Fact Sheet for NPDES Permit WA0022527

VASHON WASTEWATER TREATMENT PLANT

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 King County's Vashon Wastewater Treatment Plant (WWTP).

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

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for King County's Vashon WWTP, NPDES permit WA0022527, were available for public review and comment from June 16, 2011, until July 18, 2011. For more details on preparing and filing comments about these documents, please see *Appendix A – Public Involvement Information.*

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

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as *Appendix H – Response to Comments*, and publish it when issuing the final NPDES permit. Ecology will not revise the rest of the fact sheet, but the full document will become part of the legal history contained in the facility's permit file.

Summary

King County (County) owns and operates a wastewater treatment plant (WWTP) located on Vashon Island. This facility has a maximum monthly capacity of 0.52 MGD. The facility includes a headworks and odor control system, oxidation ditches, two secondary clarifiers, and RAS/WAS pumps. For disinfection, the County uses a UV disinfection system.

The proposed permit contains the same effluent limits for Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), Fecal Coliform Bacteria, and pH as the permit issued in 2006. The proposed permit includes revised limits for total residual chlorine on a maximum daily basis, when the facility uses chlorine as a disinfectant.

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I. Introduction

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

The following regulations apply to domestic wastewater NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC).
- Technical criteria for discharges from municipal wastewater treatment facilities (chapter 173-221 WAC).
- Water quality criteria for surface waters (chapter 173-201A WAC).
- Whole effluent toxicity testing and limits (chapter 173-205 WAC).
- Sediment management standards (chapter 173-204 WAC).
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC).

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

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

II. Background Information

Table 1. General Facility Information

Facility Information	
Applicant:	King County Department of Natural Resources & Parks Wastewater Treatment Division 201 S. Jackson Street Seattle, WA 98104-3855
Facility Name and Address:	Vashon Wastewater Treatment Plant c/o King County 9621 - SW 171 Street Vashon, WA 98070
Contact at Facility:	Name: Greg Burnham Telephone #: 206-463-7318
Responsible Official:	Name: Ms. Christie True Title: Director, Dept. of Natural Resources and Parks Address: 201 - S. Jackson Street Seattle, WA 98104-3855 Phone #: 206-296-6500
Type of Treatment:	Oxidation Ditch (Secondary Treatment)
Facility Location: (NAD83/WGS84 reference datum)	Latitude: 47.452091 Longitude: -122.455819
Discharge Waterbody Name and Location: (NAD83/WGS84 reference datum)	Puget Sound Latitude: 47.452917 Longitude: -122.433333

Permit Status	
Issuance Date of Previous Permit	August 31, 2006
Application for Permit Renewal Submittal Date	March 22, 2011
Date of Ecology Acceptance of Application	March 29, 2011

Inspection Status	
Date of Last Sampling Inspection	August 23, 2005
Date of Last Non-sampling Inspection Date	August 2, 2007

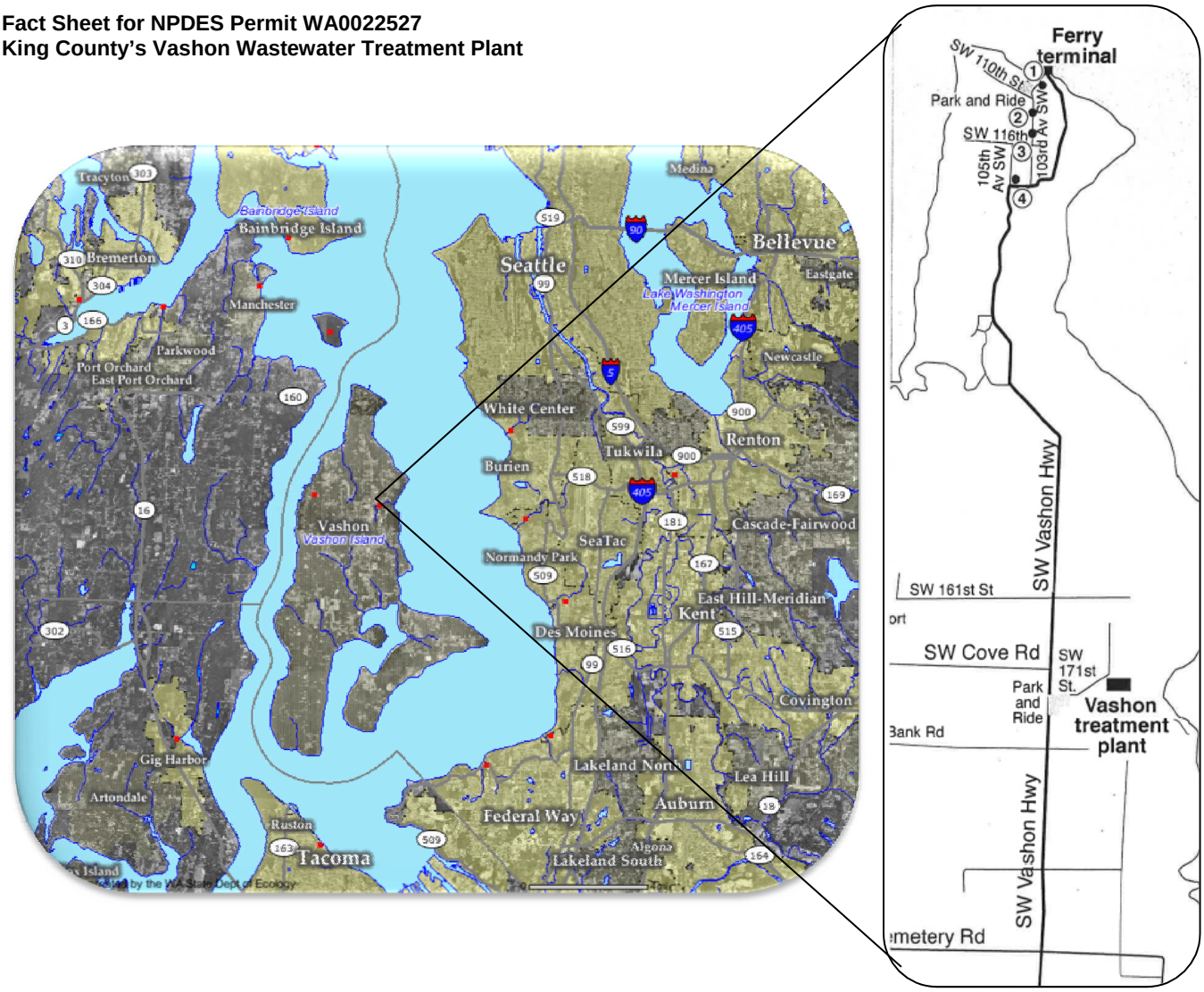


Figure 1. Facility Location Map

A. Facility description

History

The Vashon Sewer District (District), formed on September 22, 1947, first provided sewer service in 1955. The first treatment plant consisted of an Imhoff tank, trickling filter, secondary clarifier and discharge to Gorsuch Creek adjacent to the plant. The District expanded and upgraded the wastewater plant in 1976 to include an oxidation ditch and outfall to marine waters. In November 1999, King County assumed ownership and operation of the Vashon treatment plant from the Vashon Sewer District. King County modified the headworks to prevent overflows, modified the Imhoff tank for use as a sludge storage tank, and replaced the chlorination system with ultraviolet disinfection. The facility expanded again in 2005-2006, increasing its design maximum month flows from 0.264 MGD to 0.52 MGD.

Collection system status

King County has taken over ownership and operation of the treatment plant; however, Vashon Sewer District still owns and maintains most of the collection system. The District has experienced ongoing infiltration in the collection system since installation of the first collection sewers. Much of the older part of the collection system consists of 3-foot sections of concrete pipe with mortared joints. The Vashon Sewer District has conducted various infiltration/inflow studies on the collection system and has implemented portions of the recommendations in an attempt to reduce extraneous flows. To address health hazard problems, it constructed a sewer interceptor line to serve the Bunker Trail community at the north end of Vashon Island. King County operates and maintains the lift stations in the Bunker Trail community.

Treatment processes

The treatment train includes a headworks and odor control system, an oxidation ditch (with the original ditch serving as backup), two secondary clarifiers, and a UV disinfection system. The original clarifier is available to serve as an equalization basin. Chlorine is available for disinfection backup in the event the UV system goes out of service. The treated wastewater discharges into the Puget Sound via a submarine outfall.

Discharge Outfall

The treated and disinfected effluent flows into Puget Sound through the County's outfall. King County extended the outfall from a depth of -40 feet mean lower-lower water (MLLW) to -200 feet MLLW and began discharging through it in October 2004. The main objective of this extension was to better protect the shellfish beds along the east coast of Vashon Island. The updated outfall consists of an 8-inch diameter HDPE pipe and open-ended 8-inch port. The outfall terminates about 2700 feet from the MLLW beach line.

Residual Solids

The Vashon facility removes solids during the treatment of the wastewater at the headworks (grit and screenings) and waste activated sludge at the secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum, and screenings are drained and disposed of as solid waste. Waste activated sludge that is removed from the secondary clarifiers is transported to King County's South Treatment Plant at Renton where it is processed with the solids from the South Plant. The solids are ultimately disposed, reused, or land applied.

B. Description of the receiving water

King County's Vashon WWTP discharges treated effluent to Puget Sound. Other nearby point source outfalls include the Miller Creek WWTP, located about 3.5 miles to the east-southeast in Normandy Park, and the Salmon Creek WWTP, located about 4 miles to the northeast in Burien.

The ambient background data used for this permit includes the following from King County's ambient Station MSJN03 at the end of the Vashon outfall and King County's Fauntleroy/Vashon ambient Station LSNT01 located about 4 miles to the north of the outfall:

Table 2. Ambient Background Data

Parameter	Value Used
Temperature (highest annual 1-DADMax)	14.5° C
pH (Maximum / Minimum)	8.0/7.0 standard units (assumed)
Dissolved Oxygen (10th percentile)	6.0 mg/L
Total Ammonia-N	0.09 mg/L
Fecal Coliform (Maximum)	4 organisms/100 mL
Turbidity	0 NTU
Salinity (Maximum)	30.7 PSS
Lead (Total Maximum)	0.16 µg/L
Copper (Total Maximum)	0.57 µg/L
Zinc (Total Maximum)	0.89 µg/L

C. Wastewater influent characterization

King County reported the concentration of influent pollutants in discharge monitoring reports. For the period September 2006 to January 2011, the influent wastewater, on a monthly basis, is characterized as follows:

Table 3. Wastewater Influent Characterization

Parameter	Units	Average Value	Maximum Value
BOD_5	mg/L	345	648
TSS	mg/L	251	514

D. Wastewater effluent characterization

King County reported the concentration of pollutants in the discharge monitoring reports. The tabulated data represents the quality of the wastewater effluent discharged from September 2006 to January 2011. The wastewater effluent is characterized as follows:

Table 4. Wastewater Effluent Characterization

Parameter	Units	Monthly Average Value	Monthly Maximum Value
BOD_5	mg/L	3.5	19.7
TSS	mg/L	4.1	32
Parameter	**Units**	**Monthly Geometric Mean**	**7- day Geometric Mean**
Fecal Coliforms	CFUs/100 mL	11.5	65.2
Parameter	**Units**	**Minimum Value**	**Maximum Value**
pH	Standard units	5.9	8.2

E. Summary of compliance with previous permit issued on August 31, 2006

The previous permit placed effluent limits on BOD_5, TSS, fecal coliform bacteria, pH, and total residual chlorine. King County has complied with almost all of the effluent limits and permit conditions throughout the duration of the permit issued on August 31, 2006. Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections. Ecology recognized King County for outstanding performance of its Vashon WWTP for calendar year 2009.

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

Table 5. Violations

Date	Parameter	Statistical Basis	Units	Value	Limit Min/Max	Violation
December 2006	Influent BOD_5	Average	lbs/day	744	671	Numeric violation
December 2010	pH	Minimum	S.U.	5.9	6.0	Numeric effluent violation
March 2011	--	--	--	--	--	Loss of disinfection

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

Table 6. Permit Submittals

Submittal Name	Submittal Status	Due Date	Received Date	Approved?
Operation & Maintenance Manual	Received	5/31/2007	3/26/07	Yes
Application for Permit Renewal	Received	2/28/11	3/22/11	Yes

F. State environmental policy act (SEPA) compliance

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

III. Proposed Permit Limits

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

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the National Toxics Rule (40 CFR 131.36).

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

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

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

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant in the Vashon Island Wastewater Treatment Plant Facilities Plan prepared by King County Department of Natural Resources and Parks in November 2003 and approved by Ecology on March 8, 2004. The table below includes design criteria from the referenced report.

Table 7. Design Criteria for Vashon WWTP

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	0.52 MGD
Annual Average Flow	0.18 MGD
Peak Hourly Flow	1.74 MGD
Influent BOD_5 Loading for Maximum Month	671 lb/day
Influent TSS Loading for Maximum Month	671 lb/day

B. Technology-based effluent limits

Federal and state regulations define technology-based effluent limits for municipal wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for municipal wastewater.

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

Table 8. Technology-based Limits

Parameter	Average Monthly Limit	Average Weekly Limit
BOD_5 (concentration)	30 mg/L	45 mg/L
BOD_5 (concentration)	In addition, the BOD_5 effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
TSS (concentration)	30 mg/L	45 mg/L
TSS (concentration)	In addition, the TSS effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
Parameter	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**
Fecal Coliform Bacteria	200 organisms/100 mL	400 organisms/100 mL
Parameter	**Daily Minimum**	**Daily Maximum**
pH	6.0 standard units	9.0 standard units

The County uses UV radiation for disinfection but maintains chlorination equipment on-site for possible emergency use. For those occasions when the facility uses chlorine to disinfect the effluent, it must meet the proposed permit chlorine effluent limit. Ecology derived the technology-based monthly average limit for chlorine from standard operating practices. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/L chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, *Wastewater Engineering, Treatment, Disposal and Reuse*, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/L chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/L.

The previous permit included a water quality-based chlorine limit of 0.44 mg/L (monthly average) and a technology-based limit of 0.75 mg/L (daily maximum) (See Section III.F).

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

Mass Limit = C x Q x CF

where:

C = Technology-based concentration limits listed in Table 9

Q = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

Table 9. Technology-based Mass Limits – Monthly Average

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD_5 Monthly Average	30	130
TSS Monthly Average	30	130

Ecology calculated the weekly average mass limits for BOD_5 and Total Suspended Solids as follows:

Average Weekly Mass Effluent Limit = 1.5 x Average Monthly Mass Effluent Limit

Table 10. Technology-based Mass Limits - Weekly Average

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD_5 Weekly Average	45	195
TSS Weekly Average	45	195

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

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA, 1992). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1), 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.

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

Mixing zones

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

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

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

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

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 10 means the effluent is 10% and the receiving water is 90% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

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 liters/day for drinking water.
- A one-in-one-million cancer risk for carcinogenic chemicals.

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

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

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

2. **The facility must fully apply "all known, available, and reasonable methods of prevention, control and treatment" (AKART) to its discharge.**

   Ecology has determined that the treatment provided at Vashon WWTP 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 uses the water depth at mean lower low water (MLLW) for marine waters. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: http://www.ecy.wa.gov/biblio/92109.html.

Table 11. Critical Conditions

Critical Condition	Value
Water depth at MLLW of 0 feet	200 feet
Density profile with a difference of sigma-t units between 56 m and 2m	Acute 0.376 Chronic 0.534
10^{th} or 90^{th} percentile current speeds for acute mixing zone	2.9 cm/sec, 22.7 cm/s
50^{th} percentile current speeds for chronic and human health mixing zones	8.4 cm/sec
Maximum average monthly effluent flow for chronic and human health non-carcinogen	0.7 MGD (year 2050)
Annual average flow for human health carcinogen	0.18 MGD, not modeled. Chronic aquatic dilution factor used for HH criteria
Maximum daily flow for acute mixing zone	1.37 million gallons per day (MGD)
1 DAD MAX effluent temperature	18.7 degrees C

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from data provided by King County.

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

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

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

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

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

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

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

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

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

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

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. Because tidal currents change direction, the plume orientation within the mixing zone changes. The plume mixes as it rises through the water column therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. 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 95^{th} percentile pollutant concentration, the 90^{th} 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.

- **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 tables included below summarize the criteria applicable to the receiving water's designated uses.

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

The *Aquatic Life Uses* and the associated criteria for this receiving water are identified below.

Table 12. Marine Aquatic Life Uses and Associated Criteria

Extraordinary Quality	
Temperature Criteria – Highest 1D MAX	13°C (55.4°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	7.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.2 units.

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

The recreational uses for this receiving water are identified below.

Table 13. Recreational Uses

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 14 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 43 colonies/100 mL).

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

E. Water quality impairments

The coastal area just west of the outfall is listed on the current 303(d) as impaired for fecal coliform.

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

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biochemical oxygen demand (BOD_5) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

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

The outfall terminates about 2700 feet from the MLLW beach line. The diffuser has a single, end port with an 8 inch diameter. The diffuser mean lower low water (MLLW) depth is -200 feet.

Chronic Mixing Zone -- WAC 173-201A-400(7)(b) specifies that mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge port. The horizontal distance of the chronic mixing zone is 800 feet. The mixing zone extends from the top of the discharge ports to the water surface.

Acute Mixing Zone -- WAC 173-201A-400(8)(b) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone. The acute mixing zone for the outfall extends a horizontal distance of 80 feet.

King County determined the dilution ratios that occur within these zones at the critical condition using EPA Plumes model. The dilution ratios are listed below.

Table 14. Dilution Factor (DF)

Criteria	Acute	Chronic
Aquatic Life	89	681
Human Health, Carcinogen		681[1]
Human Health, Non-carcinogen		681 [1]

Ecology determined the impacts of dissolved oxygen deficiency, nutrients, pH, fecal coliform, chlorine, ammonia, metals, other toxics, and temperature as described below, using the dilution ratios 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.

BOD_5 -- With technology-based limits, this discharge results in a small amount of biochemical oxygen demand (BOD_5) relative to the large amount of dilution in the receiving water at critical conditions. Technology-based limits will ensure that dissolved oxygen criteria are met in the receiving water.

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

Fecal Coliform -- Ecology modeled the numbers of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml and a dilution ratio of 681:1.

Under critical conditions, modeling predicts no violation of the water quality criterion for fecal coliform. Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria.

Turbidity -- Ecology evaluated the impact of turbidity based on the range of total suspended solids in the effluent and turbidity of the receiving water. Ecology used total suspended solids as a surrogate because domestic wastewater dischargers do not routinely measure turbidity. Ecology expects no violations of the turbidity criteria outside the designated mixing zone provided the facility meets its technology-based total suspended solids permit limits.

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

The following toxic pollutants are present in the discharge: **ammonia, arsenic, chromium, copper, lead, nickel, toluene, zinc, bis(2-ethylhexyl)phthalate, diethyl phthalate and potentially chlorine** when chlorine is used for disinfection. Ecology conducted a reasonable potential analysis (**See Appendix E**) on these parameters to determine whether it would require effluent limits in this permit.

[1] Human health criteria dilution factors were not provided with the modeling results. The chronic dilution factor was used to evaluate human health criteria. Assumptions used to model the chronic dilution factor generally result in the chronic dilution factor being smaller than the dilution factor for human health and is therefore conservative.

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

Ecology determined that the above-listed toxic pollutants pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 (Appendix E) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

Chlorine may be used on an emergency basis when the UV system is inoperable. For those occasions when chlorine is applied to the effluent, a chlorine limit will be in effect. Ecology calculated effluent limits using methods from EPA, 1991, as shown in Appendix E. The resultant effluent limits were calculated to be 0.44 and 1.16 mg/L for average monthly and maximum daily concentrations, respectively. Ecology considers chlorine to be more of a toxicant on a daily basis rather than the technology-based weekly limit. Therefore, the proposed permit uses water-quality based average monthly and maximum daily concentrations.

The resultant effluent limits are as follows:

Residual chlorine (monthly average) = 0.44 mg/L

Residual chlorine (maximum daily) = 1.16 mg/L

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

Annual summer maximum, supplementary spawning criterion, and incremental warming criteria: Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum, the supplementary spawning criterion, and the incremental warming criteria at the edge of the chronic mixing zone during the critical condition. No reasonable potential exists to exceed the temperature criterion where:

(Criterion + 0.3) > [Criterion + (Teffluent95 – Criterion)/DF].

(13 + 0.3) > [_13+ (18.7–13)/681].

13.3 > 13.008

Therefore, the proposed permit does not include a temperature limit. The permit requires additional monitoring of effluent and ambient temperatures. Ecology will reevaluate the reasonable potential during the next permit renewal.

G. Human health

Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology determined the effluent may contain chemicals of concern for human health, based on data and information indicating regulated chemicals occur 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 discharge has no reasonable potential to cause a violation of water quality standards, and an effluent limit is not needed.

H. 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. http://www.ecy.wa.gov/programs/tcp/smu/sediment.html

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

I. Whole effluent toxicity

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

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

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate an NOEC,

LC50, EC50, IC25, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (http://www.ecy.wa.gov/biblio/9580.html), which is referenced in the permit. Ecology recommends that the County send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water acute toxicity. The proposed permit will not include an acute WET limit. King County must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization. King County may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing and/or chemical analyses after the process or material changes have been made. Ecology recommends that the Permittee check with it first to make sure that Ecology will consider the demonstration adequate to support a decision to not require an additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water chronic toxicity. The proposed permit will not include a chronic WET limit. King County must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. King County may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

J. Ground water quality limits

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

King County does not discharge wastewater to the ground. No permit limits are required to protect ground water.

K. Comparison of effluent limits with the previous permit issued on August 31, 2006

Table 15. Comparison of Previous and Proposed Effluent Limits

		Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand (5-day)	Technology	30 mg/L, 130 lb/day, 85% removal of influent BOD_5	45 mg/L, 195 lb/day	30 mg/L, 130 lb/day, 85% removal of influent BOD_5	45 mg/L, 195 lb/day
Total Suspended Solids	Technology	30 mg/L, 130 lb/day, 85% removal of influent TSS	45 mg/L, 195 lb/day	30 mg/L, 130 lb/day, 85% removal of influent TSS	45 mg/L, 195 lb/day
Parameter		**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**
Fecal Coliform Bacteria	Technology	200/100 mL	400/100 mL	200/100 mL	400/100 mL
Parameter		**Daily Min.**	**Daily Max.**	**Daily Min.**	**Daily Max.**
pH	Technology	6.0	9.0	6.0	9.0
Parameter		**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Total Residual Chlorine	Tech- and/or WQ-Based	0.44 mg/L (WQ-Based)	0.75 mg/L (Tech-based numeric limit on a weekly basis, but permit specified on a daily basis)	0.44 mg/L (WQ-Based)	1.16 mg/L (WQ-Based)

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.

A. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters). Ecology accredited the laboratory at this facility for BOD_5, pH, TSS, total residual chlorine, and fecal coliform bacteria.

B. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-09) for an activated sludge plant with an average design flow of less than 2.0 MGD.

Ecology has included some additional monitoring of nutrients in the proposed permit to establish a baseline for this discharger.

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

As a pretreatment publicly owned treatment works (POTW), the County is required to sample influent, primary clarifier effluent, final effluent, and sludge for toxic pollutants in order to characterize the industrial input. Sampling is also done to determine if pollutants interfere with the treatment process or pass-through the plant to the sludge or the receiving water. The County will use the monitoring data to develop local limits which commercial and industrial users must meet.

V. Other Permit Conditions

A. Reporting and record keeping

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

B. Prevention of facility overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require King County to:

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

Special Condition S.4 restricts the amount of flow.

C. Operation and maintenance

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

D. Pretreatment

Duty to enforce discharge prohibitions

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

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes "pass-through" or "interference." This general prohibition is from 40 CFR §403.5(a). Appendix C of this fact sheet defines these terms.

- The second section reinforces a number of specific state and federal pretreatment prohibitions found in WAC 173-216-060 and 40 CFR §403.5(b). These reinforce that the POTW may not accept certain wastes, which:
  a. Are prohibited due to dangerous waste rules.
  b. Are explosive or flammable.
  c. Have too high or low of a pH (too corrosive, acidic or basic).
  d. May cause a blockage such as grease, sand, rocks, or viscous materials.
  e. Are hot enough to cause a problem.
  f. Are of sufficient strength or volume to interfere with treatment.
  g. Contain too much petroleum-based oils, mineral oil, or cutting fluid.
  h. Create noxious or toxic gases at any point.

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

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

Ecology delegated authority to King County for permitting, monitoring, and enforcement over industrial users discharging to their treatment system to provide more direct and effective control of pollutants. Ecology oversees the delegated Industrial Pretreatment Program to assure compliance with federal pretreatment regulations (40 CFR Part 403) and categorical standards and state regulations (chapter 90.48 RCW and chapter 173-216 WAC).

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

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

E. Residual solids handling

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

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under chapter 70.95J RCW, chapter 173-308 WAC "Biosolids Management," and chapter 173-350 WAC "Solid Waste Handling Standards." The disposal of other solid waste is under the jurisdiction of the King County Health Department.

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

F. General conditions

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

VI. Permit Issuance Procedures

A. Permit modifications

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

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

B. Proposed permit issuance

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

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

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

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

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.

Washington State Department of Ecology.

November 2010. *Permit Writer's Manual*. Publication Number 92-109. (http://www.ecy.wa.gov/biblio/92109.html)

Laws and Regulations (http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information. (http://www.ecy.wa.gov/programs/wq/wastewater/index.html)

Water Pollution Control Federation.

1976. *Chlorination of Wastewater*.

Appendix A - Public Involvement Information

Ecology proposes to reissue a permit to King County's Vashon Wastewater Treatment Plant. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Draft on June 16, 2011, in the *Seattle Times* to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Told where copies of the draft permit and fact sheet were available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offered to provide the documents in an alternate format to accommodate special needs.
- Asked people to tell us how well the proposed permit would protect the receiving water.
- Invited people to suggest fairer conditions, limits, and requirements for the permit.
- Invited comments on Ecology's determination of compliance with antidegradation rules.
- Urged people to submit their comments, in writing, before the end of the comment period.
- Told how to request a public hearing about the proposed NPDES permit.
- Explained 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 http://www.ecy.wa.gov/biblio/0307023.html.

You may obtain further information from Ecology by telephone, 425-649-7201, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

The primary author of this permit and fact sheet is Mark Henley, P.E.

Appendix B - Your Right to Appeal

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

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

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

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

ADDRESS AND LOCATION INFORMATION

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

Appendix C - Glossary

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

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

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

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

Alternate point of compliance -- An alternative location in the ground water from the point of compliance where compliance with the ground water standards is measured. It may be established in the ground water 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 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 ground water 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.

BOD_5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 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 -- See Method Detection Level.

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, ground water, 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 ground water at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a ground water 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.

Ground water -- 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 storm water and, also, leachate from solid waste facilities.

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

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

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

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

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

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

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

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

Method detection level (MDL) -- 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.

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 ground water 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 ground water 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).

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 year(s), 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 storm water 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 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.

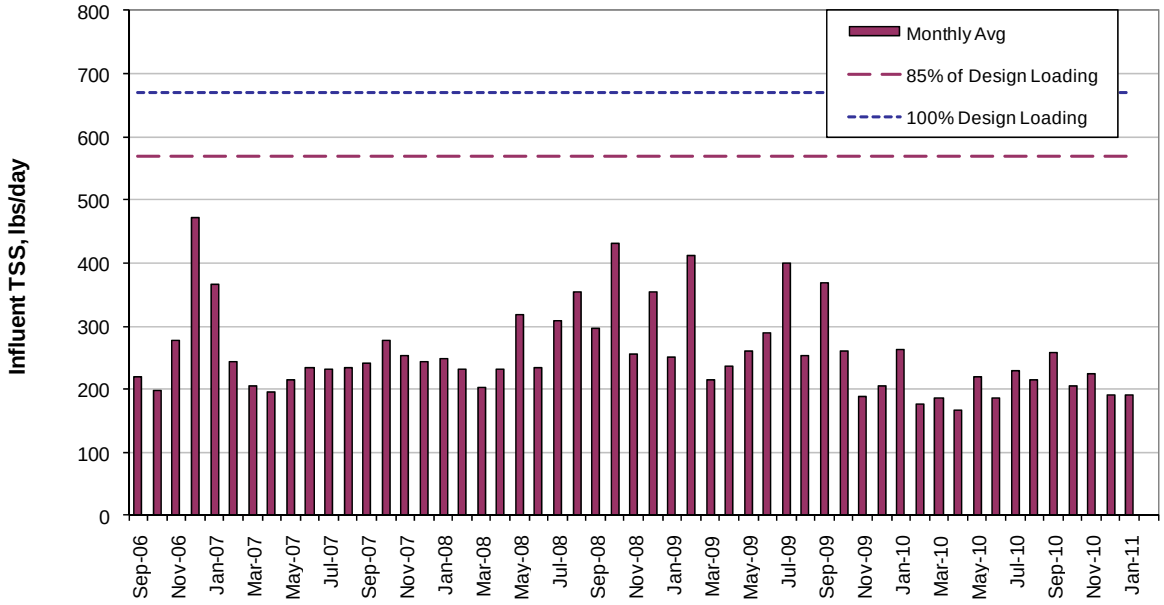
Appendix D – Vashon WWTP Discharge Monitoring Report Summary Tables & Graphs

(September 2006 – January 2011)

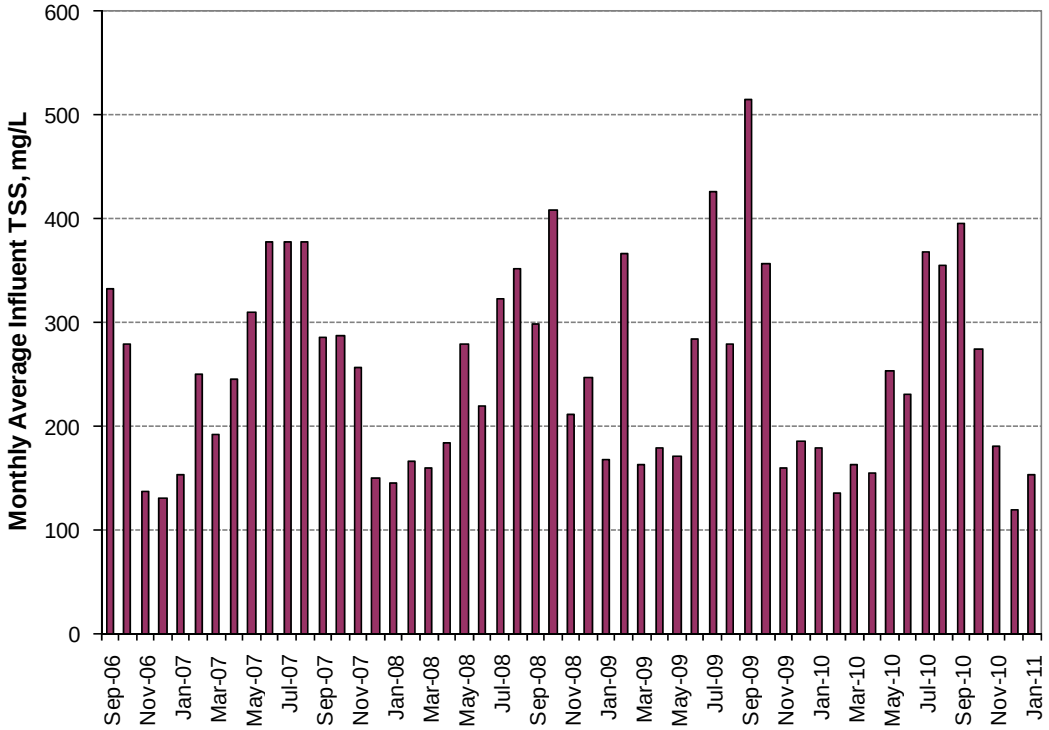
Influent								
Date	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd
	Monthly Avg	Max day	Monthly Avg	Max day	Monthly Avg	Max Day	Monthly Avg	Max day
1-Sep-06	580	712	387	479	331	935	220	624
1-Oct-06	496	543	350	483	278	346	197	270
1-Nov-06	177	282	361	559	137	222	277	373
1-Dec-06	190	418	744	2038	130	217	472	1045
1-Jan-07	271	479	553	1946	152	383	367	2020
1-Feb-07	289	546	296	347	250	519	244	456
1-Mar-07	215	378	229	353	191	400	205	470
1-Apr-07	306	428	244	414	244	412	196	337
1-May-07	371	509	256	361	309	511	214	354
1-Jun-07	418	527	263	352	377	620	233	388
1-Jul-07	453	674	279	455	377	618	232	417
1-Aug-07	502	582	312	383	377	616	234	370
1-Sep-07	447	524	380	435	285	362	242	336
1-Oct-07	427	450	407	439	287	384	277	437
1-Nov-07	376	486	373	506	256	356	254	371
1-Dec-07	192	283	312	419	149	207	243	324
1-Jan-08	195	316	333	510	145	233	248	376
1-Feb-08	253	375	339	422	165	303	232	357
1-Mar-08	238	318	298	379	159	230	203	293
1-Apr-08	262	321	326	386	183	264	231	408
1-May-08	350	438	393	530	279	565	319	662
1-Jun-08	344	408	367	470	218	311	233	324
1-Jul-08	454	679	435	661	322	765	309	744
1-Aug-08	462	617	458	567	351	503	355	609
1-Sep-08	397	553	393	526	298	555	296	527
1-Oct-08	434	650	439	719	407	1600	430	1913
1-Nov-08	311	408	375	450	210	303	255	355
1-Dec-08	356	520	492	1174	247	458	355	1034
1-Jan-09	221	350	331	426	167	340	251	419
1-Feb-09	439	718	503	799	366	1500	413	1668
1-Mar-09	262	379	348	458	163	250	215	305
1-Apr-09	267	402	352	516	178	260	237	323
1-May-09	306	496	461	593	170	256	261	355
1-Jun-09	528	762	540	781	283	378	289	388
1-Jul-09	637	1380	593	1348	426	1300	399	1269
1-Aug-09	585	726	534	662	278	436	253	411
1-Sep-09	648	1200	466	826	514	825	368	583
1-Oct-09	492	700	353	480	356	772	260	593
1-Nov-09	284	577	327	441	159	322	189	229
1-Dec-09	259	405	275	361	185	334	205	291
1-Jan-10	230	666	352	777	179	559	262	652
1-Feb-10	141	214	178	268	135	176	177	224
1-Mar-10	220	334	248	366	162	200	187	331
1-Apr-10	193	223	210	263	154	180	167	190
1-May-10	340	427	291	377	252	386	219	413
1-Jun-10	303	455	250	408	230	341	185	223
1-Jul-10	410	500	254	324	368	621	229	425
1-Aug-10	447	622	275	376	354	540	214	326
1-Sep-10	414	561	270	356	394	496	257	345
1-Oct-10	366	567	278	377	273	367	206	239
1-Nov-10	212	365	255	392	180	245	225	320
1-Dec-10	138	258	221	351	118	231	192	314
1-Jan-11	192	296	257	330	153	260	190	286
AVE:	345	510	355	555	251	467	257	515
MIN:	138	214	178	263	118	176	167	190
MAX:	648	1380	744	2038	514	1600	472	2020
Limit			671				671	
85%			570				570	

	Effluent															
Date	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	BOD, % Removal	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd	TSS, % Removal	PH	PH	Fecal Coliform,	Coliform, #/100 ml
	Monthly Avg	Max day	Monthly Avg	Weekly Avg	Monthly Avg	Weekly Avg	Monthly Avg	Monthly Avg	Weekly Avg	Monthly Avg	Weekly Avg	Monthly Avg	Day Min	Day Max	GEM	GM7
1-Sep-06	0.078	0.083	19.7		12	17	97	32	50	21	34	90	6.5	7	23	146
1-Oct-06		0.082	5	8	3	5	99	9	13	6	8	97	6.6	7.4	6	116
1-Nov-06	0.247		3	4	6	10	98	6	8	13	20	95	6.4	7.5	28	38
1-Dec-06	0.486	1.04	4	9	17	38	98	6.6	14	24.3	67.4	95	6	6.9	24	85
1-Jan-07	0.24	0.632	2	4	5	14	99	3	5	7	19	98	6.5	7.1	27	64
1-Feb-07	0.115	0.153	3	4	3	4	99	3	6	4	7	98	6.6	7	2	8
1-Mar-07	0.135	0.247	3	5	4	6	98	3	4	3	4	98	6.7	7.1	3	17
1-Apr-07	0.097	0.121	2	5	2	3	99	3	6	3	5	99	6.8	7.3	13	257
1-May-07	0.08	0.094	2	2	1	2	99	2	4	2	3	99	6.8	7.4	37	389
1-Jun-07	0.074	0.106	3.5	5.5	2.2	3.3	99	5.6	8	3.5	4.8	99	6.8	7.4	15	117
1-Jul-07	0.073	0.083	2.7	3.4	1.6	2.1	99	5.2	5.8	3.2	3.6	99	6.5	7.5	40	81
1-Aug-07	0.072	0.083	2.3	4.4	1.4	2.5	99	4.2	10	2.6	6	99	6.7	7.8	4	16
1-Sep-07	0.102	0.141	1.3	2	1.1	1.8	99.7	2.8	3.4	2.4	3	99	6.7	7.9	28	41
1-Oct-07	0.111	0.136	1.8	2.7	1.7	2.5	99.6	3.5	5.5	3.3	5.1	98.8	6.6	6.9	24	86
1-Nov-07	0.12	0.18	1.9	2.5	1.9	2.2	99.5	4.5	6.1	4.5	5.9	98.3	6.6	7.7	21	97
1-Dec-07	0.203	0.556	1.7	1.9	3	4.1	99	2.2	2.9	3.9	6.7	98.3	6.2	6.8	4.0	9.0
1-Jan-08	0.212	0.344	1.3	1.6	2.3	2.8	99.3	2	3.2	3.3	4.8	98.7	6.4	6.9	2.0	2.0
1-Feb-08	0.169	0.234	2.6	3.8	3.4	4.3	99	1.8	2.6	2.6	3.2	98.8	6.4	6.9	2.0	5.0
1-Mar-08	0.161	0.235	2.3	3.1	2.8	3.4	99	2.3	3	2.8	3.9	98.5	6.3	6.9	3.0	10.0
1-Apr-08	0.146	0.146	1.4	1.7	1.7	2.1	99.5	1.4	1.9	1.8	2.3	99.2	6.4	7.4	5.0	30.0
1-May-08	0.127	0.163	2.2	2.4	2.5	2.8	99.4	2.4	2.8	2.7	3.6	99	6.1	7.1	5.0	26.0
1-Jun-08	0.124	0.154	1.3	1.8	1.4	1.9	99.6	1.4	1.8	1.5	2	99.3	6	6.9	11.0	123.0
1-Jul-08	0.116	0.135	2	3.4	1.9	3.2	99.6	1.6	2.6	1.5	2.3	99.5	6.5	7.1	11.0	41.0
1-Aug-08	0.118	0.139	2	3	2	3.5	99.6	1.6	2.5	1.6	2.9	99.6	6.1	7.4	15.0	64.0
1-Sep-08	0.117	0.125	1.8	2	1.8	2	99.5	2.6	3.1	2.6	3.1	98.9	6.2	7	39.0	185.0
1-Oct-08	0.12	0.143	3	3.8	3.1	4.1	99.3	4.6	7.2	4.7	7.8	98.6	6.4	7	21.0	168.0
1-Nov-08	0.153	0.305	3.5	4.3	4.6	7.6	98.7	2.9	4.2	3.8	5	98.5	6.4	6.9	14.0	42.0
1-Dec-08	0.172	0.343	3.2	4.2	4.2	6.3	99.1	2.6	3.2	3.5	6	99	6.5	7.1	19.0	63.0
1-Jan-09	0.206	0.634	3.7	5.1	6.7	10.4	97.8	5.2	10	9.7	17	96.5	6.1	6.8	12.0	118.0
1-Feb-09	0.134		3	4.3	3.4	4.6	99.3	2.5	3.8	2.9	4.1	99.1	6.6	7	1.0	1.0
1-Mar-09	0.167	0.239	3.9	6	5.2	7.8	98.5	5.3	9.4	7.1	12.4	96.7	6.3	6.9	7.0	29.0
1-Apr-09	0.167	0.216	6	7.2	8	8.6	97.6	8.9	11.9	11.9	14.4	95.1	6.4	7.1	1.0	19.0
1-May-09	0.176	0.316	2.9	3.8	5	9.1	98.8	4.9	6.2	8.3	14.3	96.8	6.4	6.8	2.0	5.0
1-Jun-09	0.12	0.131	12.6	25.5	13.2	27.3	97.8	12.6	30.5	13.2	32.6	95.6	6.3	7.2	6.0	283.0
1-Jul-09	0.115	0.183	5	8	4.6	7.5	99.1	2.6	3.8	2.4	3.5	99.3	6.7	8.2	4.0	12.0
1-Aug-09	0.106	0.121	4.1	5	3.7	4.6	99.3	1.9	2.5	1.7	2.3	99.3	6.7	7.1	7.0	29.0
1-Sep-09	0.084	0.11	3.8	8.1	2.8	5.9	99.3	4	9	2.9	6.5	99.3	6.4	7	40.0	287.0
1-Oct-09	0.087	0.124	3	3.9	2.1	2.8	99.3	1.7	1.9	1.2	1.4	99.4	6.3	7.3	16.0	45.0
1-Nov-09	0.17	0.299	2.9	3.1	3.8	4.6	98.7	2	2.7	3	4.5	98.4	6.2	7	14.0	53.0
1-Dec-09	0.136	0.222	3.1	5.1	3.3	4.4	98.8	5.1	9.9	5.5	8.4	97.3	6.3	6.9	12.0	56.0
1-Jan-10	0.211	0.401	2.6	3.6	4.9	7.8	98.3	3.9	6.3	7.6	12.4	96.1	6.1	6.5	1.0	2.0
1-Feb-10	0.158	0.237	1.2	1.4	1.5	1.8	99.1	1.9	2.1	2.5	2.8	98.6	6.4	6.9	1.0	1.0
1-Mar-10	0.139	0.226	2.6	3.8	3	4.6	98.8	2.8	4.2	3.1	4.5	98.2	6.4	6.7	3.0	12.0
1-Apr-10	0.136	0.244	1.9	2.6	2	2.7	99	2.1	2.3	2.3	3	98.6	6.3	6.8	7.0	17.0
1-May-10	0.102	0.144	2.7	3.7	2.4	3.7	99.2	2.1	4	1.9	3.8	99	6.5	7	10.0	65.0
1-Jun-10	0.101	0.139	1.2	2	1	1.9	99.6	1.4	1.8	1.2	1.8	99.3	6.5	6.9	5.0	19.0
1-Jul-10	0.075	0.089	4.5	5.7	2.7	3.4	99	2.4	3.3	1.5	2.1	99.3	6.3	7	6.0	52.0
1-Aug-10	0.071	0.082	3.9	5.4	2.4	3.2	99	1.7	1.9	1	1.1	99.5	6.4	7.1	2.0	12.0
1-Sep-10	0.08	0.121	5	5.1	3.3	3.5	98.7	3.5	4	2.3	2.8	99.1	6.5	7	3.0	6.0
1-Oct-10	0.096	0.174	5	5.1	3.9	5.2	98.5	3.8	4.2	3.1	4.3	98.5	6.3	6.9	1.0	1.0
1-Nov-10	0.142	0.295	5	5	6.2	6.3	97.5	4.2	7.9	5.3	8.3	97.7	6.1	6.5	1.0	1.0
1-Dec-10	0.239	0.726	5	5	8.8	11.9	95.2	4.2	6.9	7.8	12.9	95.4	5.9	7.1	1.0	1.0
1-Jan-11	0.174	0.38	5.3	6.4	8	11.5	96.7	4.6	7.1	6.6	11.4	96.2	6	6.7	1.0	1.0
AVE:	0.14	0.24	3.5	4.6	4.0	6.2	98.8	4.1	6.6	4.8	8.3	98.0	6.4	7.1	11.5	65.2
MIN:	0.07	0.08	1.2	1.4	1.0	1.8	95.2	1.4	1.8	1.0	1.1	90.0	5.9	6.5	1.0	1.0
MAX:	0.49	1.04	19.7	25.5	17.0	38.0	99.7	32.0	50.0	24.3	67.4	99.6	6.8	8.2	40	389
Limit	0.52		30	45	130	195	85	30	45	130	195	85	6.0	9.0	200	400
85%	0.44															

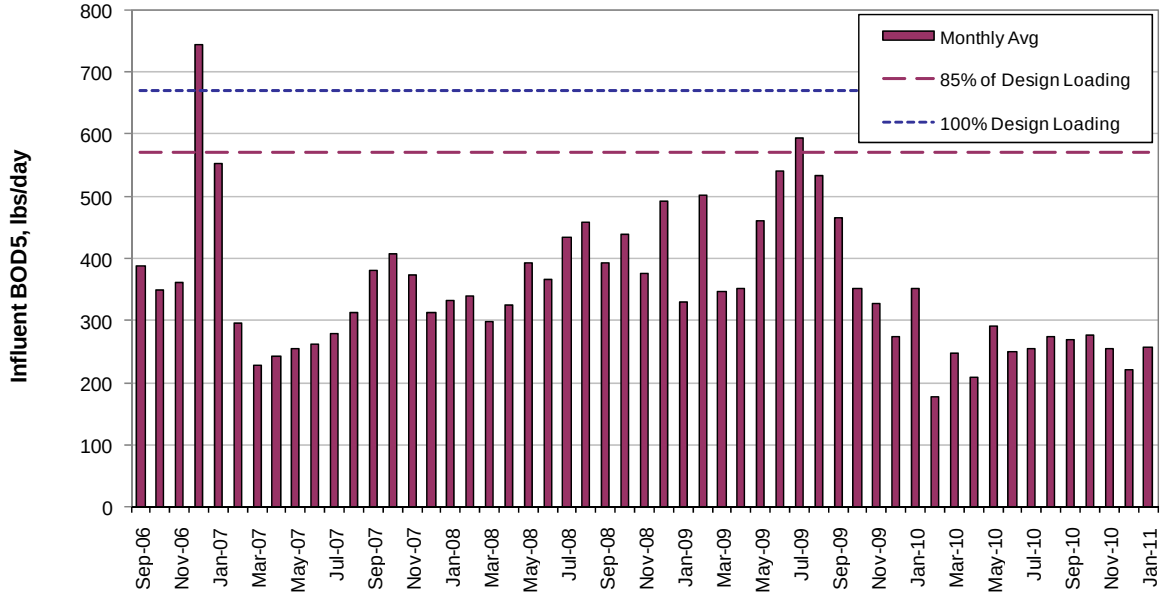
Vashon WWTP – Influent TSS (Mass Basis)



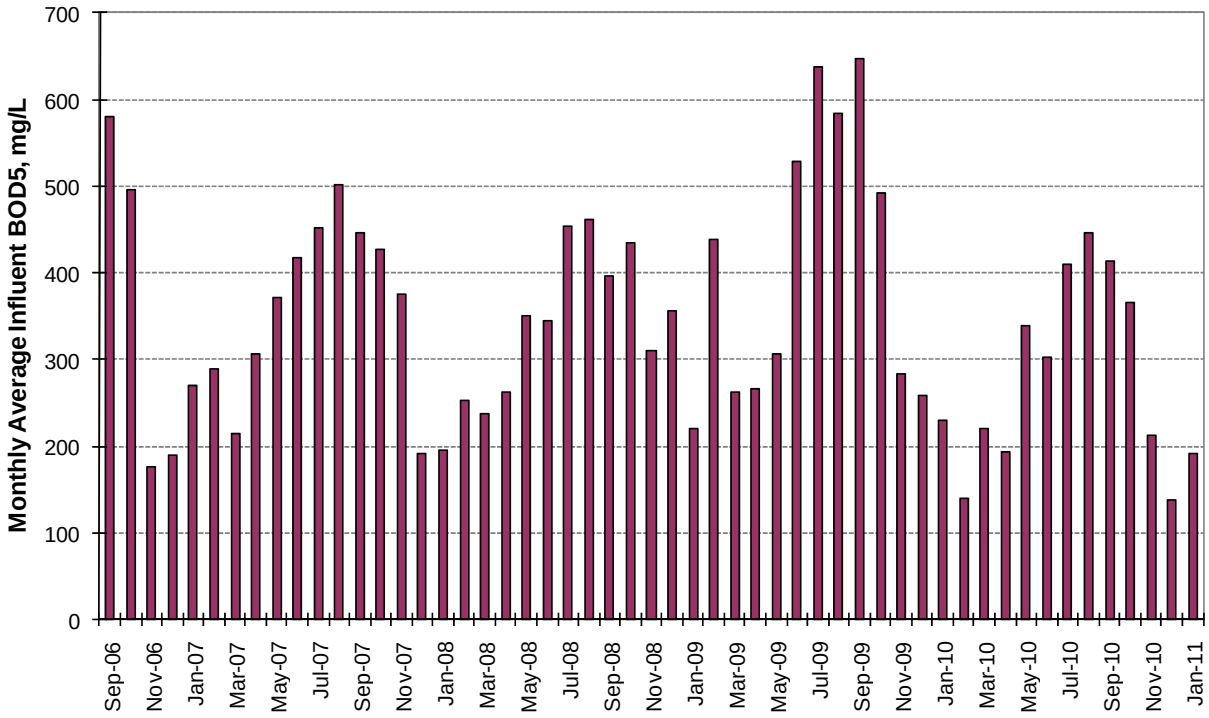
Vashon WWTP – Influent TSS (Concentration Basis)



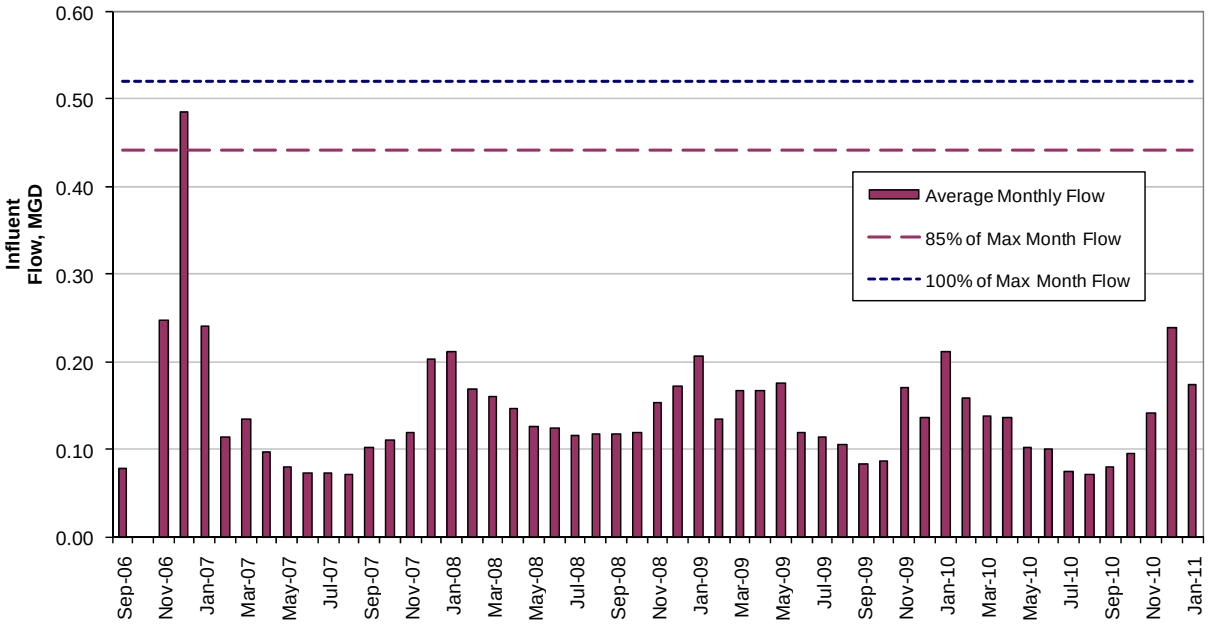
Vashon WWTP – Influent BOD_5 (Mass Basis)



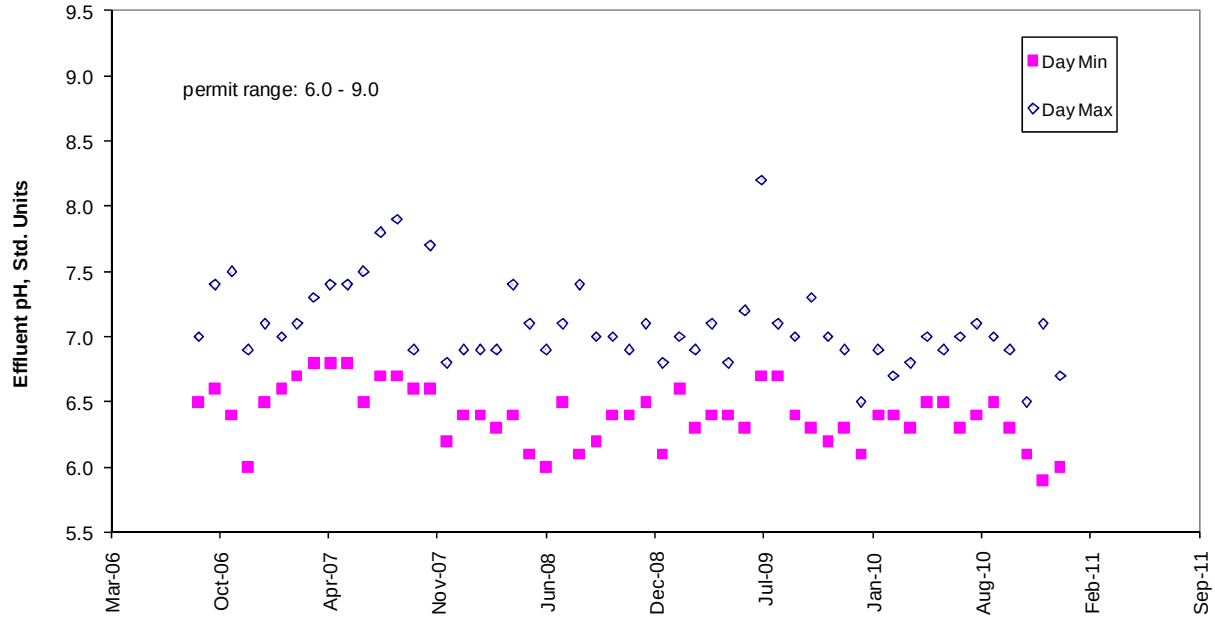
Vashon WWTP – Influent BOD_5 (Concentration Basis)



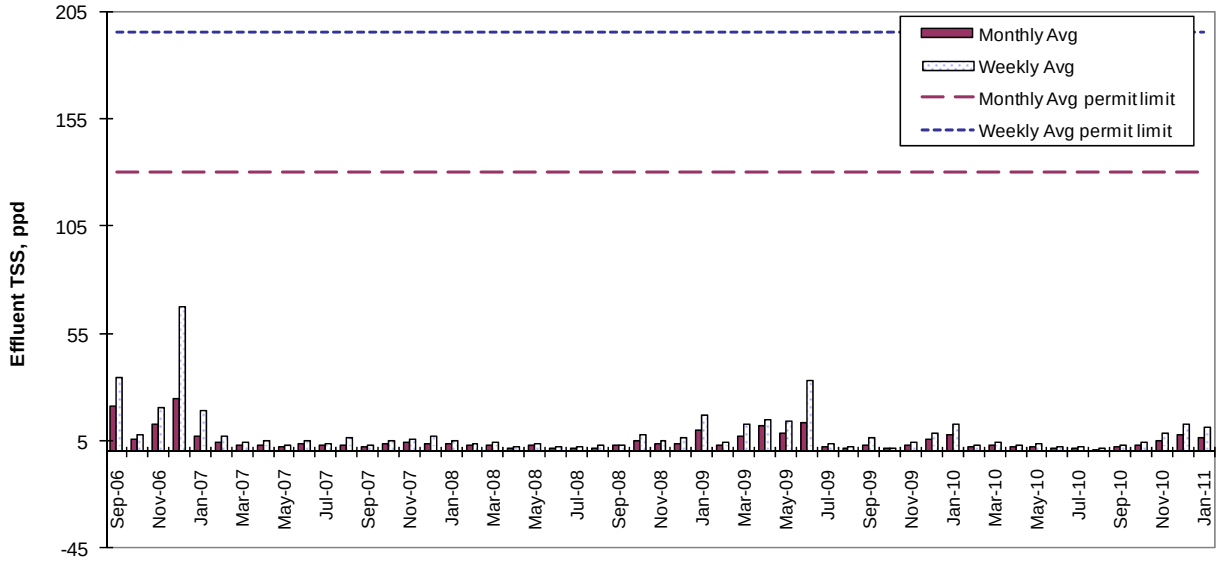
Vashon WWTP – Influent Flow



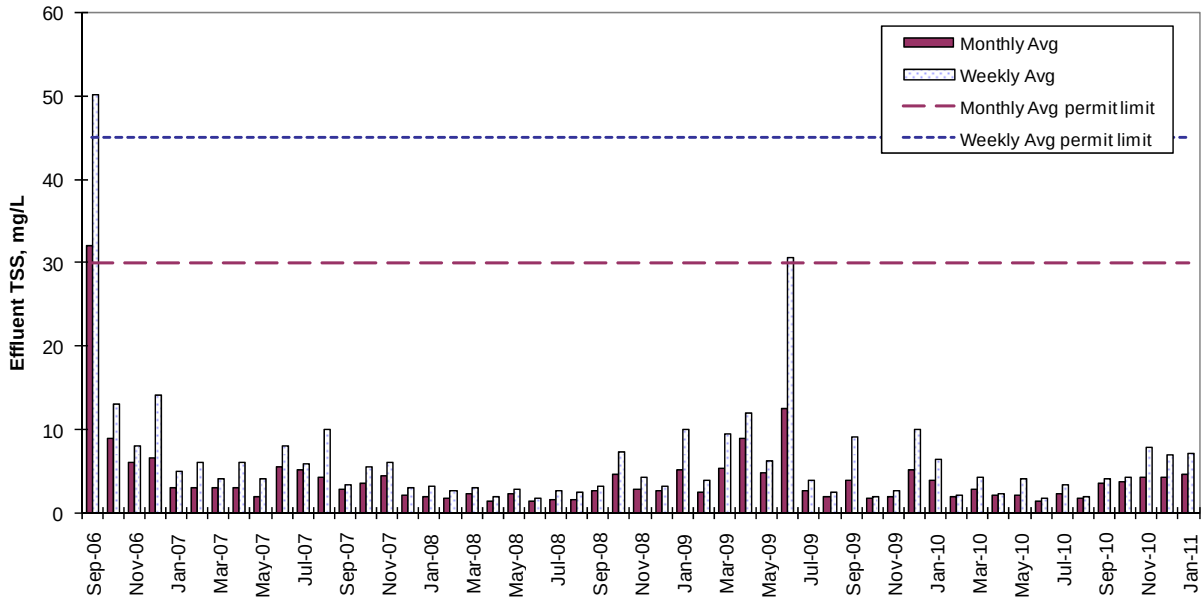
Vashon WWTP – Effluent pH



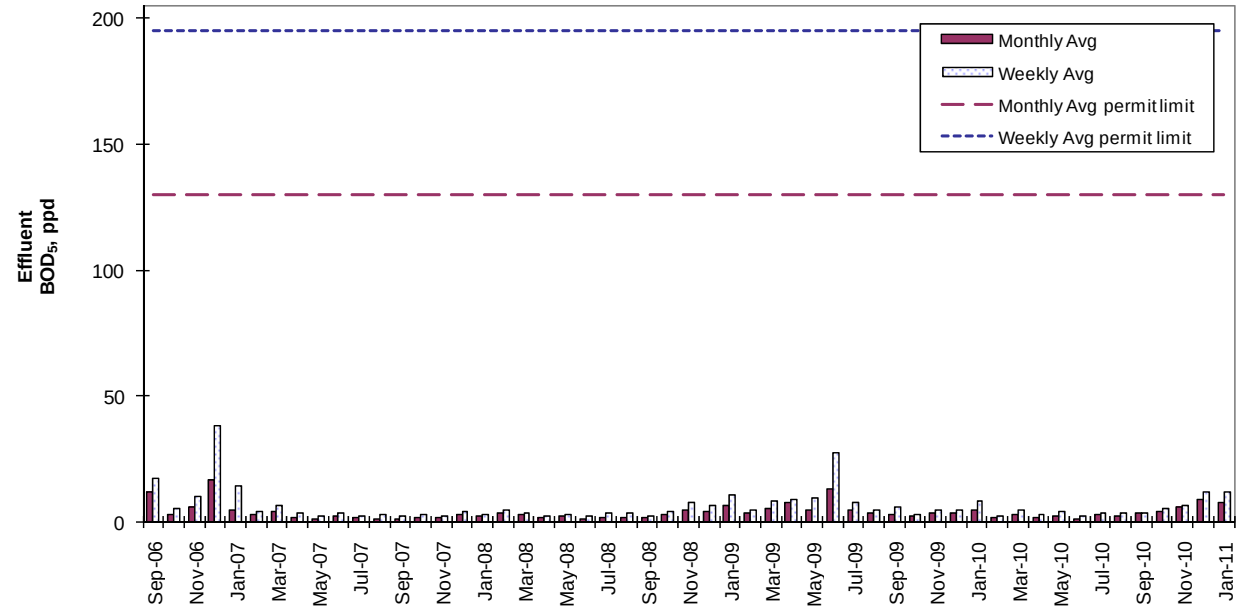
Vashon WWTP – Effluent TSS (Mass Basis)



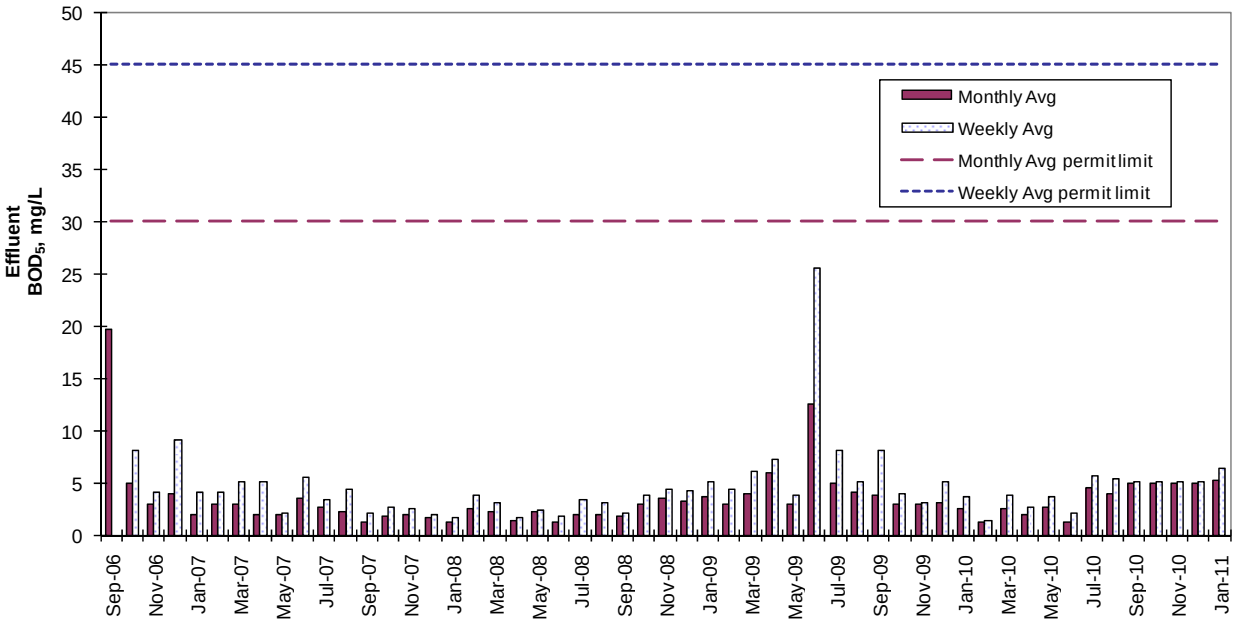
Vashon WWTP – Effluent TSS (Concentration Basis)



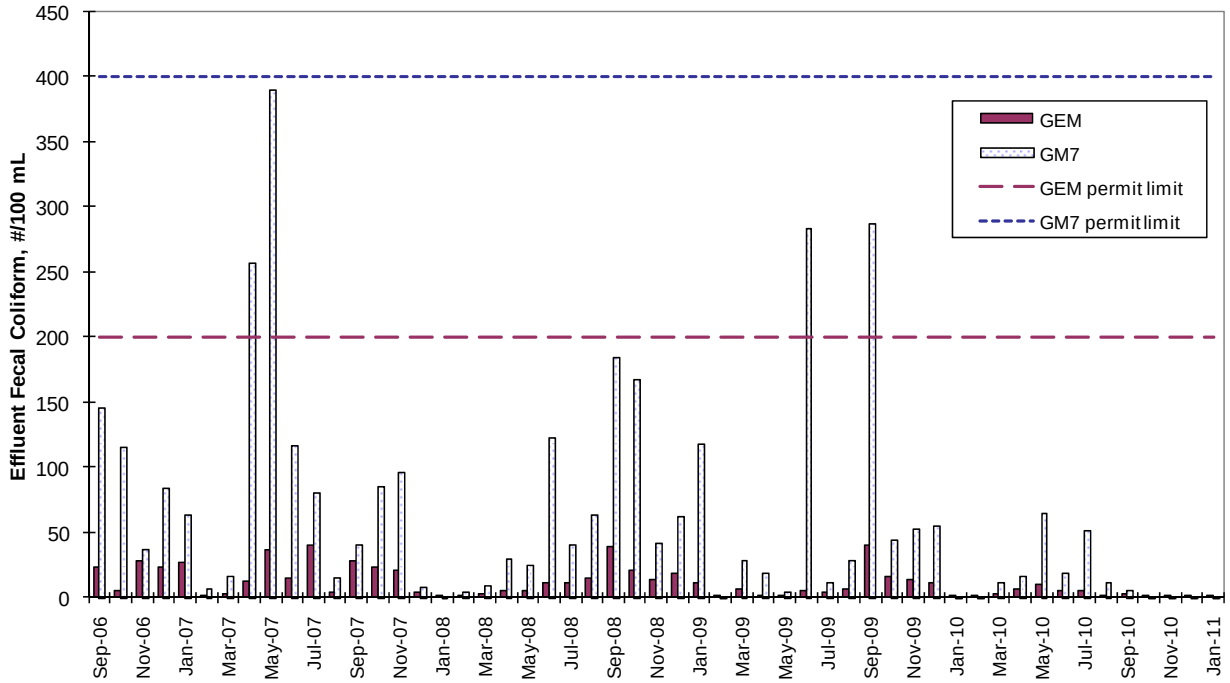
Vashon WWTP – Effluent BOD_5 (Mass Basis)



Vashon WWTP – Effluent BOD_5 (Concentration Basis)



Vashon WWTP – Effluent Fecal Coliform Bacteria



Appendix E - 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 on Ecology's homepage at http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.html.

APPENDIX E – TECHNICAL CALCULATIONS (CONT'D)

Marine Temperature Reasonable Potential and Limit Calculation

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

INPUT	May-Sep	Oct-Apr
1. Chronic Dilution Factor at Mixing Zone Boundary	681	681
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	13.9 °C	7.3 °C
3. 1DADMax Effluent Temperature (95th percentile)	18.7 °C	10.7 °C
4. Aquatic Life Temperature WQ Criterion	3.0 °C	
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	13.91 °C	7.30 °C
6. Incremental Temperature Increase or decrease:	0.01 °C	0.00 °C
7. Incremental Temperature Increase 12/(T-2) if T≤ crit:	---	---
8. Maximum Allowable Temperature at Mixing Zone Boundary:	14.20 °C	7.60 °C
A. If ambient temp is warmer than WQ criterion		
9. Does temp fall within this warmer temp range?	YES	YES
10. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	NO LIMIT
B. If ambient temp is cooler than WQ criterion but within 12/(T_{amb}-2) and within 0.3 °C of the criterion		
11. Does temp fall within this incremental temp. range?	---	---
12. Temp increase allowed at mixing zone boundary, if required:	---	---
C. If ambient temp is cooler than (WQ criterion-0.3) but within 12/(T_{amb}-2) of the criterion		
13. Does temp fall within this Incremental temp. range?	---	---
14. Temp increase allowed at mixing zone boundary, if required:	---	---
D. If ambient temp is cooler than (WQ criterion - 12/(T_{amb}-2))		
15. Does temp fall within this Incremental temp. range?	---	---
16. Temp increase allowed at mixing zone boundary, if required:	---	---
RESULTS		
17. Do any of the above cells show a temp increase?	**NO**	**NO**
18. Temperature Limit if Required?	**NO LIMIT**	**NO LIMIT**

Conclusion: At design flow, discharge has negligible impact on receiving water temperature.

APPENDIX E – TECHNICAL CALCULATIONS (CONT'D)

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	681
Ambient Fecal Coliform, #/100 ml	4
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criteria, #/100 ml	*14*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**5**
Difference between mixed and ambient, #/100 ml	1

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

APPENDIX E – TECHNICAL CALCULATIONS (CONT'D)

Marine Un-ionized Ammonia Criteria Calculation

Calculation of seawater fraction of un-ionized ammonia from Hampson (1977). Un-ionized ammonia criteria for salt water are from EPA 440/5-88-004. Revised 19-Oct-93.

INPUT	
1. Receiving Water Temperature, deg C (90th percentile):	14.5
2. Receiving Water pH, (90th percentile):	8.0
3. Receiving Water Salinity, g/Kg (90th percentile):	30.7
4. Pressure (atm; EPA criteria assumes 1 atm):	1.0
5. Unionized ammonia criteria (mg un-ionized NH3 per liter)	
from EPA 440/5-88-004	
Acute:	0.233
Chronic:	0.035
OUTPUT	
1. Molal Ionic Strength (not valid if >0.85):	0.631
2. pKa8 at 25 deg C (Whitfield model "B"):	9.318
3. Percent of Total Ammonia Present as Unionized:	2.2%
4. Total Ammonia Criteria (mg/L as NH3)	
Acute:	10.73
Chronic:	1.61
RESULTS	
Total Ammonia Criteria (mg/L as NH3-N)	
Acute:	**8.82**
Chronic:	**1.33**

APPENDIX E – TECHNICAL CALCULATIONS (CONT'D)

Reasonable Potential Calculation

Water Body Type Marine — **Facility** Vashon WWTP

Amb. Hardness, mg/L

Dilution Factors:

	Acute	Chronic
Aquatic Life	89	681
Human Health Carcinogenic		681
Human Health Non-Carcinogenic		681

Pollutant, CAS No. & NPDES Application Ref. No.		AMMONIA, Criteria as Total NH3	ARSENIC (dissolved) 7440382 2M	CHROMIUM(HEX) 18540299	COPPER - 744058 6M Hardness dependent	LEAD - 7439921 7M Dependent on hardness	NICKEL - 7440020 9M - Dependent on hardness	ZINC- 7440666 13M hardness dependent	TOLUENE 108883 25V	BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	DIETHYLPHTHALATE 84662 24B
Effluent Data	# of Samples (n)	34	3	3	3	3	3	3	3	3	3
	Coeff of Variation (Cv)		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)	2,900	2.4	0.41	8.82	0.22	3.01	72.1	180	3.04	2.02
	Calculated 50th percentile Effluent Conc. (when n>10)										
Ambient Data	90th Percentile Conc., ug/L				0.57	0.16		0.89			
	Geo Mean, ug/L										
Water Quality Criteria	Aquatic Life Criteria, ug/L — Acute	8,825	69	1100	4.8	210	74	90	-	-	-
	Aquatic Life Criteria, ug/L — Chronic	1,326	36	50	3.1	8.1	8.2	81	-	-	-
	WQ Criteria for Protection of Human Health, ug/L	-	-	-	-	-	4600	-	2E+05	5.9	1E+05
	Metal Criteria Translator, decimal — Acute		1	0.993	0.83	0.951	0.99	0.946	-	-	-
	Metal Criteria Translator, decimal — Chronic		-	0.993	0.83	0.951	0.99	0.946	-	-	-
	Carcinogen?		Y	N	N	N	N	N	N	Y	N

Aquatic Life Reasonable Potential

s		0.0000	0.555	0.555	0.555	0.555	0.555	0.555
Pn		0.9157	0.368	0.368	0.368	0.368	0.368	0.368
Multiplier		1.00	3.00	3.00	3.00	3.00	3.00	3.00
Max concentration (ug/L) at edge of…	Acute	33	0.081	0.014	0.810	0.165	0.100	3.179
	Chronic	4	0.0106	0.0018	0.6014	0.1607	0.0131	1.1891
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Aquatic Life Limit Calculation

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

Human Health Reasonable Potential

s						0.555	0.555	0.555	0.555
Pn						0.368	0.368	0.368	0.368
Multiplier						1.205	1.205	1.205	1.205
Dilution Factor						681	681	681	681
Max Conc. at edge of Chronic Zone, ug/L						0.005	0.318	0.005	0.004
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								

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

Chlorine Limit

Reasonable Potential Calculation

references: WAC 173-201A
56/99

Receiving Water		Facility	Vashon WWTP
Water Body Type		Outfall #	001
Temperature	°C *(Marine 1DMAX or Freshwater 7D*		
pH			
Hardness	mg/L		
Salinity	psu		
Ambient TSS	mg/L		
TSS Period			

Dilution Factors	Acute	Chronic
Aquatic Life	89	681
Human Health Carcinogenic		
Human Health Non-Carcinogenic		

Pollutant, CAS No. & NPDES Application Ref. No.		CHLORINE (Total Residual) 7782505
Effluent Data	# of Samples (n)	1
	Coeff of Variation (Cv)	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)	
	Calculated 50th percentile Effluent Conc. (when n>10)	
Ambient Data	90th Percentile Conc., ug/L	0
	Geo Mean, ug/L	
Water Quality Criteria	Aquatic Life Criteria, ug/L Acute	13
	Chronic	7.5
	WQ Criteria for Protection of Human Health, ug/L	-
	Metal Criteria Acute	-
	Translator, decimal Chronic	-
	Carcinogen?	N

Aquatic Life Reasonable Potential

s		0.555
Pn		0.05
Multiplier		6.20
Max concentration (ug/L) at edge of...	Acute	0.042
	Chronic	0.01
Reasonable Potential? Limit Required?		**NO**

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month		30
LTA Coeff. Var. (CV), decimal		0.6
Permit Limit Coeff. Var. (CV), decimal		0.6
Waste Load Allocations, ug/L	Acute	*1157*
	Chronic	*5108*
Long Term Averages, ug/L	Acute	*371.5*
	Chronic	*2694*
Limiting LTA, ug/L		*371.5*
Metal Translator or 1?		*1*
Average Monthly Limit (AML), ug/L		**442**
Maximum Daily Limit (MDL), ug/L		**1157**

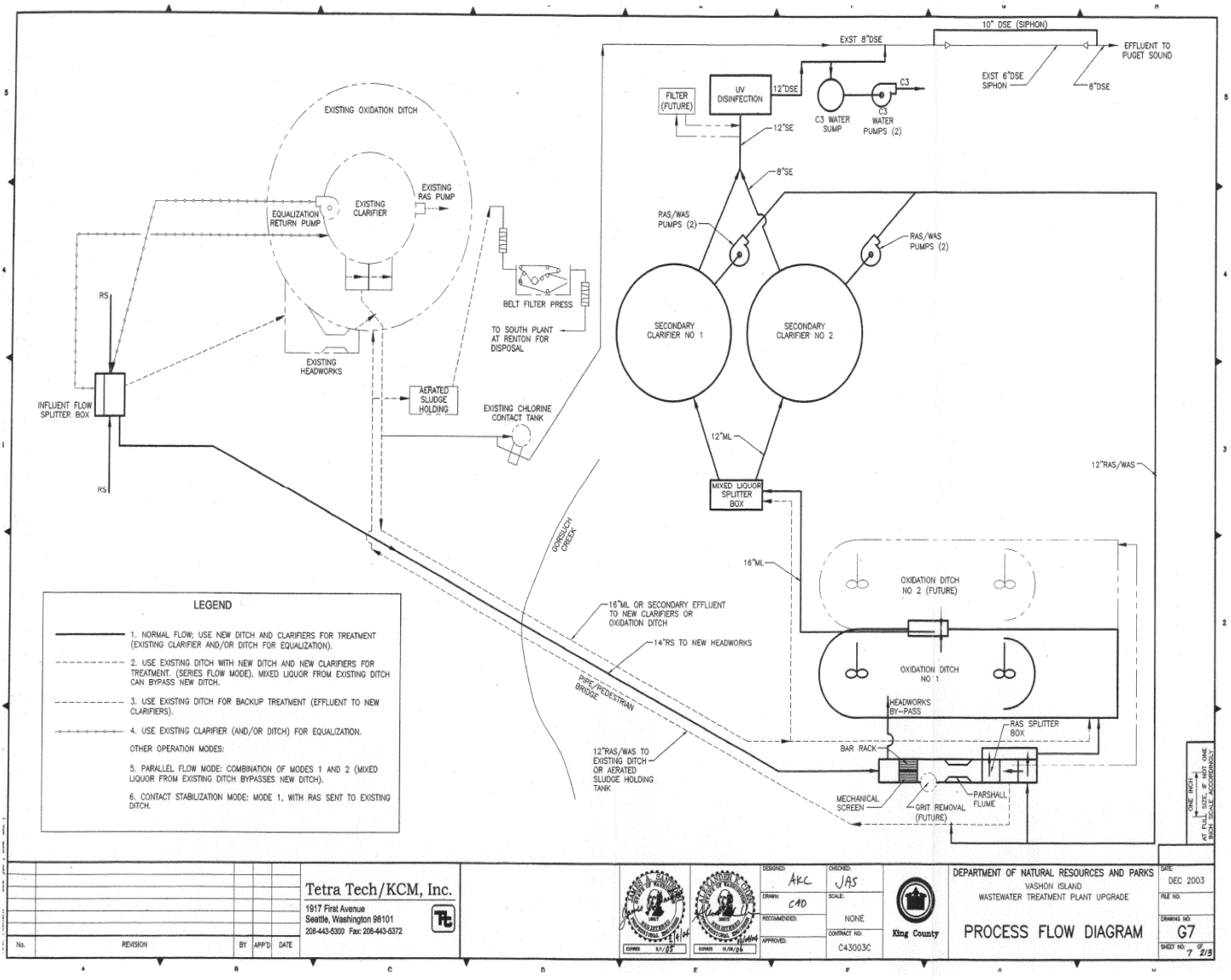
Human Health Reasonable Potential

s	
Pn	
Multiplier	
Dilution Factor	
Max Conc. at edge of Chronic Zone, ug/L	
Reasonable Potential? Limit Required?	

Human Health Limit Calculation

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

Appendix F - Vashon WWTP Diagram



Appendix G - Dilution Model Results

200' depth- single por
Acute

```
Case 48; ambient file C:\plumes\Vashon.001.db; Diffuser table record 12: -------------------------
--------
   P-dia   P-elev V-angle H-angle    Ports SttTime EndTime Incrmnt
     (m)     (m)   (deg)   (deg)      ()    (hr)    (hr)    (hr)
  0.2032  0.3048     0.0    90.0     1.0     1.0    48.0     1.0
 AcuteMZ ChrncMZ P-depth Ttl-flo Eff-sal    Temp Polutnt
     (m)     (m)     (m) (m3/s)    (psu)     (C) (kg/kg)
  12.192  121.92  60.961 0.06002     0.0    10.0   100.0

Froude number:      8.769
     W Cclumn  Amb-cur  Amb-sal  Amb-tem    P-dia  Polutnt   Dilutn   x-posn   y-posn
Step      (m)    (m/s)    (psu)      (C)      (m)  (kg/kg)      ()      (m)      (m)
   0    60.96    0.227    29.02    11.25    0.203    100.0     1.0      0.0      0.0;
 100    60.59    0.227    29.02    11.26    1.073     13.8   7.108      0.0    2.775;
 200    58.13    0.227    29.03     11.3    3.759    1.905   51.36      0.0    9.115;
 228    56.98    0.227    29.03    11.32    5.125    1.094    89.4      0.0    12.23; acute zone,
 300    52.28    0.227    29.03     11.4    10.92    0.263   371.9      0.0    28.41;
 370    43.54    0.227    29.04    11.56    22.24   0.0658  1487.6      0.0    77.85; trap level,
 391    39.87    0.227    29.04    11.62    27.49   0.0434  2254.7      0.0    122.8; chronic
zone,
 396    39.43    0.227    29.04    11.64    28.68   0.0399  2450.1      0.0    149.5; local
maximum rise or fall,
Outside chronic zone
```

200' depth -single port
Chronic

```
Case 13; ambient file C:\plumes\Vashon.001.db; Diffuser table record 11: -------------------------
--------
   P-dia   P-elev V-angle H-angle    Ports SttTime EndTime Incrmnt
     (m)     (m)   (deg)   (deg)      ()    (hr)    (hr)    (hr)
  0.2032  0.3048     0.0    90.0     1.0    17.0    32.0     1.0
 AcuteMZ ChrncMZ P-depth Ttl-flo Eff-sal    Temp Polutnt
     (m)     (m)     (m) (m3/s)    (psu)     (C) (kg/kg)
  12.192  121.92  60.961 0.03067     0.0    10.0   100.0

Froude number:      4.411
     W Column  Amb-cur  Amb-sal  Amb-tem    P-dia  Polutnt   Dilutn   x-posn   y-posn
Step      (m)    (m/s)    (psu)      (C)      (m)  (kg/kg)      ()      (m)      (m)
   0    60.96    0.084    29.36    8.348    0.203    100.0     1.0      0.0      0.0;
 100    60.04    0.084    29.35    8.416    0.942    14.78   6.634      0.0    2.096;
 200    55.42    0.084    29.32    8.761    3.248     2.04   47.93      0.0     5.52;
 282    48.05    0.084    29.28    9.312    9.182    0.402   243.0      0.0     12.2; acute zone,
 295    46.69    0.084    29.27    9.415    10.88    0.311   314.4      0.0    14.11; trap level,
 300    46.18    0.084    29.26    9.454    11.62    0.282   347.1      0.0    14.96;
 353    43.66    0.084    29.25    9.651    16.48    0.164   594.4      0.0    24.58; local
maximum rise or fall,
Const Eddy Diffusivity.  Farfield dispersion based on wastefield width of      16.48 m
    conc  dilutn   width distnce    time
 (kg/kg)             (m)      (m)   (hrs) (kg/kg)   (s-1)   (m/s)(m0.67/s2)
 0.16439   594.7   17.74    36.58  0.0397     0.0     0.0  0.084 3.00E-4
 0.16412   595.7   18.94    48.77    0.08     0.0     0.0  0.084 3.00E-4
 0.16245   602.0   20.06    60.96    0.12     0.0     0.0  0.084 3.00E-4
 0.15954   613.2   21.13    73.15   0.161     0.0     0.0  0.084 3.00E-4
 0.15587   628.0   22.14    85.34   0.201     0.0     0.0  0.084 3.00E-4
 0.15192   644.7   23.11    97.54   0.241     0.0     0.0  0.084 3.00E-4
 0.14792   662.5   24.04    109.7   0.282     0.0     0.0  0.084 3.00E-4
   0.144   680.9   24.93    121.9   0.322     0.0     0.0  0.084 3.00E-4
count: 8
```

Appendix H - Response to Comments

No comments were received during the public comment period.