201A WAC are based on the dissolved fraction of the metal (see footnotes to table WAC 173-201A-240(3); 2006). GHEC

may provide data clearly demonstrating the seasonal partitioning of the dissolved metal in the ambient water in relation to an effluent discharge. EFSEC may adjust a metal's translator on a site-specific basis when data is available clearly demonstrating the seasonal partitioning in the ambient water in relation to an effluent discharge.

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

EFSEC 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).

- 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, EFSEC's 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.

General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.

Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

GHEC routes all of its stormwater to the C-1 detention pond. EFSEC determined that temperature is not a significant stormwater pollutant parameter. Therefore, the proposed permit does not include a temperature limit at Outfall 002B and it does not require the facility to monitor temperature in the stormwater discharge. EFSEC may elect to develop procedures and guidance for regulating the effects of stormwater to comply with temperature water quality criteria in the future.

Annual summer maximum, supplementary spawning criterion, and incremental warming criteria: EFSEC calculated the reasonable potential for the discharge to exceed the annual summer maximum, the supplementary spawning criterion, and the incremental warming criteria (See temperature calculations in **Appendix F**).

The discharge is only allowed to warm the water by a defined increment when the background (ambient) temperature is cooler or warmer than the assigned threshold criterion. EFSEC allows warming increments only when they do not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

The incremental increase for this discharge is within the allowable amount. The reasonable potential to exceed analysis showed that no limit was required for temperature.

The proposed permit retains the daily maximum limit of 16°C for effluent temperature at Outfall 001 which was established by the Site Certification Agreement between EFSEC and GHEC in 2003. This limit was based on a Stipulated Agreement with the Washington State Department of Fish and Wildlife. Under critical conditions, the temperature criterion for the receiving water could be exceeded. Although a temperature effluent limit of 18°C is normally considered protective of aquatic life in this receiving water, a temperature effluent limit of 16°C was imposed at Outfall 001 because it was found to be the threshold at which risk to Chinook salmon from disease, reduce oxygen, and abnormalities in alevins increases substantially.

Outfall 002B - The previous permit included stormwater benchmarks for the discharge at Outfall 002B. These benchmarks were based upon Ecology's Industrial Stormwater General Permit and were intended to indicate whether a discharge had potential to violate surface water quality standards. GHEC discharges all of its stormwater to the C-1 detention pond and the stormwater infiltrates into the ground. The proposed permit removes the stormwater benchmarks and requires monitoring at Outfall 002B to evaluate impacts to groundwater quality. See the discussion in Section III.J., Groundwater Quality Limits.

H. Human Health

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

EFSEC determined the effluent may contain chemicals of concern for human health, based on data or information indicating the discharge contains regulated chemical that EFSEC knows is present in the discharge.

EFSEC evaluated the discharge's potential to violate the water quality standards as required by 40 CFR 122.44(d) by following the procedures published in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001) and ECOLOGY's *Permit Writer's Manual* to make a reasonable potential determination. The evaluation showed that the discharge has a reasonable potential to cause a violation of human health standards for arsenic.

Arsenic

Ecology submitted newly adopted state Human Health Water Quality Criteria to the EPA for Clean Water Act review and approval in August 2016. Parts of that submittal to EPA were new total arsenic criteria of 10 µg/L for both marine and freshwaters. Additional requirements in the new state rule included pollutant minimization requirements for anthropogenic inputs of arsenic from both indirect and direct discharges. The state's new total arsenic criteria match the EPA's Safe Drinking Water Act maximum contaminant level (MCL) used in Washington State for drinking water protection. The state's new arsenic criteria took into account existing scientific data, high concentrations of naturally occurring arsenic in the State of Washington, and EPA's CWA approval of 10 µg/L total arsenic criteria in almost all other western states.

Ecology intended the new total arsenic criteria to supersede the inorganic arsenic human health criteria adopted for the State of Washington by the EPA in the 1992 National Toxics Rule (NTR; 40 CFR 131.36). The EPA's 1992 risk based human health criterion for marine waters is 0.14 µg/L inorganic arsenic, and is based on exposure from fish and shellfish tissue ingestion. The freshwater criterion is 0.018 µg/L, and is based on exposure from fish and shellfish tissue and surface water ingestion. The 2016 arsenic criteria adopted by Ecology eliminated uncertainties associated with the cancer potency factor used by the EPA in the 1992 NTR arsenic standards. However, the EPA disapproved Ecology's proposed total arsenic criteria in November 2016 and retained the inorganic arsenic human health criteria

set in the 1992 NTR. The EPA's Technical Support Document for the approval/disapproval of Washington's Human Health Water Quality Criteria states that the federal agency intends to conduct a toxicological review of inorganic arsenic in 2017. The work has not yet been completed. This toxicological review could lead to an opportunity for Ecology to participate in a national dialogue associated with the update of the arsenic criteria in section 304(a) of the Clean Water Act. Until the EPA inorganic arsenic review is completed, scientific information is updated, and Washington State adopts into rule EPA CWA-approvable new total or inorganic arsenic criteria, the EPA's existing marine and freshwater inorganic arsenic criteria remain in effect at 0.14 and 0.018 μg/L.

The EPA's disapproval of Washington's new total arsenic criteria continues to create several difficulties in the wastewater discharge permitting process. One issue, as mentioned above, involves natural background concentrations of both marine and freshwaters that exceed the criteria. This can be particularly problematic for groundwater-sourced drinking waters with arsenic concentrations above 0.018 μg/L, which then pass through wastewater treatment plants after initial use. In this situation, no implementation tool exists to account for the naturally occurring element in the drinking water source. Intake credits do not apply in this situation because the source water and the receiving water must be the same body of water or proven to be hydraulically connected. Another issue is the lack of a 40 CFR 136-approved analytical method for inorganic arsenic that can be used for compliance assessment.

Evaluation of point source discharges for effluent limit compliance must use 40 CFR 136 methods. The current 40 CFR 136-approved method for arsenic measures the total recoverable portion of the metal, and does not differentiate the inorganic portion. The lack of federally approved translators for inorganic-to-total recoverable arsenic in discharges increases the difficulty in assigning an effluent limitation for discharges to surface waters. Attainment of Washington's inorganic arsenic criteria remains challenging if not improbable.

At best, current treatment technologies may be capable of arsenic removal to approximate concentrations ranging from 0.5- 1 μg/L. The difference between the best available treatment technology and numeric effluent limits based on the criteria creates difficulty for both existing and proposed discharges. Ecology intends to continue to pursue a solution to the regulatory issue of groundwater sources with high arsenic concentrations that would cause treatment plant effluent to exceed effluent limits based on the numeric criteria.

Where numeric effluent limits are infeasible, 40 CFR 122.44(k) provides for the use of best management practices (BMPs) to control or abate the discharge of pollutants. This provision in the federal regulations provides the basis for EFSEC's permitting strategy for inorganic arsenic until the EPA revisits their criteria development procedures and develops site specific total-to-inorganic arsenic translators for individual dischargers.

Components of EFSEC's permitting strategy include permit requirements to monitor for total recoverable arsenic, implementation of source control BMPs, and an adaptive management process to refine BMPs for continuous pollutant minimization. While numeric effluent limits based on the human health inorganic arsenic criteria remain infeasible, Washington NPDES

permits will continue to contain numeric effluent limits for arsenic based on best available treatment technology and aquatic life-based criteria as appropriate.

EFSEC evaluated the discharge at Outfall 001 for the potential to exceed the arsenic human health criteria. This evaluation included a review of all total recoverable arsenic data and available dilution. EFSEC determined that there is a potential to exceed the arsenic human health criteria at Outfall 001. The proposed permit requires continued monitoring for total arsenic at Outfall 001, evaluating contributions from chemicals used in cooling tower maintenance, and reviewing quality assurance reports from bulk chemical suppliers to minimize the arsenic levels in the effluent.

I. Sediment Quality

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards EFSEC 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. http://www.ecy.wa.gov/programs/tcp/smu/sediment.html

GHEC's discharge of an average 0.44 MGD consists primarily of non-contact cooling water with very low suspended solids concentrations and dissolved and non-dissolved fractions of metals. The metals tend not to bind to the sands and gravels in the river, therefore metals accumulation is not expected to be of concern. After a review of the discharger and effluent characteristics, EFSEC determined that the discharge at Outfall 001 has no reasonable potential to violate the sediment management standards.

Permit Condition S8. requires that GHEC observes the natural conditions and any solids deposition surrounding Outfall 001 during the outfall evaluation and document these observations in the report.

J. Groundwater Quality Limits

The groundwater quality standards (chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by EFSEC must not allow violations of these standards (WAC 173-200-100).

GHEC discharges its stormwater to C-1 pond which is unlined allowing the stormwater to infiltrate into the ground. The stormwater monitoring data for Outfall 002B in Table 4 was compared to the Groundwater Quality Standards. Overall, the stormwater data was below the groundwater quality criteria except on one occasion when pH was lower than the minimum groundwater quality criteria of 6.5. GHEC is required to continue to monitor their stormwater quarterly throughout the next permit term. EFSEC will evaluate the monitoring results at the end of the permit term and determine if limits are required to protect groundwater quality 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 with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.
- *Chronic toxicity tests measure various sublethal toxic responses,* such as reduced growth or reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure survival.

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know 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/SummaryPages/9580.html) which is referenced in the permit. EFSEC recommends that each regulated facility send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

During the previous permit term, the facility conducted effluent characterization for acute and chronic toxicity in 2010 and 2012, respectively (https://fortress.wa.gov/ecy/paris/PermitLookup.aspx). Table 11 shows that all test results for Outfall 001 met the performance standards.

Table 11 WET Testing Summary for Outfall 001

Test Date	Test	Organism	Endpoint	NOEC	LOEC
9/20/2010	Acute	*Ceriodaphnia dubia*	48-Hour Survival	100%	>100%
		Water Flea			
9/20/2010	Acute	*pimephales promelas*	96-Hour Survival	100%	>100%
		Fathead Minnow			
9/20/2010	Chronic	*Ceriodaphnia dubia*	7 Day Survival	100%	>100%
		Water Flea	7 Day Reproduction	100%	>100%
9/20/2010	Chronic	*pimephales promelas*	7 Day Survival	100%	>100%
		Fathead Minnow	7 Day Biomass	100%	>100%
			7 Day Weight	100	>100%
9/30/2010	Chronic	*selenastrum*	96-Hour Cell Density	100%	>100%

Test Date	Test	Organism	Endpoint	NOEC	LOEC
		Green Algae			
8/14/2012	Acute	*Ceriodaphnia dubia*	48-Hour Survival	100%	>100%
		Water Flea			
8/14/2012	Acute	*pimephales promelas*	96-Hour Survival	100%	>100%
		Fathead Minnow			
8/14/2012	Chronic	*Ceriodaphnia dubia*	7 Day Survival	100%	>100%
		Water Flea	7 Day Reproduction	100%	>100%
8/14/2012	Chronic	*pimephales promelas*	7 Day Survival	100%	>100%
		Fathead Minnow	7 Day Biomass	100%	>100%
			7 Day Weight	100%	>100%
8/14/2012	Chronic	*selenastrum*	96-Hour Cell Density	100%	>100%
		Green Algae			

The previous permit required GHEC to conduct WET testing for one year to characterize both the acute and chronic toxicity of the effluent at Outfall 001. GHEC was only able to complete part of the characterization requirements as they were only operating intermittently during this time period. GHEC facility operating schedule depends upon the market demand for its power. Typically, the GHEC facility operates intermittently between June and February, although this timeframe can vary from year to year.

The proposed permit requires GHEC to repeat the characterization of the effluent at Outfall 001 for acute and chronic toxicity. The effluent must be sampled quarterly. If there is no discharge during the required quarter, GHEC must notify EFSEC and Ecology and conduct sampling on the next representative discharge that occurs in the following quarter.

L. Comparison of Effluent Limits with the Previous Permit.

Table 12 Comparison of Previous and Proposed Effluent Limits

		Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
Parameter	**Basis of Limit**	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Temperature	Site Certification Agreement	--	16 °C	--	16 °C
Ammonia	Performance-based	160 mg/L	321 mg/L	--	--
Total Suspended Solids (TSS)	Technology-based	30 mg/L	100 mg/L	30 mg/L	100 mg/L
Free Available Chlorine	Technology-based and BPJ	0.2 mg/L	0.5 mg/L	--	0.2 mg/L

Table 12 Comparison of Previous and Proposed Effluent Limits

		Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
Parameter	**Basis of Limit**	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Oil and Grease	Technology-based	15 mg/L	20 mg/L	15 mg/L	20 mg/L
Chromium, Total	Technology-based	0.2 mg/L	0.2 mg/L	--	0.2 mg/L
Iron, Total	Technology-based	1.0 mg/L	1.0 mg/L	--	--
pH	Technology-based	6 – 9 SU		6 – 9 SU	
Priority Pollutants and PCBs	Technology-based and BPJ	Non-detect		Non-detect	

	Previous Stormwater Benchmarks: Outfall 002B		Proposed Stormwater Benchmarks: Outfall 002B	
Parameter	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Turbidity	--	25 NTU	--	--
Oil and Grease	--	15 mg/l	--	--
Zinc, Total	--	117 µg/l	--	--
Copper, Total	--	14 µg/l	--	--
pH	6 – 9 SU		--	

IV. Monitoring Requirements

EFSEC 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 for Outfalls 001 and 002B is detailed in the proposed permit under Special Condition S2. 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.

EPA distributed guidance in April of 1996 entitled, "Interim Guidance for Performance-Based Reduction of NPDES Permit Monitoring Frequencies". EPA's goal was to reduce the regulatory burden associated with monitoring and reporting on the basis of excellent performance. The guidance provides a tool to evaluate a facility's performance.

EFSEC may reduce monitoring frequency by examining the performance of a discharge. The amount of reduction is dependent upon the ratio of the long term effluent average to the monthly average effluent limit.

Total Suspended Solids, turbidity, Oil & Grease, Total Residual Chlorine, ammonia, chromium, and iron data for Outfall 001 were evaluated using the EPA guidance. In addition to using the approach recommended in the guidance, maximum values were also compared with the daily maximum permit limits. Table 13 summarizes the performance of the parameters monitored at Outfall 001 for the last three years (See **Appendix E**) and the current, recommended, and proposed monitoring frequencies.

EFSEC is proposing to retain the monitoring of Free Available Chlorine to compare to a new water quality-based effluent limit to ensure compliance with the Total Residual Chlorine water quality standard. EFSEC is proposing to reduce the frequency of chromium monitoring based upon the evaluation below. EFSEC is proposing to remove the ammonia and iron limits from the previous permit and reduce the frequency of monitoring for these parameters based on the reasonable potential analysis and performance of the facility during the last 3 years (See **Appendix F**). GHEC is required to monitor turbidity, ammonia, and iron annually with other priority pollutants.

Table 13 Monitoring Frequency Reduction Evaluation

Parameter Name	Ratio of LTEA / AML	EPA Guidance	Current Permit	Proposed Permit
Free & Available Chlorine	18%	1/6 months	Continuous	Continuous
TSS	21%	1/6 months	1/month	1/month
Turbidity	11%	1/6 months	1/month	1/year
Chromium	40%	Quarterly	1/month	Quarterly
Oil & Grease	8%	1/6 months	1/month	1/month
Ammonia	22%	1/6 months	1/month	1/year
Iron	8%	1/6 months	1/month	1/year
Arsenic, Total			1/month	1/month

B. Lab Accreditation

EFSEC requires that facilities 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). GHEC sends their final effluent and stormwater samples to the ALS Environmental Lab. Ecology has accredited the ALS Environmental Lab for: Total Residual Chlorine, TSS, turbidity, ammonia, chromium, oil & grease, arsenic, iron, zinc, and copper. GHEC submitted the Laboratory DMR-QA Evaluation Study 38 to Ecology on August 16, 2018.

C. Effluent Limits which are Near Detection or Quantitation Levels

The water quality-based effluent concentration limits in the permit are near the limits of current analytical methods to detect or accurately quantify. The method detection level (MDL), also known as detection level (DL), is the minimum concentration of a pollutant that a laboratory can measure and report with a 99 percent confidence that its concentration is greater than zero (as determined by a specific laboratory method). The quantitation level (QL) is the level at which a laboratory can reliably report concentrations with a specified level of error. Estimated concentrations are the values between the DL and the QL. EFSEC requires permitted facilities to report estimated concentrations. When reporting maximum daily effluent concentrations, EFSEC requires the facility to report "less than X" where X is the required detection level if the measured effluent concentration falls below the detection level.

V. Other Permit Conditions

A. Reporting and Record Keeping

EFSEC 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. Spill Plan

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. EFSEC can require a facility to develop best management plans to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080].

GHEC developed a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires the facility to update this plan and submit it to EFSEC.

C. Solid Waste Control Plan

GHEC could cause pollution of the waters of the state through inappropriate disposal of solid waste or through the release of leachate from solid waste.

This proposed permit requires that the facility update the solid waste control plan designed to prevent solid waste from causing pollution of waters of the state. The facility must submit the updated plan to EFSEC for approval (RCW 90.48.080). Ecology's guidance document, which describes how to develop a Solid Waste Control Plan, can be obtained at: http://www.ecy.wa.gov/pubs/0710024.pdf

D. Outfall Evaluation

The proposed permit requires that GHEC conduct an outfall inspection and submit a report detailing the findings of that inspection (Special Condition S.8.). The inspection must evaluate the physical condition of the discharge pipe and diffuser, and evaluate the extent of sediment accumulation in the vicinity of the outfall.

E. Operation and Maintenance Manual

EFSEC requires industries to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state and federal regulations [40 CFR 122.41(e) and WAC 463-76-053]. The facility will prepare and submit an operation and maintenance manual as required by state regulation for the construction of wastewater treatment facilities (WAC 173-240-150). Implementation of the procedures in the operation and maintenance manual ensure the facility's compliance with the terms and conditions in the permit.

F. General Conditions

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

VI. Permit Issuance Procedures

A. Permit Modifications

EFSEC 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 groundwater, after obtaining new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.
EFSEC may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed Permit Issuance

This proposed permit includes all statutory requirements for EFSEC 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. EFSEC proposes to issue this permit for a term of 5 years.

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

2016. Revision of Certain Federal Water Quality Criteria Applicable to Washington. Federal Register, V. 81, No. 228, Monday, November 28, 2016.

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

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

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

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

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

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

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

Washington State Department of Ecology

January 2015. *Permit Writer's Manual*. Publication Number 92-109 *(https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html)*

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://www.ecy.wa.gov/laws-rules/index.html*)

Permit and Wastewater Related Information *(http://www.ecy.wa.gov/programs/wq/permits/guidance.html)*

February 2007. *Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees*, Publication Number 07-10-024. *http://www.ecy.wa.gov/pubs/0710024.pdf*

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

EFSEC tentatively plans to reissue a permit to GHEC. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and EFSEC's reasons for requiring permit conditions.

EFSEC will publish a Public Notice of Draft on April 23, 2019 in The Olympian and in the Vidette on April 25, 2019 to inform the public that a draft permit and fact sheet are available for review. Interested parties were mailed the notice on April XX, 2019 and are invited to submit written comments regarding the draft permit. The NPDES Permit and Permit Fact Sheet are available for public comment. These documents may be viewed at the EFSEC website: https://www.efsec.wa.gov/energy-facilities/grays-harbor-energy-center/grays-harbor-energy-center-permits. The draft permit, fact sheet, and related documents are also available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at EFSEC's office listed below.

Written comments should be mailed to:

Amí Kidder
Energy Facility Site Evaluation Council
PO Box 43172
Olympia, Washington 98504-3172

Any interested party may comment on the draft permit within the 30-day comment period to the address above. Comments should reference specific text in the permit followed by proposed modifications or concerns when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other content that would result from issuance of this permit. If changes to the schedule are necessary, EFSEC will notify the public as soon as possible.

EFSEC will consider all comments received by 5:00pm on May 21, 2019 in formulating a final determination to issue, revise, or deny the permit. EFSEC will provide a response to comments received at the time notice of the final permit decisions is provided.

Further information may be obtained from EFSEC by telephone at (360) 664-1345, or at the EFSEC website at www.efsec.wa.gov.

Questions regarding the proposed permit and fact sheet may be directed to Amí Kidder of EFSEC at (360) 664-1305 or by email at ami.kidder@utc.wa.gov.

Appendix B--Your Right to Appeal

The terms and conditions of coverage under this permit are subject to judicial review pursuant to RCW 34.05 (WAC 463-76-063). EFSEC's reissuance, modification, or revocation of the permit is subject to these same provisions.

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 months' 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 waste stream 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: *http://www.ecy.wa.gov/programs/wq/permits/guidance.html.*

Simple Mixing:

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

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

where: Ce = Effluent Concentration
Ca = Ambient Concentration
DF = Dilution Factor

Reasonable Potential Analysis:

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

Calculation of Water Quality-Based Effluent Limits:

Water quality-based effluent limits are calculated by the two-value wasteload allocation process as described on page 100 of the TSD (EPA, 1991) and shown below.

1. Calculate the acute wasteload allocation WLA_a by multiplying the acute criteria by the acute dilution factor and subtracting the background factor. Calculate the chronic wasteload allocation (WLA_c) by multiplying the chronic criteria by the chronic dilution factor and subtracting the background factor.

WLA_a = (acute criteria x DF_a) – [(background conc. x (DF_a - 1)]
WLA_c = (chronic criteria x DF_c) – [(background conc. x (DF_c -1)]
where: DF_a = Acute Dilution Factor
DF_c = Chronic Dilution Factor

2. Calculate the long term averages (LTA_a and LTA_c) which will comply with the wasteload allocations WLA_a and WLA_c.

$LTA_a = WLA_a \times e^{[0.5\square^2 - z\square]}$

where: $\square^2 = \ln[CV^2 + 1]$

$z = 2.326$

CV = coefficient of variation = std. dev/mean

$LTA_c = WLA_c \times e^{[0.5\square^2 - z\square]}$

where: $\square^2 = \ln[(CV^2 \square\ 4) + 1]$

$z = 2.326$

3. Use the smallest LTA of the LTA_a or LTA_c to calculate the maximum daily effluent limit and the monthly average effluent limit.

MDL = Maximum Daily Limit

$MDL = LTA \times e^{(Z\sigma - 0.5\sigma^2)}$

where: $\square^2 = \ln[CV^2 + 1]$

$z = 2.326$ (99th percentile occurrence)

LTA = Limiting long term average

AML = Average Monthly Limit

$AML = LTA \times e^{(Z\sigma_n - 0.5\sigma_n^2)}$

where: $\square^2 = \ln[(CV^2 \div n) + 1]$

n = number of samples/month

$z = 1.645$ (95^{th} % occurrence probability)

LTA = Limiting long term average

Appendix E—Monthly Discharge Monitoring Report

PROCESS WATER EFFLUENT: OUTFALL 001

Parameter	Ammonia (Total)	Ammonia (Total)	Arsenic (Total)	Chromium (Total)	Chromium (Total)	Flow	Flow	Free & Available Chlorine	Free & Available Chlorine	Iron (Total)	Iron (Total)	Oil & Grease	Oil & Grease	pH Daily	pH Daily	TSS	TSS	Temperature	Turbidity
Units	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(ug/L)	(MGD)	(MGD)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	SU	SU	(mg/L)	Milligrams/L (mg/L)	Degrees C	NTU
Statistical Base	Average Monthly	Daily Maximum	Daily Maximum	Average Monthly	Daily Maximum	Average Monthly	Daily Maximum	Average Monthly	Daily Maximum	Average Monthly	Daily Maximum	Average Monthly	Daily Maximum	Maximum	Minimum	Average Monthly	Daily Maximum	Daily Maximum	Daily Maximum
Limits	160	321		200	200			0.2	0.5	1	1	15	20	9	6	30	100	16	
Date																			
10/1/2015	0.2	0.2	19	4.6	4.6	0.557111	0.811	0.02	0.04	0.0262	0.0262	0.8	0.8	8.11	6.91	5	5	16	1.31
11/1/2015	0.2	0.2	21.8	4.38	4.38	0.484357	0.869	0.02	0.051	0.038	0.038	0.8	0.8	8.04	7.18	5	5	13	1.85
12/1/2015	0.2	0.2	19.4	2.98	2.98	0.434	0.768	0.02	0.042	0.015	0.015	0.8	0.8	8.42	7.09	5	5	13	2.16
1/1/2016	0.2	0.2	20	4.01	4.01	0.375	0.778	0.035	0.035	0.01	0.01	0.7	0.7	8.44	7.8	5	5	14	1.5
2/1/2016	0.2	0.2	24.2	4.52	4.52	0.43	0.791	0.024	0.096	0.014	0.014	0.8	0.8	8.36	7.16	5	5	14	0.73
3/1/2016	0.2	0.2	30	4.51	4.51	0.338	0.589	0.032	0.075	0.031	0.031	0.8	0.8	8.4	7.17	5	5	13	1.72
4/1/2016	0.2	0.2	35.1	4.1	4.1	0.272	0.536	0.023	0.049	0.031	0.031	0.8	0.8	8.36	6.86	5	5	15.1	3.51
5/1/2016	0.2	0.2	27.4	14.5	14.5	0.407	0.711	0.043	0.121	0.128	0.128	0.7	0.7	8.31	7.2	5	5	16	2.91
6/1/2016	0.2	0.2	22.5	6.93	6.93	0.248	0.523	0.03	0.049	0.047	0.047	0.7	0.7	8.48	7.9	5	5	14	3.22
7/1/2016	0.2	0.2	25.4	6.84	6.84	0.394	0.744	0.042	0.095	0.035	0.035	0.8	0.8	8.54	7.35	5	5	15	1.47
8/1/2016	0.2	0.2	10.5	3.58	3.58	0.497258	0.965	0.05	0.11	0.041	0.041	0.7	0.7	8.44	7.98	5	5	15	1.24
9/1/2016	0.2	0.2	17.7	3.5	3.5	0.4749	0.674	0.04	0.089	0.044	0.044	0.8	0.8	8.42	7.7	5	5	15	0.78
10/1/2016	0.2	0.2	22.1	4.45	4.45	0.418	0.821	0.03	0.07	0.005	0.005	0.8	0.8	8.44	7.74	5	5	15	0.51
11/1/2016	0.2	0.2	64.9	9.67	9.67	0.321	0.486	0.02	0.042	0.088	0.088	0.8	0.8	8.34	8.14	5	5	15	1.54
12/1/2016	0.2	0.2	41.9	8.3	8.3	0.33	0.61	0.03	0.078	0.088	0.088	0.7	0.7	8.43	7.99	5	5	15	3.93
1/1/2017	0.2	0.2	28.7	7.59	7.59	0.378	0.669	0.05	0.108	0.139	0.139	0.7	0.7	8.32	6.83	5	5	15	6.59
2/1/2017	0.2	0.2	12.7	5	5	0.387	0.598	0.021	0.051	0.083	0.083	0.7	0.7	8.44	7.77	5	5	15	3.91
3/1/2017	0.2	0.2	19.6	13	13	0.356	0.637	0.038	0.055	0.232	0.232	1.1	1.1	8.43	8.08	10	10	13	6.57
4/1/2017	0.2	0.2	16	11	11	0.079	0.318	0.084	0.336	0.353	0.353	2	2	8.57	7	12	12	11	25
5/1/2017	0.009	0.009	12.5	7.42	7.42	0.278	0.489	0.046	0.126	0.201	0.201	1	1	8.5	8.03	6	6	14	3.6
6/1/2017	0.02	0.02	5.64	5.27	5.74	0.314	0.711	0.029	0.082	0.0785	0.089	1.5	1.6	8.48	7.89	5	5	15	3.61
7/1/2017	0.2	0.2	3.52	2.73	2.73	0.476	0.91	0.021	0.061	0.081	0.081	1.4	1.4	8.51	8.03	5	5	14	1.04
8/1/2017	0.2	0.2	3.17	2.15	2.69	0.502	0.771	0.027	0.054	0.027	0.039	0.9	0.9	8.41	7.97	5	5	15.5	1.91
9/1/2017	0.2	0.2	4	2	2	0.435	0.852	0.02	0.049	0	0	1	1	8.77	7.95	5	5	15.6	2
10/1/2017	0.2	0.2	3	2	3	0.406	0.697	0.039	0.081	0	0	3	3	8.48	8.02	5	5	14	0.2
11/1/2017	0	0	3	2	2	0.391	0.64	0.033	0.058	0	0	3	3	8.5	7.4	5	5	14	0.4
12/1/2017	0.02	0.02	4	2	2	0.363	0.703	0.028	0.055	0	0	11	11	8.4	7.2	5	5	15	0.6
1/1/2018	0.01	0.01	3	2	2	0.284	0.445	0.031	0.085	0	0	0.7	0.7	8.4	7.5	5	5	15	0.3
2/1/2018	0.2	0.2	5	3	3	0.291	0.602	0.034	0.08	0	0	1	1	8.3	7.9	5	5	14	0.5
3/1/2018	0.02	0.02	4	3	3	0.332	0.734	0.03	0.107	0	0	1	1	8.3	7.6	5	5	15	0.3
4/1/2018	0.1	0.2	4	3	3	0.304	0.621	0.035	0.09	0	0	1	1	8.3	7.9	5	5	15	1
5/1/2018	0.2	0.2	4	3	3	0.231	0.897	0.027	0.075	0.2	0.2	1	1	8.4	7.9	5	5	15.6	2
6/1/2018	0.2	0.2	5	4	4	0.308	0.726	0.02	0.07	0	0	2	2	8.3	7.9	5	5	14	2
7/1/2018	0.2	0.2	3	2	2	0.484	0.668	0.02	0.05	0	0	2	2	8.4	7.8	5	5	15	2
Min	0	0	3	2	2	0.079	0.318	0.02	0.035	0	0	0.7	0.7	8.04	6.83	5	5	11	0.2
Max	0.2	0.2	64.9	14.5	14.5	0.557111	0.965	0.084	0.336	0.353	0.353	11	11	8.77	8.14	12	12	16	25
Average	0.16	0.17	16.05	4.97	5.03	0.37	0.69	0.03	0.08	0.06	0.06	1.40	1.40	8.40	7.61	5.38	5.38	14.49	2.70
Median	0.20	0.20	14.35	4.06	4.06	0.38	0.70	0.03	0.07	0.03	0.03	0.80	0.80	8.42	7.79	5.00	5.00	15.00	1.79
95th Percentile	0.20	0.20	37.48	11.70	11.70	0.50	0.90	0.05	0.12	0.21	0.21	3.00	3.00	8.55	8.05	7.40	7.40	15.74	6.58

STORMWATER: OUTFALL 002B

Parameter	Copper (Total)	Oil & Grease	pH	pH	Turbidity	Zinc (Total)
Units	(ug/L)	Yes/No	SU	SU	NTU	(ug/L)
Benchmarks	14	NVS	9	6	25	117
Date						
10/1/2015	23.1	No	8.2	7.12	2.5	1.6
1/1/2016	2.3	No	7.39	7.39	6.39	3
7/1/2016	5.96	No	7.16	7.16	6.02	4.84
10/1/2016	3.04	No	7.2	7.2	1.83	2.89
1/1/2017	6.57	No	6.96	6.96	0.25	14.5
4/1/2017	6.38	No	7.56	7.56	19.21	6.5
10/1/2017	12	No	6.4	6.4	7	6
1/1/2018	1	No	8	7.5	5	4
4/1/2018	3	No	7.2	7.2	2	6
Min	1	0	6.4	6.4	0.25	1.6
Max	23.1	0	8.2	7.56	19.21	14.5
Average	7.04	#DIV/0!	7.34	7.17	5.58	5.48
Median	5.96	#NUM!	7.2	7.2	5	4.84
95th Percentile	18.66	#NUM!	8.12	7.536	14.326	11.3

Appendix F—Reasonable Potential Analysis

Instructions

Reasonable Potential Calculation

Facility	Grays Harbor Energy Center
Water Body Type	Freshwater
Rec. Water Hardness	Acute=104.5, Chronic=38.6 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	4.0	51.0
Human Health Carcinogenic		67.0
Human Health Non-Carcinogenic		67.0

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	ALUMINUM, total recoverable, pH 6.5-9.0 7429905	ANTIMONY (INORGANIC) 7440360 1M	ARSENIC (dissolved) 7440382 2M	CHLORINE (Total Residual) 7782505	CHLOROFORM 67663 11V	COPPER - 744058 6M Hardness dependent	CYANIDE 57125 14M	DIETHYLPHTHALATE 84662 24B	DI-n-BUTYL PHTHALATE 84742 26B	IRON 7439896
Effluent Data	# of Samples (n)		35	3	3	18	658	3	19	3	3	3	19
	Coeff of Variation (Cv)		0.6	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)		110	11.1	1.49	3.46	75	1.6	1.18	3	0.068	0.083	39
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L		28						2.34				
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	#DIV/0!	750	-	360	19	-	17.73681	22	-	-	-
		Chronic	#DIV/0!	87	-	190	11	-	5.033199	5.2	-	-	1000
	WQ Criteria for Protection of Human Health, ug/L		-	-	6	-	-	100	1300	9	200	8	300
	Metal Criteria Translator, decimal	Acute	-	-	-	1	-	-	0.996	-	-	-	-
		Chronic	-	-	-	1	-	-	0.996	-	-	-	-
	Carcinogen?		N	N	N	Y	N	Y	N	N	N	N	N

Aquatic Life Reasonable Potential

Effluent percentile value			0.950	0.950		0.950	0.950		0.950	0.950			0.950
s	$s^2=\ln(CV^2+1)$		0.555	0.555		0.555	0.555		0.555	0.555			0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.918	0.368		0.847	0.995		0.854	0.368			0.854
Multiplier			1.00	3.00		1.41	1.00		1.39	3.00			1.39
Max concentration (ug/L) at edge of…		Acute	49	8.324		1.222	18.750		2.163	2.250			13.53
		Chronic	30	0.653		0.096	1.471		2.326	0.176			1.06
Reasonable Potential? Limit Required?			**#DIV/0!**	**NO**		**NO**	**NO**		**NO**	**NO**			**NO**

Aquatic Life Limit Calculation

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

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$	0.554513	0.554513	0.554513	0.55451	0.55451	0.55451	0.554513029
Pn	Pn=(1-confidence level)1/n	0.368	0.368	0.854	0.368	0.368	0.368	0.854
Multiplier		1.204861	1.204861	0.55731	1.20486	1.20486	1.20486	0.557310087
Dilution Factor		67	67	67	67	67	67	67
Max Conc. at edge of Chronic Zone, ug/L		0.026795	2.9E-02	9.8E-03	0.05395	0.00122	0.00149	0.324404379
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Human Health Limit Calculation

# of Compliance Samples Expected per month	
Average Monthly Effluent Limit, ug/L	
Maximum Daily Effluent Limit, ug/L	

Comments/Notes:

References: WAC 173-201A.

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Override formatting & show Aq. Life Limit Calc?	N	N	N	N	N	N	N	N	N	N	N
Override formatting & show HH Limit Calc?	N	N	N	N	N	N	N	N	N	N	N

Instructions

Reasonable Potential Calculation - Page 2

Facility	Grays Harbor Energy Center
Water Body Type	Freshwater
Rec. Water Hardness	Acute=104.5, Chronic=38.6 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	4.0	51.0
Human Health Carcinogenic		67.0
Human Health Non-Carcinogenic		67.0

Pollutant, CAS No. & NPDES Application Ref. No.			LEAD - 7439921 7M Dependent on hardness	MANGANESE 7439965	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	NITRATE/NITRITE (N)	SELENIUM 7782492 10M	ZINC- 7440666 13M hardness dependent				
Effluent Data	# of Samples (n)		3	3	19	3	3	3	17				
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		0.057	1.12	0.0101	1.16	7560	1.3	2.7				
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L		0.18		0	1.1		0.16	2.28				
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	67.7496	-	2.1	1469.11	-	20	118.7963				
		Chronic	0.88067	-	0.012	70.2682	-	5	46.65938				
	WQ Criteria for Protection of Human Health, ug/L		-	50	0.14	80	10000	60	1000				
	Metal Criteria Translator, decimal	Acute	0.466	-	0.85	0.998	-	-	0.996				
		Chronic	0.466	-	-	0.997	-	-	0.996				
	Carcinogen?		N	N	N	N	N	N	N				

Aquatic Life Reasonable Potential

Effluent percentile value			0.950		0.950	0.950		0.950	0.950			
s	$s^2=\ln(CV^2+1)$		0.555		0.555	0.555		0.555	0.555			
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.368		0.854	0.368		0.368	0.838			
Multiplier			3.00		1.39	3.00		3.00	1.44			
Max concentration (ug/L) at edge of…		Acute	0.155		0.003	1.693		1.095	2.678			
		Chronic	0.178		0.000	1.146		0.233	2.311			
Reasonable Potential? Limit Required?			**NO**		**NO**	**NO**		**NO**	**NO**			

Aquatic Life Limit Calculation

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

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$		0.55451	0.554513	0.55451	0.554513	0.554513	0.554513				
Pn	$Pn=(1\text{-confidence level})1/n$		0.368	0.854	0.368	0.368	0.368	0.838				
Multiplier			1.20486	0.55731	1.20486	1.204861	1.204861	0.578173				
Dilution Factor			67	67	67	67	67	67				
Max Conc. at edge of Chronic Zone, ug/L			0.02014	8.4E-05	0.02086	135.9514	2.3E-02	2.3E-02				
Reasonable Potential? Limit Required?			**NO**	**NO**	**NO**	**NO**	**NO**	**NO**				

Human Health Limit Calculation

# of Compliance Samples Expected per month												
Average Monthly Effluent Limit, ug/L												
Maximum Daily Effluent Limit, ug/L												

Comments/Notes:

References: WAC 173-201A,

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Override formatting & show Aq. Life Limit Calc?		N	N	N	N	N	N	N	N	N	N	N
Override formatting & show HH Limit Calc?		N	N	N	N	N	N	N	N	N	N	N

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 Critera	Supplemental Criteria
INPUT	**July 1-Sept 14**	**Sept 15-July 1**
1. Chronic Dilution Factor at Mixing Zone Boundary	51.0	51.0
2. 7DADMax Ambient Temperature (T) (Upstream Background 90th percentile)	19.5 °C	19.5 °C
3. 7DADMax Effluent Temperature (95th percentile)	15.7 °C	15.7 °C
4. Aquatic Life Temperature WQ Criterion in Fresh Water	17.5 °C	17.5 °C
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	19.4 °C	19.4 °C
6. Incremental Temperature Increase or decrease:	-0.1 °C	-0.1 °C
7. Maximum Allowable Incremental Temperature Increase:	0.3 °C	0.3 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	19.8 °C	19.8 °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_{amb}+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_{amb}+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_{amb}+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**

Appendix G--Response to Comments

[EFSEC will complete this section after the public notice of draft period.]