FACT SHEET FOR
PUGET SOUND ENERGY, JACKSON PRAIRIE
GAS STORAGE FACILITY
NPDES PERMIT WA0040827

Purpose of this Fact Sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for Puget Sound Energy (PSE), Jackson Prairie Gas Storage Facility (JPGSF).

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

Ecology makes the draft permit and fact sheet available for public review and comment at least 30 days before issuing the final permit. Copies of the fact sheet and draft permit for PSE-JPGSF, NPDES permit WA0040827, are available for public review and comment. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

PSE, JPGSF reviewed the draft permit and fact sheet for factual accuracy. Ecology 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, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as **Appendix E - Response to Comments**, and publish it when issuing the final NPDES permit. Ecology generally will not revise the rest of the fact sheet. The full document will become part of the legal history contained in the facility's permit file.

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I. INTRODUCTION

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

The following regulations apply to industrial NPDES permits:

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

II. BACKGROUND INFORMATION

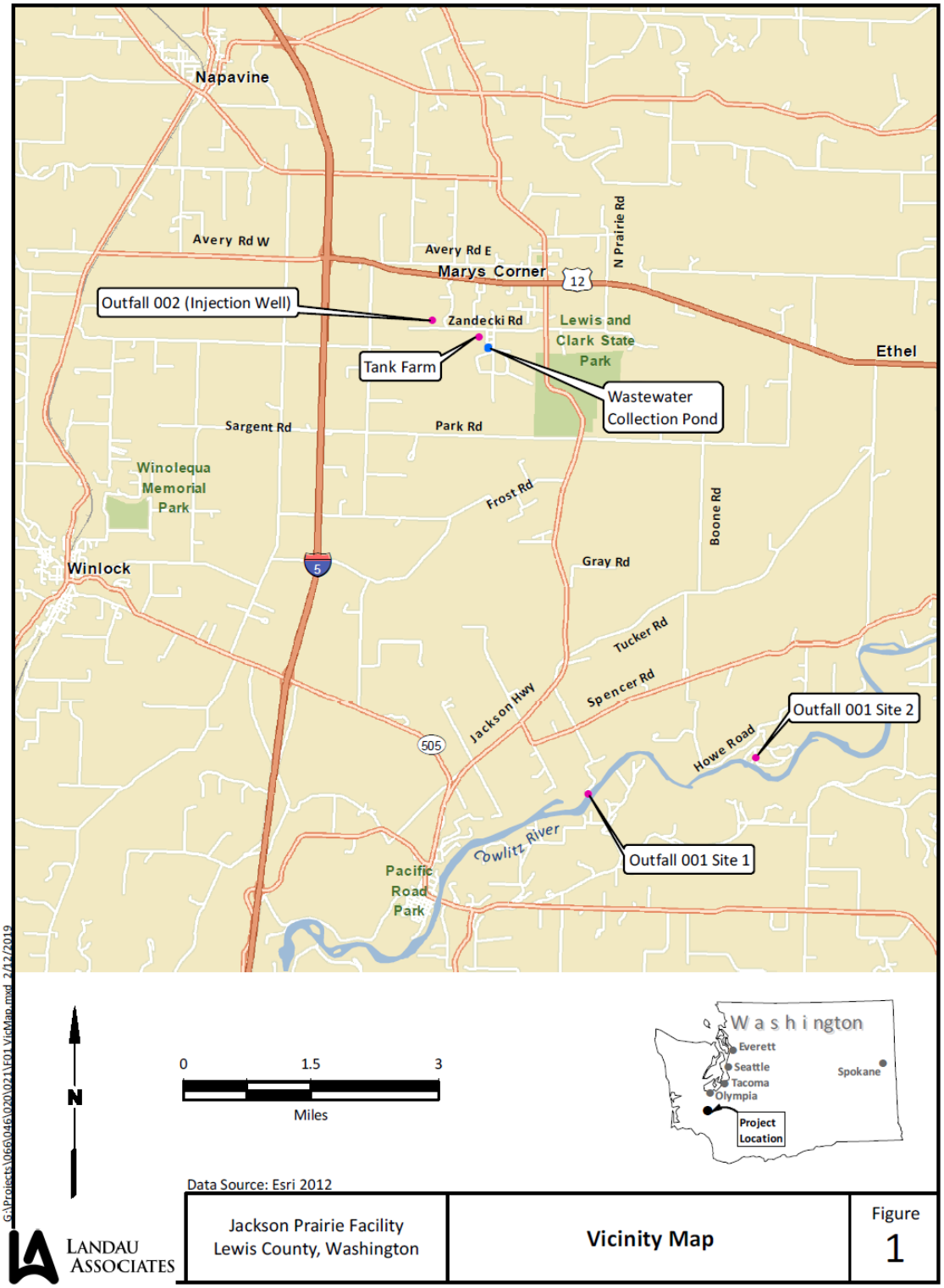
Table 1 General Facility Information

Facility Information	
Applicant	Puget Sound Energy
Facility Name and Address	Jackson Prairie Gas Storage Facility 239 Zandecki Road, Chehalis, WA 98532
Contact at Facility	Name: Pat Haworth, Manager Jackson Prairie Gas Storage Facility Telephone #: 360-262-5950
Responsible Official	Name: Pat Haworth Title: Manager Address: 239 Zandecki Road, Chehalis, WA Telephone #: 360-262-5950 FAX #
Industry Type	Gas Storage Facility
Categorical Industry	BAT (BPJ)/AKART
Type of Treatment	Activated Carbon Filters, and detention pond
SIC Codes	4922
NAIC Codes	211130
Facility Location (NAD83/WGS84 reference datum)	Latitude: 46.535946 Longitude: -122.833903
Discharge Location (NAD83/WGS84 reference datum)	**Surface Waterbody Name**: Cowlitz River Site #1, Latitude: 46.4575, Longitude: -122.808333 Site #2, Latitude: 46.46444, Longitude: -122.767216 **Underground Injection Well 909** Latitude: 46.53277777 Longitude: -122.834997

Permit Status	
Renewal Date of Previous Permit	January 1, 2011
Application for Permit Renewal Submittal Date	May 24, 2018
Date of Ecology Acceptance of Application	May 30, 2018

Inspection Status	
Date of Last Non-sampling Inspection Date	April 10, 2018

Figure 1 Facility Location Map



A. FACILITY DESCRIPTION

History

The Jackson Prairie Gas Storage Project (JPGSF) stores natural gas underground to be used as a seasonal peaking supply or for emergency use if gas supplies to the region are interrupted. This facility is located approximately 10 miles southeast of Chehalis, Washington in Lewis County (Figure 1). The development of the JPGSF began in 1960 and the project was certified in 1970 by the Federal Power Commission. The project was developed through the joint efforts of Washington Natural Gas (now Puget Sound Energy), Washington Water Power (now Avista Corp), and Northwest Pipeline Corporation (now Williams Gas Pipelines West). Customers for gas from the JPGSF include Puget Sound Energy, Avista Corp, Northwest Natural Gas, Intermountain Gas, Terasen Gas Inc., Cascade Natural Gas, Idaho Power Co., and the Boeing Co. The facility currently has a storage capacity of approximately 45,000 million cubic feet (Mmcf) and a maximum daily delivery capacity to the pipeline of 1,150 Mmcf. The first application for discharge of wastewater from this facility was submitted in 1964 to Pollution Control Commission. The first wastewater permit for this facility was issued in 1969.

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. PSE-JPGSF selected "No" on this form when asked if a cooling water intake is associated with the facility.

Industrial Processes

Natural gas is stored in three subsurface sandstone formations: Zones 1, 2, and 9. Zone 1 is approximately 100 feet (ft.) thick, is located approximately 1,100 ft. below ground surface (bgs), and stores approximately 3 billion cubic feet (bcf) of natural gas. Zone 2 is considered the most important storage zone and is approximately 200 ft. thick, is located approximately 1,800 ft. bgs, and can store 37 bcf of natural gas. Zone 9 is approximately 400 to 500 ft. thick, is located approximately 2,800 ft. bgs, and can store 5 bcf of natural gas. The geologic features, including a northwest-southeast trending fault and an anticline at the northeast side of the fault, create an effective reservoir for storage of natural gas under pressure. The JPGSF includes a number of natural gas injection and withdrawal wells, groundwater extraction wells, natural gas and wastewater conveyance lines, a natural gas compressor station, a yard tanks area (which includes two wastewater storage tanks and activated carbon filters), a central wastewater collection pond, and the discharge outfalls. Most of the facility components are shown on Figure 1and depicted in the line drawing on Figure 2.

Wastewater Treatment Processes

The JPGSF produces wastewater from its operations. Wastewater at the Facility includes:

- Gas storage wastewater (naturally occurring groundwater intentionally extracted from the sandstone formations to create unsaturated storage space for natural gas),
- Gas withdrawal wastewater (naturally occurring groundwater incidentally recovered during natural gas withdrawal), and

- Gas compression wastewater (condensed water vapor separated from natural gas during gas compression).

Groundwater withdrawn from the groundwater extraction wells to maintain gas storage capacity is pumped directly to the wastewater collection pond. Wastewater separated from natural gas (either at the gas withdrawal wells or at the compressor station) is transported to wastewater storage Tank 1 (Tank 1) at the yard tanks area. From Tank 1, wastewater is passed through a set of activated carbon filters to remove potentially hazardous constituents associated with natural gas (i.e., benzene, toluene, ethylbenzene and xylenes [BTEX]) before it is passed to wastewater storage Tank 2 (Tank 2). From Tank 2, wastewater is conveyed to the wastewater collection pond. However, prior to discharge from the wastewater storage tanks to the collection pond, the following steps are taken to address concentrations of BTEX in the treated wastewater:

1) Prior to any discharge from the wastewater storage tanks into the collection pond, wastewater samples are collected and analyzed for BTEX concentrations.

2) If the concentration of any BTEX constituent exceeds the applicable water quality standards, the activated carbon filter are replaced and the wastewater cycled through the carbon filter system again.

3) Records for all analytical test results for all constituents must be documented and kept on file for every discharge from the wastewater storage tanks to the collection pond.

The wastewater collection pond allows for aeration treatment and biological oxidation of the wastewater prior to discharge. From the wastewater collection pond, wastewater is conveyed by the pipelines to Outfall 001 (either Site 1 or Site 2- Figures 3) for discharge to gravel bars adjacent to the Cowlitz River. The old polyvinyl chloride (PVC) conveyance pipe to Outfall 001 is being replaced on an ongoing basis with high-density polyethylene (HDPE) pipe.

The gravel bar diffusers at Site 1 and Site 2 (Outfall 001) were selected as the most appropriate technology for dilution of the naturally saline groundwater extracted from the natural gas storage zones (Special Report 66-6). As required to maintain performance, PSE conducts maintenance of the gravel bar diffusers to maintain the efficacy of the diffusers. Backup conveyance piping is also installed to convey wastewater from the wastewater collection pond—or directly from the groundwater extraction wells—to Outfall 002 (Injection Well SU-909), as depicted on Figure 2. Because Injection Well SU-909 is not yet operational as an injection well, the backup piping is not currently used but may come into use following the approval from Ecology.

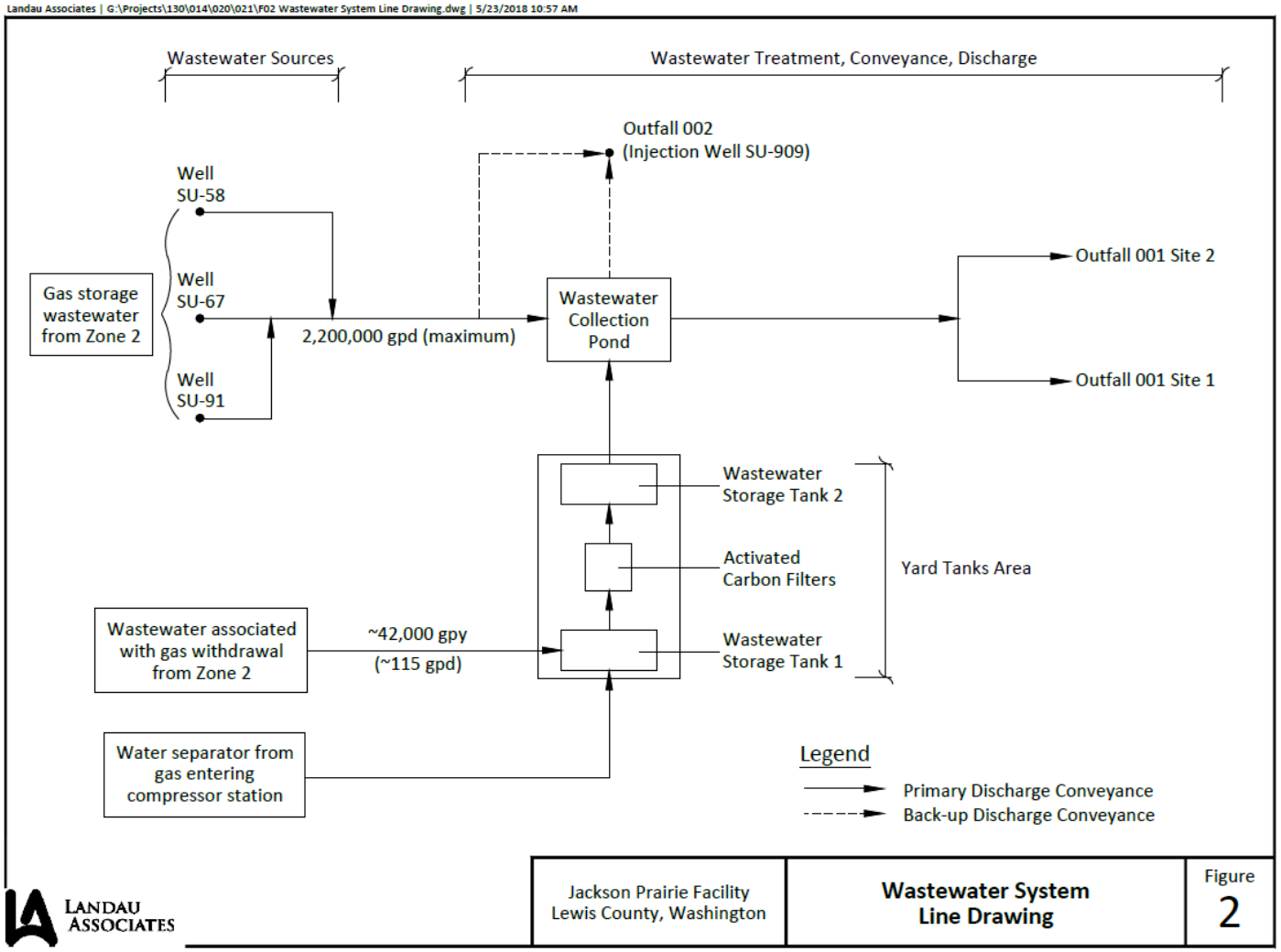


Figure 2: Wastewater Source and Treatment System

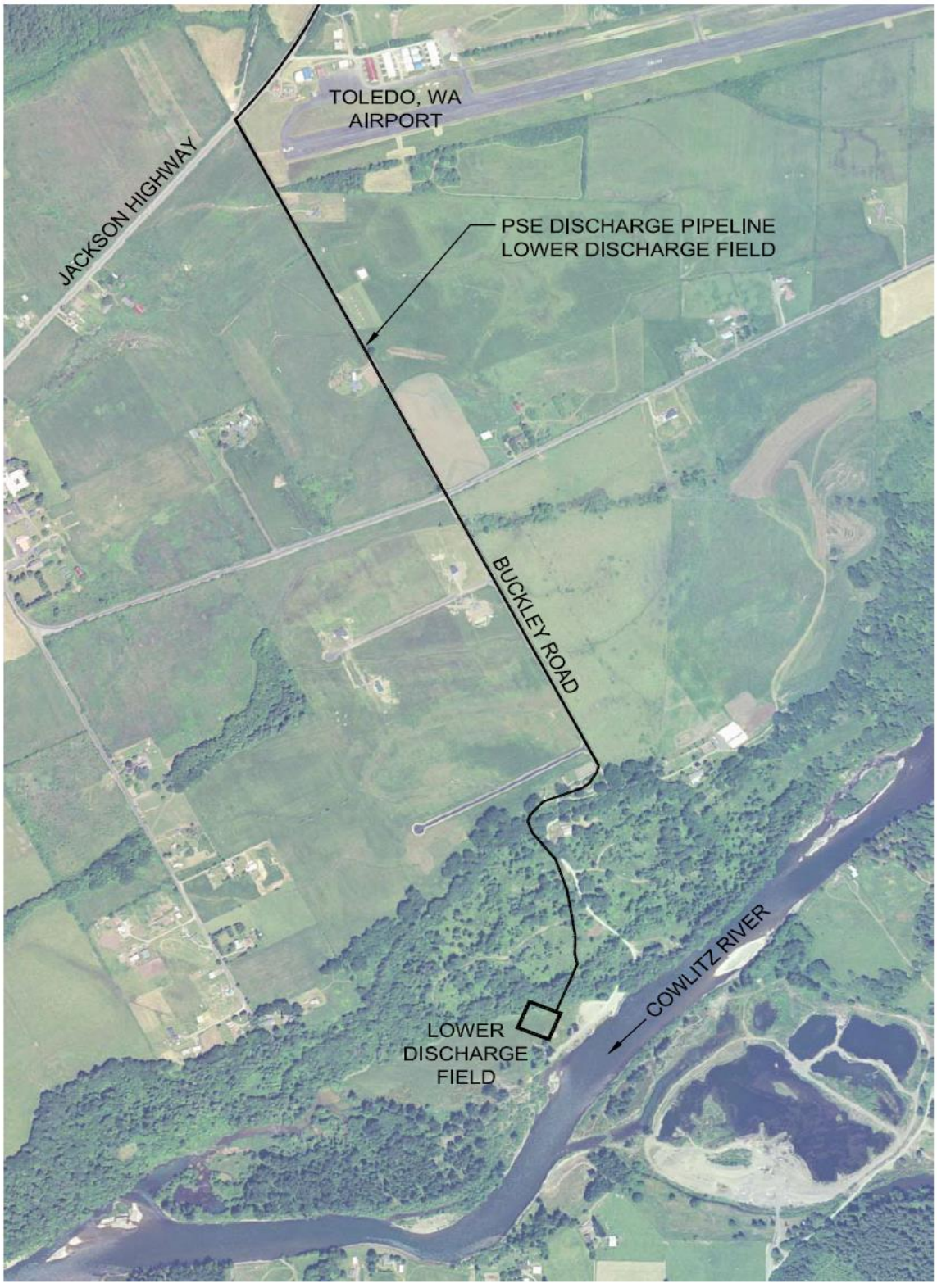


Figure 3: Site 1 (Lower Gravel Bar)

Solid Wastes

The solid waste generated at the facility is handled by Waste Management Company and transferred to Hillsboro Landfill in Hillsboro, Oregon.

Discharge Outfall

The discharge outfall consists of gravel bars with the vertical diffuser units next to the Cowlitz River. The gravel bars serve to diffuse the wastewater as it enters the Cowlitz River.

B. DESCRIPTION OF THE RECEIVING WATER

PSE-JPGSF discharges to Cowlitz River via two gravel bars. Other nearby point source outfalls are not known. Significant nearby non-point sources of pollutants include stormwater discharges. Nearby drinking water intakes are not known. IIIE of this fact sheet describes any receiving waterbody impairments.

There is no available ambient water quality data for the Cowlitz River in the vicinity of PSE-JPGSF discharge sites. The reasonable potential analysis assumes ambient concentration of zero for all pollutants.

C. WASTEWATER CHARACTERIZATION

PSE-JPGSF reported the concentration of pollutants in the discharge in the permit renewal application. The wastewater effluent is characterized as follows:

Table 2 Wastewater Characterization

Parameter	Units	# of Samples	Average Value	Maximum Value
Biochemical Oxygen Demand (BOD_5)	mg/L	1	<4.0	<4.0
Chemical Oxygen Demand (COD)	mg/L	1	127	127
Total Organic Carbon (TOC)	mg/L	1	<1	<1
Total Suspended Solids (TSS)	mg/L	1	36	36
Ammonia (as N)	mg/L	1	5.53	5.53
Fluoride	mg/L	1	<0.2	<0.2
Nitrate-Nitrite (as N)	mg/L	1	7.77	7.77
Sulfate (as(SO4)	mg/L	1	<0.2	<0.2

Table 2 Wastewater Characterization

Parameter	Units	# of Samples	Average Value	Maximum Value
Aluminum, total	ug/L	1	<40	<40
Iron, total	ug/L	1	1,680	1,680
Chloride	mg/L	1	21800	21800
Magnesium, total	ug/L	1	199	199
Manganese, total	ug/L	1	2,450	2,450
Arsenic, total	ug/L	1	<10	<10
Cadmium, total	ug/L	1	<0.4	<0.4
Lead, total	ug/L	1	0.7	0.7
Mercury, total	ug/L	1	<1.0	<1.0
Zinc, total	ug/L	1	20	20
Benzene	ug/L	1	<5.0	<5.0
Ethylbenzene	ug/L	1	<5	<5
Toluene	ug/L	1	<5	<5

Parameter	Units	# of Samples	Minimum Value	Maximum Value
pH	standard units	1	8.2	8.2

D. SUMMARY OF COMPLIANCE WITH PREVIOUS PERMIT ISSUED

The permittee submitted DMRs, spill plan and the permit application as required under the permit conditions (S3A, S6, and S8). The previous permit placed effluent limits on the flow. PSE-JPGSF most of the time has complied with the effluent limits and permit conditions throughout the duration of the permit issued on January 1, 2011. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs) and on inspections. The permittee has two incidents of their pipe failure on January 30th and April 17th, 2015. Ecology issued correction warning to the PSE-JPGSF on May 29, 2015. The permittee repaired those pipes segments of the infrastructure. Ecology also required the permittee to submit the infrastructure improvement plan to replace the aged infrastructure. The permittee is planning to repair/replace 9,000 feet old infrastructure in 5-year capital improvement plan.

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 Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).

- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the National Toxics Rule (40 CFR 131.36).

- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

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

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

A. DESIGN CRITERIA

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria and methodology of discharge in 1970. The permittee discharges brine water to the gravel bars located next to the Cowlitz River. In 1966 detailed study was conducted under the supervision of the Pollution Control Commission. The study has following two parts:

(1) Physical and chemical aspects of the diffuser and its effect upon the river and the surrounding area, and

(2) determination as to whether or not the discharged effluent had a noticeable effect on river aquatic life. In the current permit, Ecology is requiring the permittee to conduct the gravel bars/diffusers assessment as well as receiving water studies.

B. TECHNOLOGY-BASED EFFLUENT LIMITS

Ecology must ensure that facilities provide all known, available, and reasonable methods of prevention, control, and treatment (AKART) when it issues a permit. There are no federal categorical standards that applies to this discharge. Therefore, the establishment of best available technology (BAT) is based on the best professional judgement (BPJ) of the permit writer/expert engineer.

C. SURFACE WATER QUALITY-BASED EFFLUENT LIMITS

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

Numerical Criteria for the Protection of Aquatic Life and Recreation

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

Numerical Criteria for the Protection of Human Health

In 1992, U.S. EPA published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State in its National Toxics Rule (40 CFR (EPA, 1992). Ecology submitted a standards revision for 192 new human health criteria for 97 pollutants to EPA on August 1, 2016. In accordance with requirements of CWA section 303(c)(2)(B), EPA finalized 144 new and revised Washington specific human health criteria for priority pollutants, to apply to waters under Washington's jurisdiction. EPA approved 45 human health criteria as submitted by Washington. The EPA took no action on Ecology submitted criteria for arsenic, dioxin, and thallium. The existing criteria for these three pollutants as adopted in the National Toxics Rule (40 CFR 131.36) remain in effect.

These newly adopted criteria, located in WAC 173-201A-240, are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative Criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 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. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.
- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.

- Whenever the natural conditions of a water body are of a lower quality than the assigned criteria, the natural conditions constitute the water quality criteria. Where water quality criteria are not met because of natural conditions, human actions are not allowed to further lower the water quality, except where explicitly allowed in chapter 173-201A WAC.

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

Mixing Zones

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

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

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive 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)].

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

The mixing zone analysis produces a numerical value called a dilution factor (DF). The DF represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a DF of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses DFs 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. Ecology must specify both the allowed size and location in a permit.

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

2. The facility must fully apply AKART to its discharge.

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

3. Ecology must consider critical discharge conditions.

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

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: https://fortress.wa.gov/ecy/publications/documents/92109.pdf. This modeling study used RIVPLUM spreadsheet model conduct the analysis and establish the dilution factors (DFs) for the combined discharge of PSE-JPGSF and Cowlitz Indian Tribe Membrane Bioreactor (MBR) wastewater treatment plant.

Table 3 Critical Conditions Used to Model the Discharge to the Lower Gravel Bar (Cosmopolitan, Engineering Group, Civil and Recreational Consulting, Cowlitz Mixing Zone Study Report, 2011)

Critical Condition	Value
The seven-day-average low river flow with a recurrence interval of ten years (7Q10)	2,000 cfs
River depth at the 7Q10 period	4.00 feet
River velocity	2.00 fps
Manning roughness coefficient	0.03
Channel width	250 feet
Maximum average monthly effluent flow for chronic and human health non-carcinogen	1.115 MGD
Maximum daily flow for acute mixing zone	1.115 MGD
Maximum effluent temperature (assumed)	20 degrees C

This mixing zone study adopts a 7Q10 flow of 2,000 cfs as was established in the Lewis County Water and Sewer District No.6 (Lake Mayfield) NPDES permit fact sheet. Minimum flows in the vicinity of the PSE-JPGSF discharge are controlled by the Mayfield Dam at River Mile 52.

4. Supporting information must clearly indicate the mixing zone would not:

- Have a reasonable potential to cause the loss of sensitive or important habitat.
- Substantially interfere with the existing or characteristic uses.
- Result in damage to the ecosystem.
- Adversely affect public health.

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

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

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

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

Ecology reviewed the limited specific information on the characteristics of the discharge, the receiving water characteristics and the discharge location. Based on this review of the information, Ecology couldn't determine if the discharge would 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. Therefore, Ecology is requiring the permittee to conduct a detailed sampling of the effluent wastewater characteristics (permit condition S2), gravel bars/diffusers assessment (S11) and receiving water study (S10), and submit report to Ecology. If the report shows that the permittee has reasonable potential to impact the receiving water body, Ecology will establish the compliance schedule and the permit limits as required under the Federal Water Pollution Control Act, Section 301, 40 CFR 122.47 and WAC 173-220-140.

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

Based on the limited data, Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met except chloride. Ecology is requiring is requiring the permittee to conduct the gravel bars/diffusers assessment, receiving water study and effluent characterization, and submit report to Ecology for their review/assessment against the applicable water quality standards/criteria. Ecology will review the report and if necessary will establish the permit limits.

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

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

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

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

7. Maximum size of mixing zone.

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

8. Acute mixing zone.

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

Ecology determined the acute criteria will be met at 10% of the distance of the chronic mixing zone at the ten year low flow.

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

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

- **Comply with size restrictions.**

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

9. Overlap of Mixing Zones.

This mixing zone does not overlap another mixing zone.

D. 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 4 Freshwater Aquatic Life Uses and Associated Criteria

Core Summer Salmonid Habitat	
Temperature Criteria – Highest 7-DAD MAX	16°C (60.8°F)

Core Summer Salmonid Habitat	
Dissolved Oxygen Criteria	9.5 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 0.2 units.

Table 5 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

Ecology has not documented any water quality impairments in the receiving water in the vicinity of the outfall.

F. EVALUATION OF SURFACE WATER QUALITY-BASED EFFLUENT LIMITS FOR NARRATIVE CRITERIA

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

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

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

G. EVALUATION OF SURFACE WATER QUALITY-BASED EFFLUENT LIMITS FOR NUMERIC CRITERIA

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as 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. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by chapter 173-201A WAC.

The Cowlitz Indian Tribal Housing –Lewis County (CITH- Lewis County) wastewater treatment facility was built in 2011 to replace failed septic systems at both the Cowlitz Tribal Housing Center and the Lewis County Airport. The membrane bioreactor (MBR) treated wastewater discharges to the PSE-JPGSF's lower gravel bar. As part of AKART, the CITH-Lewis County facility was required to conduct the mixing zone study for the lower gravel bar adjacent to Cowlitz River.

The diffusers well discharge to the lower gravel bar adjacent to the Cowlitz River. In the plume modeling (RIVPLUM5) the diffusers are assumed to be single point source at the edge of the Cowlitz River. Ecology obtained this information from the Dilution Ratio Study Report submitted on January 26, 2011.

Chronic Mixing Zone--WAC 173-201A-400(7)(a) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body. The horizontal distance of the chronic mixing zone is 62.5 feet (25 percent of the river width). The mixing zone extends from the bottom to the top of the water column. The concentration of pollutants at the edge of the chronic zone must meet chronic aquatic life criteria and human health criteria.

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 62.5 feet (25 percent of the river depth). The mixing zone extends from the bottom to the top of the water column. The concentration of pollutants at the edge of the acute zone must meet acute aquatic life criteria.

Cosmopolitan Engineering Group in 2011 mixing zone study determined the dilution factors that occur within these zones at the critical condition using RIVPLUM5. The dilution factors are listed below.

Table 6 Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	21	66
Human Health, Carcinogen		66
Human Health, Non-carcinogen		66

Ecology determined the impacts of dissolved oxygen deficiency, pH, fecal coliform, 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.

Biochemical Oxygen Demand (BOD5) - Based on the nature of discharge (saline water) and sampling results (< 4 mg/L) Ecology predicted no violation of the surface water quality standards for dissolved oxygen due to the impacts of BOD_5 under critical conditions. Therefore, the proposed permit does not contain the effluent limit for BOD_5.

pH—The applicable water quality criteria for pH ranges 6.5 S.U-8.5 S.U. The effluent recorded value of pH is 6.96 S.U., which is well within the range of the applicable water quality standards. Ecology predicts no violation of the pH criteria under critical conditions. Therefore, the proposed permit includes technology-based effluent limits for pH.

Fecal Coliform—Due to the nature of the discharge (saline water) and the NPDES permit application submittal data, Ecology doesn't expect the permittee will impact water quality of Cowlitz River. Therefore, Ecology is not proposing fecal coliform limits for this dischargers.

Turbidity--Ecology evaluated the impact of turbidity based on the range of turbidity in the effluent and turbidity of the receiving water. Based on visual observation of the facility's effluent, Ecology expects no violations of the turbidity criteria outside the designated mixing zone.

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

Ecology conducted a reasonable potential analysis (See **Appendix D**) for the pollutants that are present and/or have potential to be present in the discharge to determine whether it would require effluent limits in this permit. This analysis shows that the discharge has reasonable potential to exceed the surface water quality standards/criteria for chloride. This analysis was based on singe sample of the parameters shown in appendix D. These samples were collected before the discharge to the gravel bars. In the proposed permit, Ecology is requiring the permittee to collect more samples and conduct gravel bar analysis/receiving water study. Based on these studies and sampling results, Ecology will conduct the reasonable potential analysis and determine if additional treatment is necessary and/or permit limits are required.

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

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects

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

- Annual summer maximum and supplementary spawning/rearing criteria

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

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

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

- Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

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

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

fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- Protections for temperature acute effects

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

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.

Reasonable Potential Analysis

Data Collection Required: Ecology does not have sufficient information on the temperature of the effluent or the receiving water to determine compliance with water quality criteria for temperature. The proposed permit requires PSE-JPGSF to monitor effluent and receiving water study and report the results to Ecology. Based on the report, Ecology will conduct a reasonable potential analysis and if necessary will establish the permit limits.

H. HUMAN HEALTH

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

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

Ecology evaluated the discharge's potential to violate the water quality standards as required by 40 CFR 122.44(d) by following the procedures published in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001) and Ecology's *Permit Writer's Manual* to make a reasonable potential determination. The evaluation showed that the existing data (limited data) resulted in an ambiguous determination so the proposed permit requires the facility to submit additional data before the next permit reissuance.

I. SEDIMENT QUALITY

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

Ecology could not determine the potential for this discharge to cause a violation of sediment quality standards. If in the future Ecology determines a potential for violation of the sediment quality standards, Ecology may issue an order requiring PSE-JPGSF to demonstrate either:

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

J. GROUNDWATER QUALITY LIMITS

The groundwater quality standards (chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100). Ecology determined PSE-JPGSF's discharge has the potential to cause a violation of the groundwater quality standards if they use underground injection well (UIC). Currently, PSE-JPGSF does not use UIC Well. The proposed permit includes the following conditions/requirements to protect the groundwater, if the PSE-JPGSF decides to use the UIC well.

a. Maximum Injection flowrate, 499,000 gallons per day and maximum permitted Wellhead Injection Pressure of 800 psi

These flowrate and pressure numbers are based on the previous permits that Ecology issued to PSE-JPGSF. Ecology couldn't find the study report that was used to establish these numbers. Therefore, Ecology is requiring the permittee to submit a report based on the requirements outlined in 40 CFR 146. This report must include UIC well 909 location, the flowrate and pressure determination to prevent the fracture to the confining zone. These requirements/limits could change based on the report that the permittee is required to submit to Ecology six months before it uses UIC Well 909. Prohibitions include injection-caused fractures to the underground confining zones, injection-caused migration of injected water or formation water into any underground source of drinking water, and injection between the outermost well casing and the well bore.

A limitation on the flowrate is necessary to prevent fractures to the confining zone and the movement of wastewater or formation water into an underground source of drinking water (WAC 173-218-100 and 40 CFR 146.23). Also, injection must be at or below of the estimated pressure to prevent fractures to the confining zone and the movement of wastewater or natural formation water into an underground source of drinking water, (WAC 173-218-100 and 40 CFR 146.23).

b. The applicable code of federal regulation requires the applicant to comply with the following requirements before, during and after the use of UIC wells.

40 CFR 146.5 (b)- Classification of Injection wells and Class II Well

"Class II. Wells which inject fluids:

(1) Which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.

(2) For enhanced recovery of oil or natural gas; and

(3) For storage of hydrocarbons which are liquid at standard temperature and pressure."

40 CFR 146.6 Area of review of Class II Well

The area of review for each injection well or each field, project or area of the State shall be determined according to either paragraph (a) or (b) of this section. The Director may solicit input from the owners or operators of injection wells within the State as to which method is most appropriate for each geographic area or field.

(a) *Zone of endangering influence.* (1) The zone of endangering influence shall be:

(i) In the case of application(s) for well permit(s) under §122.38 that area the radius of which is the lateral distance in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water; or

(ii) In the case of an application for an area permit under §122.39, the project area plus a circumscribing area the width of which is the lateral distance from the perimeter of the project area, in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water.

(2) Computation of the zone of endangering influence may be based upon the parameters listed below and should be calculated for an injection time period equal to the expected life of the injection well or pattern. The following modified Theis equation illustrates one form which the mathematical model may take.

$$r = \left(\frac{2.25\,KHt}{S10^{x}}\right)^{1/2}$$

where:

$$X = \frac{4\pi KH\left(h_w - h_{bo} \times S_p G_b\right)}{2.3Q}$$

r = Radius of endangering influence from injection well (length)

k = Hydraulic conductivity of the injection zone (length/time)

H = Thickness of the injection zone (length)

t = Time of injection (time)

S = Storage coefficient (dimensionless)

Q = Injection rate (volume/time)

h_{bo} = Observed original hydrostatic head of injection zone (length) measured from the base of the lowermost underground source of drinking water

h_w = Hydrostatic head of underground source of drinking water (length) measured from the base of the lowest underground source of drinking water

S_p G_b = Specific gravity of fluid in the injection zone (dimensionless)

π = 3.142 (dimensionless)

The above equation is based on the following assumptions:

(i) The injection zone is homogenous and isotropic;

(ii) The injection zone has infinite area extent;

(iii) The injection well penetrates the entire thickness of the injection zone;

(iv) The well diameter is infinitesimal compared to "r" when injection time is longer than a few minutes; and

(v) The emplacement of fluid into the injection zone creates instantaneous increase in pressure.

(b) Fixed radius. (1) In the case of application(s) for well permit(s) under §122.38 a fixed radius around the well of not less than one-fourth (¼) mile may be used.

(2) In the case of an application for an area permit under §122.39 a fixed width of not less than one-fourth (¼) mile for the circumscribing area may be used.

In determining the fixed radius, the following factors shall be taken into consideration: Chemistry of injected and formation fluids; hydrogeology; population and ground-water use and dependence; and historical practices in the area.

(c) If the area of review is determined by a mathematical model pursuant to paragraph (a) of this section, the permissible radius is the result of such calculation even if it is less than one-fourth (¼) mile.

40 CFR 146.7 Corrective action.

In determining the adequacy of corrective action proposed by the applicant under 40 CFR 144.55 and in determining the additional steps needed to prevent fluid movement into underground sources of drinking water, the following criteria and factors shall be considered by the Director:

(a) Nature and volume of injected fluid;

(b) Nature of native fluids or by-products of injection;

(c) Potentially affected population;

(d) Geology;

(e) Hydrology;

(f) History of the injection operation;

(g) Completion and plugging records;

(h) Abandonment procedures in effect at the time the well was abandoned; and

(i) Hydraulic connections with underground sources of drinking water.

40 CFR 146.8 Mechanical integrity for Class II Well.

(a) An injection well has mechanical integrity if:

(1) There is no significant leak in the casing, tubing or packer; and

(2) There is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection well bore.

(b) One of the following methods must be used to evaluate the absence of significant leaks under paragraph (a)(1) of this section:

(1) Following an initial pressure test, monitoring of the tubing-casing annulus pressure with sufficient frequency to be representative, as determined by the Director, while maintaining an annulus pressure different from atmospheric pressure measured at the surface;

(2) Pressure test with liquid or gas; or

(3) Records of monitoring showing the absence of significant changes in the relationship between injection pressure and injection flow rate for the following Class II enhanced recovery wells:

(i) Existing wells completed without a packer provided that a pressure test has been performed and the data is available and provided further that one pressure test shall be performed at a time when the well is shut down and if the running of such a test will not cause further loss of significant amounts of oil or gas; or

(ii) Existing wells constructed without a long string casing, but with surface casing which terminates at the base of fresh water provided that local geological and hydrological features allow such construction and provided further that the annular space shall be visually inspected. For these wells, the Director shall prescribe a monitoring program which will verify the absence of significant fluid movement from the injection zone into an USDW.

(c) One of the following methods must be used to determine the absence of significant fluid movement under paragraph (a)(2) of this section:

(1) The results of a temperature or noise log; or

(2) For Class II only, cementing records demonstrating the presence of adequate cement to prevent such migration.

40 CFR 146.10 Plugging and abandoning Class I, II, and III wells.

(a) Requirements for Class I, II and III wells. (1) Prior to abandoning Class I, II and III wells, the well shall be plugged with cement in a manner which will not allow the movement of fluids either into or between underground sources of drinking water.

(2) Placement of the cement plugs shall be accomplished by one of the following:

(i) The Balance method;

(ii) The Dump Bailer method;

(iii) The Two-Plug method; or

iv) An alternative method approved by the Director, which will reliably provide a comparable level of protection to underground sources of drinking water.

(3) The well to be abandoned shall be in a state of static equilibrium with the mud weight equalized top to bottom, either by circulating the mud in the well at least once or by a comparable method prescribed by the Director, prior to the placement of the cement plug(s).

40 CFR 146 - Subpart C—Criteria and Standards Applicable to Class II Wells

146.21 Applicability.

This subpart establishes criteria and standards for underground injection control programs to regulate Class II wells.

146.22 Construction requirements.

(a) All new Class II wells shall be sited in such a fashion that they inject into a formation which is separated from any USDW by a confining zone that is free of known open faults or fractures within the area of review.

(b)(1) All Class II injection wells shall be cased and cemented to prevent movement of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors shall be considered:

(i) Depth to the injection zone;

(ii) Depth to the bottom of all USDWs; and

(iii) Estimated maximum and average injection pressures;

(2) In addition the Director may consider information on:

(i) Nature of formation fluids;

(ii) Lithology of injection and confining zones;

(iii) External pressure, internal pressure, and axial loading;

(iv) Hole size;

(v) Size and grade of all casing strings; and

(vi) Class of cement.

(f) Appropriate logs and other tests shall be conducted during the drilling and construction of new Class II wells. A descriptive report interpreting the results of that portion of those logs and tests which specifically relate to (1) an USDW and the confining zone adjacent to it, and (2) the injection and adjacent formations shall be prepared by a knowledgeable log analyst and submitted to the director. At a minimum, these logs and tests shall include:

(1) Deviation checks on all holes constructed by first drilling a pilot hole and then enlarging the pilot hole, by reaming or another method. Such checks shall be at sufficiently frequent intervals to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling.

(2) Such other logs and tests as may be needed after taking into account the availability of similar data in the area of the drilling site, the construction plan, and the need for additional information that may arise from time to time as the construction of the well progresses. In determining which logs and tests shall be required the following shall be considered by the Director in setting logging and testing requirements:

(i) For surface casing intended to protect underground sources of drinking water in areas where the lithology has not been determined:

(A) Electric and caliper logs before casing is installed; and

(B) A cement bond, temperature, or density log after the casing is set and cemented.

(ii) for intermediate and long strings of casing intended to facilitate injection:

(A) Electric porosity and gamma ray logs before the casing is installed;

(B) Fracture finder logs; and

(C) A cement bond, temperature, or density log after the casing is set and cemented.

(g) At a minimum, the following information concerning the injection formation shall be determined or calculated for new Class II wells or projects:

(1) Fluid pressure;

(2) Estimated fracture pressure;

(3) Physical and chemical characteristics of the injection zone.

40 CFR 146.23 Operating, monitoring, and reporting requirements.

(a) Operating requirements. Operating requirements shall, at a minimum, specify that:

(1) Injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure during injection does not initiate new fractures or propagate existing fractures in the confining zone adjacent to the USDWs. In no case shall injection pressure cause the movement of injection or formation fluids into an underground source of drinking water

(2) Injection between the outermost casing protecting underground sources of drinking water and the well bore shall be prohibited.

(b) Monitoring requirements. Monitoring requirements shall, at a minimum, include:

(1) Monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics;

(2) Observation of injection pressure, flow rate, and cumulative volume at least with the following frequencies:

(i) Weekly for produced fluid disposal operations;

(ii) Monthly for enhanced recovery operations;

(iii) Daily during the injection of liquid hydrocarbons and injection for withdrawal of stored hydrocarbons; and

(iv) Daily during the injection phase of cyclic steam operations

And recording of one observation of injection pressure, flow rate and cumulative volume at reasonable intervals no greater than 30 days.

(3) A demonstration of mechanical integrity pursuant to §146.8 at least once every five years during the life of the injection well;

(4) Maintenance of the results of all monitoring until the next permit review (see 40 CFR 144.52(a)(5)); and

(5) Hydrocarbon storage and enhanced recovery may be monitored on a field or project basis rather than on an individual well basis by manifold monitoring. Manifold monitoring may be used in cases of facilities consisting of more than one injection well, operating with a common manifold. Separate monitoring systems for each well are not required provided the owner/operator demonstrates that manifold monitoring is comparable to individual well monitoring.

(c) Reporting requirements. (1) Reporting requirements shall at a minimum include an annual report to the Director summarizing the results of monitoring required under paragraph (b) of this section. Such summary shall include monthly records of injected fluids, and any major changes in characteristics or sources of injected fluid. Previously submitted information may be included by reference.

40 CFR 146.24 Information to be considered by the Director.

This section sets forth the information which must be considered by the Director in authorizing Class II wells. Certain maps, cross-sections, tabulations of wells within the area of review, and other data may be included in the application by reference provided they are current, readily available to the Director (for example, in the permitting agency's files) and sufficiently identified to be retrieved. In cases where EPA issues the permit, all the information in this section is to be submitted to the Administrator.

(a) Prior to the issuance of a permit for an existing Class II well to operate or the construction or conversion of a new Class II well the Director shall consider the following:

(1) Information required in 40 CFR 144.31 and 144.31(g);

(2) A map showing the injection well or project area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name and location of all existing producing wells, injection wells, abandoned wells, dry holes, and water wells. The map may also show surface bodies of waters, mines (surface and subsurface), quarries and other pertinent surface features including residences and roads, and faults if known or suspended. Only information of public record and

pertinent information known to the applicant is required to be included on this map. This requirement does not apply to existing Class II wells; and

(3) A tabulation of data reasonably available from public records or otherwise known to the applicant on all wells within the area of review included on the map required under paragraph (a)(2) of this section which penetrate the proposed injection zone or, in the case of Class II wells operating over the fracture pressure of the injection formation, all known wells within the area of review which penetrate formations affected by the increase in pressure. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and complete, and any additional information the Director may require. In cases where the information would be repetitive and the wells are of similar age, type, and construction the Director may elect to only require data on a representative number of wells. This requirement does not apply to existing Class II wells.

(4) Proposed operating data:

(i) Average and maximum daily rate and volume of fluids to be injected.

(ii) Average and maximum injection pressure; and

(iii) Source and an appropriate analysis of the chemical and physical characteristics of the injection fluid.

(5) Appropriate geological data on the injection zone and confining zone including lithologic description, geological name, thickness and depth;

(6) Geologic name and depth to bottom of all underground sources of drinking water which may be affected by the injection;

(7) Schematic or other appropriate drawings of the surface and subsurface construction details of the well;

(8) In the case of new injection wells the corrective action proposed to be taken by the applicant under 40 CFR 122.44;

(9) A certificate that the applicant has assured through a performance bond or other appropriate means, the resources necessary to close plug or abandon the well as required by 40 CFR 122.42(g);

(b) In addition the Director may consider the following:

(1) Proposed formation testing program to obtain the information required by §146.22(g);

(2) Proposed stimulation program;

(3) Proposed injection procedure;

(4) Proposed contingency plans, if any, to cope with well failures so as to prevent migration of contaminating fluids into an underground source of drinking water;

(5) Plans for meeting the monitoring requirements of §146.23(b).

(c) Prior to granting approval for the operation of a Class II well the Director shall consider the following information:

(1) All available logging and testing program data on the well;

(2) A demonstration of mechanical integrity pursuant to §146.8;

(3) The anticipated maximum pressure and flow rate at which the permittee will operate.

(4) The results of the formation testing program;

(5) The actual injection procedure; and

(6) For new wells the status of corrective action on defective wells in the area of review.

(d) Prior to granting approval for the plugging and abandonment of a Class II well the Director shall consider the following information:

(1) The type, and number of plugs to be used;

(2) The placement of each plug including the elevation of top and bottom;

(3) The type, grade, and quantity of cement to be used;

(4) The method of placement of the plugs; and

(5) The procedure to be used to meet the requirements of §146.10(c).

Currently, PSE-JPGSF discharges to the gravel bars next to the Cowlitz River. It appears from the "Diffusion Effectiveness of High Salinity effluents by a Cowlitz River Gravel Bar", study that there is about 25 feet deep gavel material below which is blue clay liner. The vertical diffusers are installed in the gravel bars next to the Cowlitz River. In the current permit, PSE-JPGSF is required to conduct the gravel bars study which would include gravel bars assessment and the profile. Based on this study, Ecology will determine if the additional requirements are necessary to protect the groundwater and surface water.

K. COMPARISON OF EFFLUENT LIMITS WITH THE PREVIOUS PERMIT ISSUED ON OCTOBER 18, 2010

Table 7 Comparison of Previous and Proposed Effluent Limits

Gravel Bars (Site #1 and Site #2) adjacent to Cowlitz River					
Parameter	**Basis of Limit**	**Previous Effluent Limits: Outfall # 001**		**Proposed Effluent Limits: Outfall # 001**	
		Average Monthly	**Maximum Daily**	**Average Monthly/Average quarterly[a]**	**Maximum Daily**
Flow, GPD	Technology	N/A	2,200,000	N/A	2,200,000
Benzene, ug/L[b]		-	-	Report	Report
Toluene, ug/L[b]		-	-	Report	Report
Ethylbenzene, ug/L[b]		-	-	Report	Report

Table 7 Comparison of Previous and Proposed Effluent Limits

Gravel Bars (Site #1 and Site #2) adjacent to Cowlitz River					
Parameter	**Basis of Limit**	**Previous Effluent Limits: Outfall # 001**		**Proposed Effluent Limits: Outfall # 001**	
		Average Monthly	**Maximum Daily**	**Average Monthly/Average quarterly[a]**	**Maximum Daily**
Xylene, ug/L[b]		-	-	Report	Report
Chloride, mg/L[b]		-	-	Report	Report
TDS, mg/L[b]		-	-	Report	Report
Priority Pollutant, metals[b]		-	-	Report	Report
Temperature[b]		-	-	Report	Report
Parameter	**Basis of Limit**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
pH, S.U.[b]		-	-	Report	Report

[a]Average quarterly report applies to all parameters except flowrate.

[b]The samples for these parameters must be collected at the pond effluent.

Underground Injection Control (UIC) Well, SU-909[a]					
Parameter	**Basis of Limit**	**Previous Effluent Limits: Outfall # 002**		**Previous Effluent Limits: Outfall # 002**	
		Maximum Instantaneous	**Maximum Daily**	**Maximum Instantaneous**	**Maximum Daily**
Flow, GPD[a]	Technology	-	499,000	-	499,000
Wellhead Pressure[a]	Technology	800 psi	-	800 psi	-
[a]This permit requires UIC well location, flowrate and pressure determination before the use of proposed UIC well. The flowrate and pressure could change based on the report review and approval by Ecology.					
Underground Injection Monitoring					
Parameter		**Sampling Point**	**Minimum Sampling Frequency**		**Sample Type**
Flow, total gallons		Well SU-909, Wellhead	1/day (total for 24 hour period) after start of injection		Measurement – Continuous Recorder
Wellhead Injection Pressure, psi		Well SU-909, Wellhead	1/day (maximum for 24 hour period)		Measurement-Continuous Recorder
Casing Pressure, psi		Well SU-909, Wellhead	1/day (maximum for 24-hour period)		Measurement-Continuous Recorder
Monthly cumulative volume of injected wastewater, total gallons		Well SU-909, Wellhead	1/month after start of injection		Measurement-Continuous Recorder
Bottom hole pressure, psi		Well SU-909, Wellhead	1/month after start of injection		Calculation/ Measurement[e]
Injection Water Monitoring – the permittee must monitor wastewater injection according to the following schedule					
pH, S.U.		Well SU-909, Wellhead	quarterly		Grab
Conductivity, umhos/cm		Well SU-909, Wellhead	quarterly		Grab
TDS, mg/L		Well SU-909, Wellhead	quarterly		Grab
Sodium, mg/L		Well SU-909, Wellhead	quarterly		Grab
Chloride, mg/L		Well SU-909, Wellhead	quarterly		Grab
Turbidity, NTU		Well SU-909, Wellhead	quarterly		Grab
Color, Color Unit (CU)		Well SU-909, Wellhead	quarterly		Grab
Total hardness, mg/L		Well SU-909, Wellhead	quarterly		Grab
Total alkalinity, mg/L		Well SU-909, Wellhead	quarterly		Grab
Calcium, mg/L		Well SU-909, Wellhead	quarterly		Grab
Magnesium, mg/L		Well SU-909, Wellhead	quarterly		Grab
Manganese, mg/L		Well SU-909, Wellhead	quarterly		Grab
Potassium, mg/L		Well SU-909, Wellhead	quarterly		Grab
Iron, mg/L		Well SU-909, Wellhead	quarterly		Grab
Aluminum, mg/L		Well SU-909, Wellhead	quarterly		Grab
Sulfate, mg/L		Well SU-909, Wellhead	quarterly		Grab
Nitrate, mg/L		Well SU-909, Wellhead	quarterly		Grab
Fluoride, mg/L		Well SU-909, Wellhead	quarterly		Grab
Silica, mg/L		Well SU-909, Wellhead	quarterly		Grab
BTEX, ug/L		Well SU-909, Wellhead	quarterly		Grab
Priority Pollutants, Metals, ug/L		Well SU-909, Wellhead	quarterly		Grab

[e]**Formation Monitoring – Post Injection**: The permittee must monitor the bottom hole pressure and calculation must be based on a depth of 2,300 feet (top of zone 2 or Zone 9). The permittee must confirm/verify the zone and its formation depth.

Monitoring associated with collection pond monitoring wells The monitoring wells in the freshwater aquifer up-gradient (outfall 003) and downgradient from the collection pond (outfall 004)			
Parameter	**Sampling Point**	**Minimum Sampling Frequency**	**Sample Type**
pH, S.U.	Pond monitoring wells	quarterly	Grab
Conductivity, umhos/cm	Pond monitoring wells	quarterly	Grab
TDS, mg/L	Pond monitoring wells	quarterly	Grab
Sodium, mg/L	Pond monitoring wells	quarterly	Grab
Chloride, mg/L	Pond monitoring wells	quarterly	Grab
BTEX, ug/L	Pond monitoring wells	quarterly	Grab
Monitoring associated with the monitoring well downgradient from SU-909 well (Outfall 005)[f]			
TDS, mg/L	Downgradient well	quarterly	Grab
Chloride, mg/L	Downgradient well	quarterly	Grab
Sodium, mg/L	Downgradient well	quarterly	Grab
Conductivity, umhos/cm	Downgradient well	quarterly	Grab
pH	Downgradient well	quarterly	Grab

[f]the permittee must submit a report on the location well(s) to Ecology for its review and approval.

IV. MONITORING REQUIREMENTS

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

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

A. WASTEWATER MONITORING

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

B. LAB ACCREDITATION

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

V. OTHER PERMIT CONDITIONS

A. REPORTING AND RECORD KEEPING

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

B. NON ROUTINE AND UNANTICIPATED WASTEWATER

Occasionally, this facility may generate wastewater which was not characterized in the permit application because it is not a routine discharge and was not anticipated at the time of application. These wastes typically consist of waters used to pressure-test storage tanks or fire water systems or of leaks from drinking water systems.

The permit authorizes the discharge of non-routine and unanticipated wastewater under certain conditions. The facility must characterize these waste waters for pollutants and examine the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and on any opportunities for reuse, Ecology may:

- Authorize the facility to discharge the wastewater.
- Require the facility to treat the wastewater.
- Require the facility to reuse the wastewater.

C. SPILL PLAN

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology 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].

PSE-JPGSF 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 Ecology.

D. SOLID WASTE CONTROL PLAN

PSE-JPGSF 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 this facility to develop a solid waste control plan to prevent solid waste from causing pollution of waters of the state. The facility must submit the plan to Ecology for approval (RCW 90.48.080). You can obtain an Ecology guidance document, which describes how to develop a Solid Waste Control Plan, at: https://fortress.wa.gov/ecy/publications/documents/0710024.pdf

E. OUTFALL EVALUATION (GRAVEL BARS EVALUATION)

The proposed permit requires PSE-JPGSF to conduct an inspection for gravel bars/diffusers and submit a report detailing the findings of that inspection (Special Condition S. 11). The inspection must evaluate

the physical condition of the discharge pipe and diffusers, and evaluate the extent of sediment accumulations in the diffusers.

F. OPERATION AND MAINTENANCE MANUAL

Ecology 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 173-220-150 (1)(g)]. The facility has prepared and submitted 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 ensures the facility's compliance with the terms and limits in the permit.

G. GENERAL CONDITIONS

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

VI. PERMIT ISSUANCE PROCEDURES

A. PERMIT MODIFICATIONS

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

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

B. PROPOSED PERMIT ISSUANCE

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

VII. REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

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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.

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

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

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

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

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. https://fortress.wa.gov/ecy/publications/documents/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.)

January 2011, CCC001, Cherokee Construction Services, Cowlitz Mixing Zone Study Report. Prepared by Cosmopolitan, Engineering Group, Civil, Environmental, and Recreational Consulting. Prepared for Cherokee Construction Services, 901 West Evergreen Blvd, suite 150, Vancouver, Washington 98660.

November 12, 1998, Hydrogeologic Site Assessment, Wastewater Collection Pond and Injection Well SU 909, Jackson Prairie Gas Storage Project, Permit No. ST6151. Prepared for Puget Sound Energy, Jackson Prairie Gas Storage Project. Dalton, Olmsted & Fuglevand, Inc., Environmental Consultants.

June 1966, Diffusion Effectiveness of High Salinity Effluents by a Cowlitz River Gravel Bars, by Donald Provost and Charles D. Ziebell. Special Report 66-6, Washington State Pollution Control Commission.

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

Ecology proposes to reissue a permit to Puget Sound Energy, Jackson Prairie Gas Storage Facility. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Application on June 12, 2018, and June 19, 2018, in *The Chronicle* to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology will place a Public Notice of Draft on _____, in *The Chronicle* to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period
- Tells how to request a public hearing of comments about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting* which is available on our website at https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html

You may obtain further information from Ecology by telephone, 360-407-6280, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775

The primary author of this permit and fact sheet is Aziz Mahar, P.E.

APPENDIX B--YOUR RIGHT TO APPEAL

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

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

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive Southeast Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk P.O. Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel Road Southwest, Suite 301 Tumwater, WA 98501	**Pollution Control Hearings Board** P.O. Box 40903 Olympia, WA 98504-0903

APPENDIX C--GLOSSARY

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

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

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

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

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

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

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

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

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

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

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

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material

storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

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

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

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

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

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

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

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

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

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

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

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

Date of receipt – This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is

unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

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

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

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

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

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

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

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

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

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

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

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

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

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

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

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

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is the maximum discharge of a pollutant measured during a calendar day

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

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

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

Method detection level (MDL) -- See Detection Limit.

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

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

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

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

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

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

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

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

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

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).
Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1,2,or 5) x 10^n, where n is an integer. (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

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

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

Sample Maximum -- No sample may exceed this value.

Significant industrial user (SIU) --

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry

weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

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

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

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

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3,or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

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

Soluble BOD_5 -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

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

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

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

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

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

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

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

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

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

APPENDIX D--TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at: 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.

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

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

$z = 2.326$

CV = coefficient of variation = std. dev/mean

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

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

$z = 2.326$

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

$z = 2.326$ (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: $\sigma^2 = \ln[(CV^2 \div n) + 1]$

n = number of samples/month

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

LTA = Limiting long term average

Spread of a Plume from a Point Source in a River with Boundary Effects from the Shoreline

Based on the method of Fischer et al. (1979) with correction for the effective origin of effluent.

	Chronic	Acute	HH Non-Carcinogen	HH Carcinogen
INPUT				
1. Effluent Discharge Rate (MGD)	1.12	1.12	1.12	1.12
or, Effluent Discharge Rate (cfs)	1.73	1.73	1.73	1.73
2. Receiving Water Characteristics Downstream from Discharge:				
Stream Depth (ft)	4.00	4.00	4.00	4.00
Stream Flow (cfs) (7Q10 chronic & acute, 30Q5 for non-carc, harm. mean for carc)	2000	2000	2000	2000
% of stream flow allowed for Dilution Factor (e.g., 25% for chronic & 2.5% for acute)	2002	2001.7	2002	2002
Stream Velocity (fps)	2.00	2.00	2.00	2.00
Channel Width (ft)	250.0	250.0	250.0	250.0
Stream Slope (ft/ft) or Manning roughness "n"	0.03	0.03	0.03	0.03
0 if slope or 1 if Manning "n" in previous cell	1	1	1	1
3. Discharge Distance from Nearest Shoreline (ft)	0	0	0	0
4. Location of Point of Interest to Estimate Dilution:				
Distance Downstream to Point of Interest (ft)	300	30	300	300
Distance From Nearest Shoreline (ft)	0	0	0	0
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6	0.6	0.6
6. Original Fischer Method (enter 0) or Effective Origin Modification (enter 1)	1	1	0	0
7. Is the Plume bounded by the shoreline?	Yes	Yes	Yes	Yes
OUTPUT				
1. Source Conservative Mass Input Rate:				
Concentration of Conservative Substance (%)	100.00	100.00	100.00	100.00
Source Conservative Mass Input Rate (cfs*%)	173.30	173.30	173.30	173.30
2. Shear Velocity based on slope (ft/sec)	#N/A	#N/A	#N/A	#N/A
Shear Velocity based on Manning "n" (using Prasuhn equations 8-26 and 8-54 assuming hydraulic radius equals depth for wide channel):				
Darcy-Weisbach friction factor "f"	0.066	0.066	0.066	0.066
Shear Velocity from Darcy-Weisbach "f" (ft/sec)	0.181	0.181	0.181	0.181
Selected Shear Velocity for next step (ft/sec)	0.181	0.181	0.181	0.181
3. Transverse Mixing Coefficient (ft2/sec)	0.435	0.435	0.435	0.435
4. Plume Characteristics Accounting for Shoreline Effect (Fischer et al., 1979):				
Co	8.67E-02	8.67E-02	8.67E-02	8.67E-02
x'	1.04E-03	1.04E-04	1.04E-03	1.04E-03
y'o	0.00E+00	0.00E+00	0.00E+00	0.00E+00
y' at point of interest	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Solution using superposition equation (Fischer eqn 5.9):				
Term for n= -2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Term for n= -1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Term for n= 0	2.00E+00	2.00E+00	2.00E+00	2.00E+00
Term for n= 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Term for n= 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Upstream Distance from Outfall to Effective Origin of Effluent Source (ft)	0.07	0.07	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	300.1	30.1	300.0	300.0
x' Adjusted for Effective Origin	1.04E-03	1.05E-04	1.04E-03	1.04E-03
C/Co (dimensionless)	1.75E+01	5.51E+01	1.75E+01	1.75E+01
Concentration at Point of Interest (Fischer Eqn 5.9)	1.51E+00	4.78E+00	1.51E+00	1.51E+00
Unbounded Plume half-width (ft)	22.9	7.2	22.9	22.9
Distance from near shore to discharge point (ft)	0.0	0.0	0.0	0.0
Distance from far shore to discharge point (ft)	250.0	250.0	250.0	250.0
RESULTS				
W, Plume width bounded by shoreline (ft)	**22.9**	**7.2**	**22.9**	**22.9**
W, Unbounded Plume Width at Point of Interest (ft)	**45.7**	**14.5**	**45.7**	**45.7**
Approximate Downstream Distance to Complete Mix (ft)	**114,871**	**114,871**	**114,871**	**114,871**
Theoretical Dilution Factor at Complete Mix	**1,154**	**1,154**	**1,154**	**1,154**
Calculated Flux-Average Dilution Factor Across Entire Plume Width	**106**	**33**	**106**	**106**
Calculated Dilution Factor at Point of Interest	**66**	**21**	**66**	**66**

Regulatory Max Plume Widths and Dilution Factors

Wmax, Regulatory Max Plume Width (ft)	62.5	62.5	62.5	62.5
Regulatory Max Dilution Factor (e.g, effluent well-mixed with 25% of 7Q10 flow)	23102	23102	23102	23102

Most Restrictive Dilution Factor	**66**	**21**	**66**	**66**

Reasonable Potential Calculation

Facility	PSE
Water Body Type	#NAME?
Rec. Water Hardness	35 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	21.0	66.0
Human Health Carcinogenic		66.0
Human Health Non-Carcinogenic		66.0

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	ARSENIC (dissolved) 7440382 2M	ALUMINUM, total recoverable, pH 6.5-9.0 7429905	IRON 7439896	CHLORIDE (dissolved) in mg/L 16887006	MANGANESE 7439965	CADMIUM - 7440439 4M Hardness dependent	LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	ZINC- 7440666 13M hardness dependent	BENZENE 71432 3V
Effluent Data	# of Samples (n)		1	1	1	1	1	1	1	1	1	1	1
	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)		6	5	40	1680	21800	2450	0.4	0.7	0.0005	20	5
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L		0	0	0	0	0		0	0	0	0	
	Geo Mean, ug/L			0		0		0			0	0	0
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	12,100	360	750	-	860	-	1.1856	20.253	2.1	47.021	-
		Chronic	1,750	190	87	1000	230	-	0.474	0.7892	0.012	42.938	-
	WQ Criteria for Protection of Human Health, ug/L		-	-	-	300	-	50	-	-	0.14	1000	0.44
	Metal Criteria Translator, decimal	Acute	-	1	-	-	-	-	0.943	0.466	0.85	0.996	-
		Chronic	-	1	-	-	-	-	0.943	0.466	-	0.996	-
	Carcinogen?		N	Y	N	N	N	N	N	N	N	N	Y

Aquatic Life Reasonable Potential

Effluent percentile value			0.950	0.950	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	0.555	0.555	
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.050	0.050	0.050	0.050	0.050		0.050	0.050	0.050	0.050	
Multiplier			6.20	6.20	6.20	6.20	6.20		6.20	6.20	6.20	6.20	
Max concentration (ug/L) at edge of…		Acute	2	1.476	11.805	495.820	6433.850		0.111	0.096	0.000	5.879	
		Chronic	1	0.470	3.756	157.761	2,047.134		0.035	0.031	0.000	1.871	
Reasonable Potential? Limit Required?			**NO**	**NO**	**NO**	**NO**	**YES**		**NO**	**NO**	**NO**	**NO**	

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month							2						
LTA Coeff. Var. (CV), decimal							0.6						
Permit Limit Coeff. Var. (CV), decimal							0.6						
Waste Load Allocations, ug/L		Acute					18060						
		Chronic					15180						
Long Term Averages, ug/L		Acute					5798.7628						
		Chronic					8006.4397						
Limiting LTA, ug/L							5798.7628						
Metal Translator or 1?							1.00						
Average Monthly Limit (AML), ug/L							**10424.2**						
Maximum Daily Limit (MDL), ug/L							**18060.0**						

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$	0.554513	0.5545		0.5545	0.5545	0.5545
Pn	$Pn=(1\text{-confidence level})1/n$	0.050	0.050		0.050	0.050	0.050
Multiplier		2.489527	2.4895		2.4895	2.4895	2.4895
Dilution Factor		66	66		66	66	66
Max Conc. at edge of Chronic Zone, ug/L		63.36978	9.2E+01		2E-05	0.7544	0.1886
Reasonable Potential? Limit Required?		**NO**	**YES**		**NO**	**NO**	**NO**

Human Health Limit Calculation

# of Compliance Samples Expected per month	2	
Average Monthly Effluent Limit, ug/L	**3300**	
Maximum Daily Effluent Limit, ug/L	**5717.3**	

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

Reasonable Potential Calculation - Page 2

Facility	PSE
Water Body Type	Freshwater
Rec. Water Hardness	35 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	21.0	66.0
Human Health Carcinogenic		66.0
Human Health Non-Carcinogenic		66.0

Pollutant, CAS No. & NPDES Application Ref. No.		ETHYLBENZENE 100414 19V	TOLUENE 108883 25V	NITRATE/NITRITE (N)	SOLIDS,DISSOLVED AND SALINITY							
Effluent Data	# of Samples (n)	1	1	1	1							
	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)	5	5	0.2	38900							
	Calculated 50th percentile Effluent Conc. (when n>10)											
Receiving Water Data	90th Percentile Conc., ug/L				0							
	Geo Mean, ug/L	0	0	0	0							
Water Quality Criteria	Aquatic Life Criteria, ug/L Acute	-	-	-	-							
	Aquatic Life Criteria, ug/L Chronic	-	-	-	10000000							
	WQ Criteria for Protection of Human Health, ug/L	29	72	10000	250000							
	Metal Criteria Translator, decimal Acute	-	-	-	-							
	Metal Criteria Translator, decimal Chronic	-	-	-	-							
	Carcinogen?	N	N	N	N							

Aquatic Life Reasonable Potential

Effluent percentile value					0.950							
s	$s^2=\ln(CV^2+1)$				0.555							
Pn	$Pn=(1\text{-confidence level})^{1/n}$				0.050							
Multiplier					6.20							
Max concentration (ug/L) at edge of…	Acute				11480.585							
	Chronic				3,652.913							
Reasonable Potential? Limit Required?					**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	$s^2=\ln(CV^2+1)$	0.5545	0.5545	0.5545	0.554513029							
Pn	$Pn=(1\text{-confidence level})1/n$	0.050	0.050	0.050	0.050							
Multiplier		2.4895	2.4895	2.4895	2.489527087							
Dilution Factor		66	66	66	66							
Max Conc. at edge of Chronic Zone, ug/L		0.1886	0.1886	0.0075	1467.312177							
Reasonable Potential? Limit Required?		**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

APPENDIX E--RESPONSE TO COMMENTS

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