FACT SHEET FOR NPDES PERMIT WA 0038679
PACIFIC FUNCTIONAL FLUIDS, LLC

July 16, 2010

PURPOSE of this Fact Sheet

This fact sheet explains and documents the decisions Ecology made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for Pacific Functional Fluids, LLC.

The Environmental Protection Agency (EPA) developed the NPDES permitting program as a tool to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." EPA delegated to Ecology the power and duty to write, issue, and enforce NPDES permits within Washington State. Both state and federal laws require any industrial facility to obtain a permit before discharging waste or chemicals to a water body.

An NPDES permit limits the types and amounts of pollutants the facility may discharge. Those limits are based either on (1) the pollution control or wastewater treatment technology available to the industry, or on (2) the receiving water's customary beneficial uses. 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.

PUBLIC ROLE in the 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 to the facility operator (Chapter 173-220-050 WAC). Copies of the fact sheet and draft permit for Pacific Functional Fluids, LLC, NPDES permit WA0038679, are available for public review and comment from December 8, 2010 until the close of business January 21, 2011. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement**.

Before publishing the draft NPDES permit, Pacific Functional Fluids, LLC, reviewed it for factual accuracy. Ecology corrected any errors or omissions about the facility's location, product type or production rate, discharges or receiving water, or its history.

After the public comment period closes, Ecology will summarize substantive comments and our response to them. Ecology will include our summary and responses to comments to this Fact Sheet as **Appendix D - 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.

Ha Tran prepared the permit and this fact sheet.

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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 of permits (NPDES permits), 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).

Ecology adopted rules describing how it exercises its authority:

- Procedures Ecology follows for issuing NPDES permits (Chapter 173-220 WAC)
- Water quality criteria for surface waters (Chapter 173-201A WAC) and for ground waters (Chapter 173-200 WAC)
- Sediment management standards (Chapter 173-204 WAC)
- Submission of Plans and Reports for Construction of Wastewater Facilities (Chapter 173-240 WAC)

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

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

II. BACKGROUND INFORMATION

Table 1 - General Facility Information

Applicant	Pacific Functional Fluids, LLC
Facility Name and Address	Pacific Functional Fluids, LLC 2244 Port of Tacoma Road, Tacoma, Washington 98421
Type of Treatment	Oil and water separator, sand filtration, carbon treatment
SIC Code	5172 - Petroleum products, N.E.C. 5171 - Petroleum products station/terminal 2992 - Lubricating oils and greases
Discharge Location	Blair Waterway Latitude: 47.264722 Longitude: 122.391111

The Blair Waterway is part of the Puget Sound Commencement Bay. The map below shows the facility outlined in red. The facility is about 0.23 mile from the Blair Waterway.

Figure 1 - Facility Location Map

A. Facility Description

History

Pacific Functional Fluids (PFF) occupies 1.98 acres in the Tacoma Tideflats Industrial Area. The facility has three tank farms, and two loading areas. Warehouses, product blending areas, and office building occupy about 19,000 square feet of the property. Most of the facility is paved with asphalt and concrete, with the exception of the landscape areas in the front parking lot. The facility operational history is as follow:

- 1960's--The first commercial use of the property began with Garrett Freight Lines.
- 1972--Lilyblad Petroleum, Inc. (Lilyblad) began operating the facility as a distributor of gasoline, diesel, solvents, and packaged petroleum products.
- 1977--Lilyblad added spent solvents recycling to its operations. The facility recycled spent solvent using a Washex® vacuum distillation unit. This operation was under contract with Safety Kleen until 1990.
- 1983--Lilyblad entered a joint venture with Sol Pro Inc. to form the Sol Pro/Lilyblad Hazardous Waste Management Corporation. The corporation installed the Brighton Reclaiming System to reprocess solvents. The corporation recycled about 30,000 gallons of spent solvent per month. In addition to spent solvent recycling, they blended high-heat dangerous waste fuels for use in cement kilns.
- 1988--Lilyblad released its interest in the Sol Pro/Lilyblad Hazardous Waste Management Corporation in March. Sol-Pro removed the Brighton Reclaiming System from the facility.
- 1991--Lilyblad ended its solvent recycling operations. The company filed for bankruptcy two years later. Bankruptcy proceedings ended in 2004.
- 2003--PFF bought Lilyblad's assets, including the facility and its inventory and equipments.

Since taking over the operations from Lilyblad, PFF has not received or recycled either dangerous waste or spent solvent. PFF owns the facility, including the above-ground equipment and the wastewater treatment system. M&G Holdings, LLC, owns the property.

Ecology issued Lilyblad an NPDES permit for the discharge of the wastewater treatment system effluent. The permit transferred to PFF in 2003 following PFF's purchase of the facility.

Industrial Process

PFF blends, stores, repackages, and distributes various petroleum and chemical products. The facility operates weekdays from 8AM to 5PM. Railcars and trucks deliver a variety of industrial products to the facility. PFF sells some products without modification and formulates some products specific to customers' needs and repackages the product to meet customers' requirements. Customers include commercial and industrial facilities such as pulp and paper, forestry, mining, trucking, commercial fishing, construction, and marine. Products range from chemicals to petroleum-based lubricants and fuels. The products are:

- Automotive and industrial lubricants
- Transmission fluids
- Hydraulic fluids
- Diesel fuel

- Biodiesel
- De-icing fluids, such as propylene glycol, ethylene glycol, acetic acid, and sodium acetate

The facility has three tank farms. The tank farm, located at the front of the property, includes sixteen 20,000 to 25,000 thousand gallons tanks for storing petroleum distillates, propylene glycol, de-icing fluids, and lubeoil basestock. The tank farm in the back has twenty-eight 4,000 to 25,000 gallons tank containing potassium hydroxide, lube oil, lubeoil basestock, and lube oil additives. In 2004, PFF constructed a third tank farm to provide over 100,000 gallons of storage for de-icing fluids. Each tank farm is on a bermed concrete pad, which provides secondary containment in the event of a spill.

PFF uses part of its main building for product blending. Blending equipment consist of 5 lubricant blend tanks with pulse air mixers and 4 stainless steel chemical blend tanks on electronic load cells with heat exchangers and lightning mixers. PFF also owns storage and transport equipment.

Wastewater Treatment

Wastewater is primarily contact stormwater from the facility's industrial areas; these areas include tank containment areas, product storage areas, and uncovered areas for traffic and product handling. Occasionally PFF treats boiler blowdown along with its storm water. The facility does not generate other process wastewaters.

PFF captures storm water using a series of catch basin throughout the plant. The facility stores the storm water in four tanks at the west corner of the plant and one tank in the front tank farm. The tanks provide a total storage capacity of 57,000 gallons. Wastewater from the tanks flows through sumps and belowground oil/water separators prior to entering the treatment system.

The facility installed the wastewater treatment system in 1992. The system is vendor-based and designed by Great Lakes Environmental. The facility has operated the treatment system from the time of installation to the present. The system components include:

- A slant rib coalescing plate for the removal of oil and grease from the wastewater.
- A pH adjustment system, consisting of a pH sensor and metering pump for adding potassium hydroxide solution to treat low pH.
- A zinc treatment process, which adds sodium sulfide to the wastewater. Sodium sulfide reacts with zinc to form zinc sulfide, which precipitates out of solution.
- Three sand-filter beds for the removal of metals, zinc sulfide, and suspended solids. The system has a tank to contain backwash from the filter units.
- An activated carbon unit for the removal of oils and organic compounds

The treatment system includes a tank partitioned into three sections for the phased treatment of oil & grease, solids, pH and zinc. Wastewater exiting the three-section tank flows through the sand filter units, the carbon tank, and then discharges immediately. The volume of wastewater discharged varies with time and depends on the amount of rainfall and storage available. PFF does not discharge during some months particularly during dry times of year.

PFF included best management practices (BMPs) in its February 1, 2003 storm water pollution prevention plan. Ongoing BMPs include employee training, development operations plans, and maintenance of catch basins and treatment systems.

Solid Wastes

The facility generates solid waste from treatment system maintenance. The wastes include sludges accumulated in the oil-water separators, the three-section treatment tank, and the backwash tank. PFF samples the sludge for waste characterization and disposes of the waste in accordance with Dangerous Waste Regulation per Chapter 173-303 WAC.

Discharge Outfall

PFF discharges its effluent at outfall 001. The effluent outfall pipe connects to the City of Tacoma storm sewer across the road from the front parking lot. The storm sewer runs along the Port of Tacoma Road and empties into the Lincoln Avenue Ditch, which is enclosed in an underground pipe at the discharge point. This piped storm drain discharges into the Blair Waterway and Commencement Bay approximately 900 feet downstream. The discharge into the Blair includes stormwater runoff and treated process wastewater from PFF, US Oil & Refining, the Port of Tacoma property, and other industrial facilities adjacent to Port of Tacoma Road.

Outfall 001B is physically the same as outfall 001. Outfall 001 is the designation for discharge of effluent consisting of treated storm water and boiler blowdown and treated in-house laboratory wastewater. The previous permit designated Outfall 001B for the discharge of boiler blowdown only. At the current practice, PFF does not discharges boiler blowdown separately from the storm water. Therefore, the proposed permit does not include the limits and monitoring requirements for outfall 001B.

B. Permit Status

Pacific Functional Fluids submitted an application for permit renewal on **March 6, 2009**. Ecology accepted it as complete on **June 19, 2009**.

Ecology issued the previous permit for this facility on **July 1, 2004**. The previous permit placed effluent limits on the following:

Table 2 - Previous Permit Limits

Parameter	Outfall 001	Outfall 001B
Copper, total recoverable	50 µg/L	22 µg/L
Lead, total recoverable	100 µg/L	89 µg/L
Zinc, total recoverable	330 µg/L	147 µg/L
Pentachlorophenol	70 µg/L	-
pH	6.0 to 9.0	6.0 to 9.0
Oil and grease	15 mg/L	-
Note: Limit is for the maximum daily discharge. Outfall 001 is for combined discharges of storm water and boiler blowdown or for storm water discharge only. Outfall 001B is physically the same as Outfall 001 except this designation is the discharge of boiler blowdown in absence of any storm water.		

C. Summary of Compliance with Previous Permit Issued

Ecology staff last conducted a sampling compliance inspection on **May 17, 2010**.

The facility has violated not been in total compliance in the last permit cycle. **Appendix C Figure 2** summarizes the compliance history. For samples with concentrations below the practical quantification limit (PQL), Ecology plotted the PQL as the concentration in **Figure 2**.

The facility was out of compliance for the following:

- Zinc concentration was above the permit limit on three sampling events on February and March 2006 and February 2007. The maximum concentration was 590 µg/L.
- The pH was outside of the limit range in four samples taken during three sampling events on December 2006, March 2007, and January 2008. The highest pH detected was 11.2 and the lowest pH detected was 5.79.
- Oil and grease concentration was above permit limit during a sampling event on May 2008. The concentration was 32 mg/L.
- Failure to monitor temperature at the city outfall in December 2005, March 2007, December 2009, and February 2010.
- Failure to monitor at all outfalls in November 2009.

At the March 17, 2006 inspection, Ecology learned that B&P Laboratories, which performed analysis on the facility's effluent samples, was not accredited for the analysis of pentachlorophenol and other compounds. The facility also did not maintain the Operations and Maintenance manual as required by the permit and was not properly treating the effluent with sodium sulfide.

Ecology issued a penalty to the facility on June 20, 2006 to address the permit violations. Following the enforcement, the facility implemented corrective measures to address the violations. PFF prepared and submitted the Operations and Maintenance manual on June 27, 2007. The facility arranged for the analysis of its effluent samples by an accredited laboratory and added sodium sulfide solution to treat zinc in its wastewater.

For the past year, the facility's effluent discharge has been in compliance with permit limits.

D. Wastewater Characterization

PFF is a known source of several pollutants including oil & grease, zinc, acetone, methylene chloride, and pentachlorophenol. Oil and grease from various petroleum products stored and blended at the facility. Oil and grease includes lubricants, Maxitac (chainsaw) oil, and biodiesel.

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. The following tabulated data also includes Ecology inspection monitoring results. The tabulated data represents the quality of the effluent discharged from July 1, 2004 to March 30, 2010. The effluent is characterized as follows:

Table 3 - Wastewater Characterization

Parameter	Units	Average	Maximum
Acetone	µg/L	42	233
Arsenic	µg/L	< 3	2.11*
Copper	µg/L	7.8	29
Lead	µg/L	< 22	< 40
Zinc	µg/L	70.6	590
Methylene chloride	µg/L	3.52	15.83

Parameter	Units	Average	Maximum
Pentachlorophenol	µg/L	5.5	70
Oil and grease	mg/L	4.1	32
Total suspended solids (TSS)	mg/L	-	29
Biochemical oxygen demand (BOD)	mg/L	-	260
Chemical oxygen demand (COD)	mg/L	-	380
Total organic carbon (TOC)	mg/L	-	95
Ammonia	mg/L	-	< 0.2
Temperature (winter)	°C	8.9	12.8
Temperature (summer)	°C	12.8	21.7
pH	SU	Minimum is 5.79 and maximum is 11.2	
*Note: One sample taken at Ecology's March 22, 2007 inspection detected arsenic concentration at 109 µg/L. Other sampling inspections show arsenic at 0.4, 0.7, and 2.11 µg/L, which are more consistent with PFF's sampling results. Ecology considers 109 µg/L to be anomalous and did not use the result to characterize wastewater.			

PFF conducted a separate monitoring study on the influent and effluent on April 18, 2007. The monitoring study was part of the facility's application for the City of Tacoma discharge permit. The results are as follow:

Table 4 - Wastewater Characterization – Additional Monitoring

		Influent		Effluent	
Parameter	**Units**	**Ave**	**Max**	**Ave**	**Max**
Oil & grease	mg/L	9.2	14	< 2	< 2
1,1,1-Trichloroethane	µg/L	2	2	< 1	< 1
1,1-Dichloroethane	µg/L	11	11	< 1	< 1
1,2,4-Trimethylbenzene	µg/L	7	8	< 1	< 1
1,3,5-Trimethylbenzene	µg/L	2	2	< 1	< 1
2-Butanone	µg/L	14	18	< 10	< 10
Acetone	µg/L	60	71	26	28
Chloroethane	µg/L	7	8	< 1	< 1
Chloroform	µg/L	2	3	< 1	< 1
Ethylbenzene	µg/L	2	2	< 1	< 1
Methylene chloride	µg/L	1	2	< 1	< 1
Naphthalene	µg/L	6	7	< 1	< 1
Toluene	µg/L	13	14	< 1	< 1
Xylenes, total	µg/L	13	14	< 2	< 2
Cis-1,2-dichloroethylene	µg/L	6	6	< 1	< 1
4-Methylphenol	µg/L	17	22	< 10	< 10
Benzoic acid	µg/L	14	15	< 10	< 10
Cadmium	µg/L	< 3	< 3	< 3	< 3
Chromium	µg/L	< 7	< 7	< 7	< 7
Copper	µg/L	9	12	< 6	< 6
Lead	µg/L	< 40	< 40	< 40	< 40
Nickel	µg/L	21	26	26	26
Zinc	µg/L	380	500	260	260
Arsenic	µg/L	< 2	< 2	< 2	< 2

		Influent		Effluent	
Parameter	**Units**	**Ave**	**Max**	**Ave**	**Max**
Mercury	µg/L	< 0.2	< 0.2	< 0.2	< 0.2

E. Description of the Receiving Water

PFF discharges to the City of Tacoma storm sewer, which connects to the Lincoln Avenue ditch. Water in the ditch ultimately flows into the Blair Waterway and Commencement Bay in Puget Sound. Other nearby point source to the ditch include: U.S. Oil, McFarland Cascade Pole & Lumber, Associated Petroleum Products, and Concrete Technology Corp. Significant nearby non-point sources of pollutants includes storm water from the roads and parking lots.

The ambient background data used for this permit includes the following:

Table 5 - Ambient Background Data

Parameter	**Value used**
Temperature (highest annual 1-DADMax) [a]	15.16° C
pH (minimum - maximum) [a]	7.2 - 8.5 SU
pH (mean) [a]	7.96 SU
Dissolved Oxygen [a]	7.9 mg/L
Salinity [a]	28.37 ppt
Arsenic (total recoverable) [b]	1.77 µg/L
Arsenic (dissolved) [b]	1.60 µg/L
Lead (total recoverable) [b]	0.142 µg/L
Lead (dissolved) [b]	0.0183 µg/L
Lead (total recoverable) [b]	0.142 µg/L
Lead (dissolved) [c]	0.0198 µg/L
Cadmium (total recoverable) [b]	0.105 µg/L
Cadmium (dissolved) [b]	0.0988 µg/L
Chromium (total recoverable) [b]	0.366 µg/L
Chromium (dissolved) [b]	0.185 µg/L
Copper (total recoverable) [b]	1.55 µg/L
Copper (dissolved) [b]	1.01 µg/L
Nickel (total recoverable) [b]	0.766 µg/L
Nickel (dissolved) [b]	0.616 µg/L
Zinc (total recoverable) [b]	2.86 µg/L
Zinc (dissolved) [b]	2.00 µg/L
Total suspended solids (TSS) [b]	16 mg/L

[a] 2006-2008 data from Ecology Environmental Assessment Program Marine Water Monitoring. [b] February 1998 study prepared by Battelle for Ecology and Western States Petroleum Association. Data are geometric mean of samples taken at 10 locations in Commencement Bay, multiplied by 1.74 to estimate 90th percentile. TSS is the maximum concentration.

F. SEPA Compliance

Regulation 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 state rules and regulations. The exemption applies only to existing discharges, not to new discharges.

III. PROPOSED PERMIT CONDITIONS

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.

Nor does Ecology usually develop permit limits for pollutants that were not reported in the permit application but that 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, as described in 40 CFR 122.42(a), if significant changes occur in any constituent. Industries may be in violation of their permit until Ecology modifies the permit to reflect additional discharge of pollutants.

A. Design Criteria

Under Chapter 173-220-150 (1)(g) WAC, neither flows nor waste loadings may exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant were obtained from the engineering report dated March 31, 2007 prepared by David T. Johnson Engineering.

Table 6 - Design Criteria for Wastewater Treatment System

Parameter	Design Quantity
Maximum Design Flow Rate	100 gpm
Influent pH	Greater than 9

B. Technology-Based Effluent Limits

As in the previous permit, Ecology based the technology-based limits on the performance of the Great Lakes Environmental treatment system. Through the use of phased treatment, the system targets metals, oil and grease, and organic pollutants. During inspections Ecology discovered that the treatment system did not perform efficiently as designed prior to April 2007 because the facility did not properly operate it due to lack of a operation and maintenance manual. PFF submitted the operations and maintenance manual in March 31, 2007 and implemented BMPs to reduce pollutants to the wastewater. Therefore, Ecology used monitoring data submitted after March 2007 to evaluate technology-based limits. The information below describes how Ecology determined the technology-based limits for pollutants.

Metals--Metals are primarily removed by the sand filtration. The oil/water separators provide minor treatment by allowing some settling of metals.

- Copper – Ecology determined the limit using EPA's technical support document. Ecology log-transformed the copper data to determine the mean and standard deviation. The log-transformed mean and standard deviation are 1.46 and 1.05, respectively. The maximum daily limit is calculated as exp[*mean* + 2.326×*standard deviation*]. The maximum daily limit for copper is 50 µg/L, which is the same as the previous limit.
- Lead – PFF mostly reported lead as non-detectable in the effluent with an PQL of 1 and a reporting limit of 40 µg/L. Because monitoring data contains concentrations above and below the PQLs, we treated the concentrations below the PQL as one half the detect limit. The effluent data is not normally or lognormally distributed. Ecology determined the maximum daily limit by multiplying the average concentration by the variability factor. The variability factor is the 99th percentile divided by the 50th percentile concentration. The 99th percentile and 50th percentile concentrations are both < 40 µg/L, making the variability factor 1. Therefore, the maximum daily limit is the average concentration of 11 µg/L.
- Zinc – The facility installed a precipitation/coagulation treatment method to the system in March 2007. The system adds sodium sulfide, which reacts with zinc in the wastewater to form zinc sulfide. The sand filter removes zinc sulfide, which is non-soluble. The facility does not have data on the efficiency of this treatment method. Furthermore, the facility reported spikes in the level of zinc during the permit term that the resulted in permit violations (see Section 2C). Ecology has not determined the cause of the spikes. Due to lack of data, Ecology decided to retain the limit of 330 µg/L from the previous permit. The proposed permit requires monitoring of the influent for zinc so Ecology can determine zinc removal efficiency.

pH--PFF monitors pH in the influent and adjusts pH by adding potassium hydroxide to achieve the permit required pH level of 6.0 to 9.0.

Oil and grease--The facility has a three underground oil and water separators. The treatment tank has a slant rib coalescing separator to further remove oil and grease. The sand filter units also provide minor treatment for oil and grease. The treatment system achieves up to an 88 percent removal efficiency with its multiple treatment technologies. To calculate the limits, Ecology used the monthly monitoring data and omitted the concentration of 32 mg/L, which appeared to be an outlier. The effluent data is

not normally or lognormally distributed. Ecology determined the maximum daily limit by multiplying the average concentration by the variability factor. The 99th percentile is 9.2 mg/L and 50th percentile concentration is 2.0 mg/L, resulting in the variability factor of 4.5. The average concentration is 3.3 mg/L. Therefore, the maximum daily limit is the average concentration of 15 µg/L. This limit is the same as the limit in the previous permit.

C. Surface Water Quality-Based Effluent Limits

The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) were 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 established surface water quality standards (Chapter 173-201A-510 WAC). 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 loading study (TMDL).

Numerical Criteria for the Protection of Aquatic Life and Recreation

Numerical water quality criteria are published in the Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the 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 (40 CFR 131.36). 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. Chapter 173-201A-240(1) WAC; 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 (Chapter 173-201A-200 WAC, 2006) and of all marine waters (Chapter 173-201A-210 WAC; 2006) in the State of Washington.

Antidegradation

The purpose of Washington's Antidegradation Policy (Chapter 173-201A-300-330 WAC; 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.

This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology may not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in Chapter 173-201A WAC.
- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.
- Whenever the natural conditions of a water body are of a lower quality than the assigned criteria, the natural conditions constitute the water quality criteria. Where water quality criteria are not met because of natural conditions, human actions are not allowed to further lower the water quality, except where explicitly allowed in this chapter.

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

Tier II and Tier II requirements do not apply to this facility.

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 criteria, so long as the diluting wastewater doesn't interfere with

designated uses of the receiving water body (e.g., recreation, water supply, and aquatic life and wildlife habitat, etc.). The pollutant concentrations outside of the mixing zones must meet water quality numeric criteria.

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 use no more than 25% of the available width of the water body for dilution. Ecology uses modeling to estimate the amount of mixing within the mixing zone and determine the potential for violating the water quality standards at the edge of the mixing zone and derive 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 comprises 10% by volume and the receiving water comprises 90% of the total volume 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 (Chapter 173-201A-400 WAC; 2006). 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.

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

PFF prepared and submitted an AKART analysis report to Ecology on June 28, 2010. Ecology has reviewed the report and determined that the treatment provided and the pollution prevention activities practiced at PFF meet 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 water body uses). The critical discharge condition is often pollutant-specific or water body-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.

The facility discharges its effluent to the storm water sewer. The sewer runs along the Port of Tacoma and flows to the Lincoln Avenue ditch where the facility's effluent combines with U.S. Oil's effluent, McFarland Cascade Pole & Lumber, Associated Petroleum Products, and Concrete Technology Corp. Water in the ditch is connected to the Blair Waterway via an 84-inch pipe. The pipe has a Red Valve Series 35 check valve, which opens at low tide and closes as the tide rises above the pipe's normal depth. The check valve is elevated at 2.27 to 10.4 ft relative to the mean lower low water (MLLW).

For marine dischargers the critical flow rate is based on site specific conditions. PFF discharges mostly storm water intermittently, based on the amount of rainfall, storage available, and at the judgment of the operator. The facility has no fixed schedule for treatment or discharge.

Ecology assumes the critical period occurs when all of the following conditions take place; when the facility:

- Stores wastewater at its maximum capacity of 57,000 gallons.
- Operates the wastewater treatment system at its design capacity of 100 gpm.
- Discharges during a dry season, when there is minimal storm water flow in the Lincoln Avenue ditch. There is no storm water contribution from McFarland Cascade Pole & Lumber,

Associated Petroleum Products, and Concrete Technology Corp into the ditch. This results in minimal dilution of PFF's effluent. The only dilution available is from U.S. Oil's continuous discharge.

Ecology considered the critical period the summer season. As illustrated in **Figure 3**, PFF design flow rate is 100 gpm and U.S. Oil's design flow rate during the critical period is 500 gpm (Foster Wheeler 2000). To calculate the dilution of PFF's effluent to U.S. Oil, Ecology used a more conservative 430 gpm average monthly flow rate from U.S. Oil. Therefore, the dilution factor of PFF's effluent in U.S. Oil's effluent is 5.3.

Ecology reviewed the May 2000 Mixing Zone Evaluation prepared by Foster Wheeler for U.S. Oil. The study analyzed the dilution of U.S. Oil's discharge to the Blair Waterway during the summer season. The study modeled U.S. Oil's effluent plus another 15 gpm from remedial activities at PFF. The remedial system has since been dismantled. The 15 gpm flow is replaced by the 100 gpm design flow from PFF's storm water treatment system. In other words, PFF's effluent contributes a net of 85 gpm to the flow modeled by Foster Wheeler. Ecology modified Foster Wheeler's model by adding 85 gpm to account for PFF's effluent.

Ecology used the three-dimensional Visual Plumes with Brook's farfield model to simulate the discharge from the ditch to the Blair Waterway and the dilution factors at the mixing zones. The modeling method followed that of Foster Wheeler's study. The model simulated the discharge valve by assuming four overlapping ports at increasing depths. Based on the valve's hydraulic characteristics, Ecology found the discharge velocity associated with the flow rate and set the port diameter to match the velocity. Ecology ran the model with U.S. Oil's effluent and verified that the model results are consistent with Foster Wheeler's acute mixing zone analysis. We re-ran the model with the combined flow from U.S. Oil and PFF. The model inputs and results are in **Appendix C - Tables 14** and **15**. Ecology conservatively used the lowest dilution factor predicted from the four ports.

The Visual Plumes program modeled the discharge scenario shown in **Appendix C – Figure 3**. For this scenario, Ecology modified the discharge history graph from the graph in Foster Wheeler's study (**Figure 4**). The graphs showed the effect of PFF's effluent on the maximum discharge to the Blair Waterway. PFF's effluent, when combined with U.S. Oil's, resulted in a maximum instantaneous discharge of 75 MGD to the surface water in the Blair Waterway. Ecology used the 75 MGD to model the dilution factor at the edge of the acute mixing zone (**Table 14**).

Tables 15 and 16 contain the ambient data used in the model. The model assumes following critical condition:

- 50^{th} percentile current speeds of 6.7 m/sec for chronic and human health mixing zones
- 10^{th} percentile current speeds of 2.6 m/sec for acute mixing zone
- 95^{th} percentile effluent temperature of 27.5 degrees C

Ambient data is taken from Foster Wheeler's 2000 mixing zone study.

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, or**
- **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 protect all aquatic species.

EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for 1-hour. They set chronic criteria assuming organisms are exposed to the pollutant at the criteria concentration for 4 days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of being discharged.

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 this effluent will not exceed 33 degrees C for more than 2 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

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. Ecology concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met .

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

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. The plume rises through the water column as it mixes 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 and the receiving water is more completely mixed in a shorter time period. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant

concentration, the 90th percentile background concentration, the centerline dilution factor and the lowest flow occurring once in every 10 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 organism 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 (40 CFR 131.36). Criteria applicable to this facility's discharge are summarized below in **Table 7 and 8**.

- Aquatic life uses are designated using the following general categories. All indigenous fish and non-fish aquatic species must be protected in waters of the state.

  (a) **Extraordinary quality** salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
  (b) **Excellent quality** salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

(c) **Good quality** salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
(d) **Fair quality** salmonid and other fish migration.

The Aquatic Life Uses for this receiving water are identified as follow.

Table 7 - Aquatic Life Uses & Associated Criteria

Excellent quality	
Temperature Criteria – Highest 1DMAX	16°C (60.8°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	6.0 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 0.5 units.

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

The recreational uses for this receiving water are identified below.

Table 8 - 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.

Water quality assessment found that that water of Blair Waterway and nearby Commencement Bay is impaired. The receiving water near the area of discharge is 303(d) listed for PCB, dieldrin, bis(2-ethylhexyl) phthalate. Chemicals used at the facility do not contain PCB or dieldrin. PFF did not detect bis(2-ethylhexyl) phthalate in the influent and effluent. Ecology will not require limits or additional monitoring of these pollutants.

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

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

Pollutant concentrations in the proposed discharge exceed water quality criteria despite using technology-based controls which Ecology determined fulfills AKART. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones described in Chapter 173-201A WAC.

Chronic Mixing Zone

Chapter 173-201A-400(7)(b) WAC specifies that mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge ports as measured during MLLW.

The horizontal distance of the chronic mixing zone is 200 feet. The mixing zone extends from the seabed to the top of the water surface.

Acute Mixing Zone

Chapter 173-201A-400(8)(b) WAC 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 horizontal distance of the acute mixing zone is 20 feet. The mixing zone extends from the seabed to the top of the water surface.

The dilution factors are listed in Table 9.

Table 9 - Dilution Factors (DF)

	In U.S. Oil's Effluent*	In Receiving Water**		Overall Dilution	
Criteria		**Acute**	**Chronic**	**Acute**	**Chronic**
Aquatic Life	5.3	1.7	76.3	9.0	404
Human Health, Carcinogen	5.3	-	-	5.3	5.3
Human Health, Non-carcinogen	5.3	-	-	5.3	5.3

*Dilution of PFF's effluent by U.S. Oil's effluent in the Lincoln Avenue ditch. **Dilution of the combined U.S. Oil and PFF discharge from the Lincoln Avenue ditch in the receiving water (Blair Waterway) during low tide.

Ecology determined the impacts of immediate oxygen deficiency, temperature, pH, metals, and other toxics as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

BOD_5--Ecology used the EPA's method to determine the effluent dissolved oxygen concentration after initial dilution (see **Appendix C - Table 16**). The method is described in EPA/600/6-85-002b (Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface

and Ground Water - Part II Revised 1985) and EPA/430/9-82-011 (Revised Section 301(h) Technical Support Document). The discharge results in a small amount of BOD_5 loading relative to the large amount of dilution at the chronic mixing zone during at critical condition. Based on **Table 16**, Ecology predicts a dissolved oxygen concentration of 8.14 mg/L, which meets the water quality criterion of 6.0 mg/L, at the chronic mixing zone. Ecology expects no violations outside the chronic mixing zone.

Temperature--The state temperature standards (Chapter 173-201A-200-210 and 600-612 WAC) 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 [Chapter 173-201A-200(1)(c), 210(1)(c) WAC 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) [Chapter 173-201A-602 WAC, 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 [Chapter 173-201A-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii) WAC]. 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.

- **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 2-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.

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 critical condition. No reasonable potential exists to exceed the temperature criterion where:

$$(\text{Criterion} - T_{ambient}) > [T_{discharge95} + (DF-1) \times T_{ambient}] \div DF - T_{ambient}$$

The facility's effluent has a cooling effect on the receiving water because the 95th percentile effluent temperature of 7.8°C is lower than the ambient water 1-DADMax temperature of 15.16°C. PFF's effluent becomes warmer after combining with U.S. Oil's effluent, which has a 95th percentile temperature of 27.5°C. PFF dilution factor in U.S. Oil's effluent is 5.3. The resulting temperature of the combined discharge is:

$$T_{discharge95} = T_{USOil95} + (T_{PFF95} - T_{USOil95})/DF = 27.5°C + (7.8°C - 27.5°C)/5.3 = 23.8°C$$

Ecology performed the reasonable potential analysis using the 95th percentile temperature of the combined effluent. The dilution factor of the combined effluent in the Blair is 76.3 at the chronic mixing zone. The analysis is as follow:

$$(\text{Criterion} - T_{ambient}) > [T_{discharge95} + (DF-1) \times T_{ambient}] \div DF - T_{ambient}$$

$$(16°C - 15.16°C) > [23.8°C + (76.3 - 1) \times 15.16°C] \div 76.3 - 15.16°C$$

$$0.84°C > 0.11°C$$

The calculations above are based on the temperature modeling in **Table 17.** The discharge of PFF's effluent has no reasonable potential to exceed temperature criterion. The proposed permit does not include a temperature limit. The permit requires PFF to continue to monitor the effluent temperature. Ecology will re-evaluate the reasonable potential during the next permit renewal.

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.

Turbidity--Ecology evaluated the impact of turbidity based on the range of turbidity in the effluent and turbidity of the receiving water. Due to the large degree of dilution, Ecology expects no violations of the turbidity criteria outside the designated mixing zone.

Arsenic--In 1992 the USEPA adopted risk-based arsenic criteria for the protection of human health for the State of Washington. The criterion for marine waters is 0.14 µg/L inorganic arsenic, and is based on exposure from fish and shellfish tissue ingestion. The freshwater criterion is 0.018 µg/L, and is based on exposure from fish and shellfish tissue and water ingestion. These criteria have caused confusion in implementation because they differ from the drinking water maximum contaminant level (MCL) of 10 µg/L, which is not risk-based, and because the human health criteria are sometimes exceeded by natural background concentrations of arsenic in surface water and ground water.

In Washington, when a natural background concentration exceeds the criterion, the natural background concentration becomes the criterion, and no dilution zone is allowed. This could result in a situation where natural groundwater or surface water used as a municipal or industrial source-water would need additional treatment to meet numeric effluent limits even though no arsenic was added as waste. Although this is not the case for all dischargers, we do not have data at this time to quantify the extent of the problem.

A regulatory mechanism to deal with the issues associated with natural background concentrations of arsenic in groundwater-derived drinking waters is currently lacking. Consequently, the Water Quality Program, at this time, has decided to use a three-pronged strategy to address the issues associated with the arsenic criteria. The three strategy elements are:

> **1. Pursue, at the national level, a solution to the regulatory issue of groundwater sources with high arsenic concentrations causing municipal treatment plant effluent to exceed criteria.** The revision of the drinking water MCL for arsenic offered a national opportunity to discuss how drinking water sources can affect NPDES wastewater dischargers, however Ecology was unsuccessful in focusing the discussion on developing a national policy for arsenic regulation that acknowledges the risks and costs associated with management of the public exposure to natural background concentrations of arsenic through water sources. The current arsenic MCL of 10 µg/L could also result in municipal treatment plants being unable to meet criteria-based effluent limits. Ecology will continue to pursue this issue as opportunities arise.
>
> **2. Additional and more focused data collection**. The Water Quality Program will in some cases require additional and more focused arsenic data collection, will encourage or require dischargers to test for source water arsenic concentrations, and will pursue development of a proposal to have Ecology's Environmental Assessment Program conduct drinking water source monitoring as well as some additional ambient monitoring data. At this time, Washington NPDES permits will contain numeric effluent limits for arsenic based only on treatment technology and aquatic life protection as appropriate.
>
> **3. Data sharing**. Ecology will share data with USEPA as they work to develop new risk-based criteria for arsenic and as they develop a strategy to regulate arsenic.

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:

Table 10 - Toxic Pollutants and Discharge Concentrations

Pollutants	PFF effluent µg/L [a]	U.S. Oil effluent µg/L [b]	Combined discharge µg/L [c]
Arsenic	6	61.1	51
Cadmium	< 3	0.3	< 0.81
Chromium	< 7	2.3	< 3.2
Copper	29	1.7	6.9
Lead	< 40	0.24	< 7.7
Nickel	56	3.5	13
Zinc	590	16.7	125
Chloroform	3	-	0.6
Ethylbenzene	2	-	0.4
Methylene chloride	15.83	-	3.0
Toluene	14	-	2.6
Pentachlorophenol	70	-	13

[a] Maximum effluent concentration based on monitoring data from July 2007 to March 2010.
[b] Maximum effluent concentration based on wastewater inspection sampling results from May 2007 to August 2009.
[c] Concentrations of combined flows from PFF and U.S. Oil, assuming a 5.3 dilution factor. The result is the concentration of the total discharge to the Blair Waterway.

Ecology conducted a reasonable potential analysis (see **Appendix C, Tables 12** and **13**) on the above parameters to determine whether we would require effluent limits in this permit. This section does not include an analysis on arsenic. The analysis of arsenic level in the discharge is discussed in the previous section.

For analysis, Ecology reviewed PFF's effluent data and divided the maximum effluent concentrations by a dilution factor 5.3 to account for mixing with U.S. Oil's effluent. The dilution calculation also accounted for toxic pollutant concentrations in U.S. Oil's effluent. The reasonable potential analysis uses the concentrations of the combine discharge, as shown in the above table.

Valid ambient background data was available for arsenic, cadmium, chromium, copper, lead, nickel and zinc (see **Table 5**). Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards.

Ecology determined that cadmium, copper, hexavalent chromium, lead, nickel, zinc, and pentachlorophenol pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 (see **Table 12**) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

The previous permit set 70 ug/L as the water quality-based limit for pentachlorophenol. The limit is based on freshwater quality criteria for receiving water in the Lincoln Avenue ditch. Because the ditch is now covered and does not support aquatic life at the point of discharge, Ecology determined that the receiving water is the Blair Waterway and therefore marine water quality criteria apply. Ecology removed the pentachlorophenol limit because the pollutant concentration has no reasonable potential to exceed the marine water quality criteria (**Table 12**). The removal of the limit does not

violate the anti-backsliding provisions due to new information that was not available at the issuance of the previous permit (40 CFR 122.44(l)).

Water quality criteria for most metals published in Chapter 173-201A WAC are based on the dissolved fraction of the metal (see footnotes to table in Chapter 173-201A-240(3) WAC; 2006). PFF may provide data clearly demonstrating the seasonal partitioning of the dissolved metal in the ambient water in relation to an effluent discharge. Ecology may adjust metals criteria on a site-specific basis when data is available clearly demonstrating the seasonal partitioning in the ambient water in relation to an effluent discharge.

F. Whole Effluent Toxicity

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

- *Acute toxicity tests measure mortality as the significant response* to the toxicity of the effluent. Dischargers who monitor their wastewater using acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.

- *Chronic toxicity tests measure various sublethal toxic responses* such as retarded growth or reduced reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Using the screening criteria in WAC 173-205-040, Ecology determined that PFF's effluent has the potential to cause aquatic toxicity. The facility submitted quarterly acute toxicity tests in the previous permit cycle. The proposed permit changed the point of compliance from the fresh water to marine water. The WET results are no longer applicable to the discharge. PFF must recharacterize the effluent using salt water test species.

The proposed permit contains WET testing requirements as authorized by RCW 90.48.520 and 40 CFR 122.44, using procedures from WAC 173-205. The proposed permit requires the facility to conduct WET testing at prescribed intervals for one year, to characterize both the acute and chronic toxicity of the effluent. Ecology ranked the potential impact and likelihood of toxicity in **Table 18**. The PFF facility ranks at Rank 4. The testing frequency for a Rank 4 discharge is quarterly for acute test and semi-annually for chronic. Both the acute and chronic tests must use at least one fish and one invertebrate.

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

- Set a limit on acute or chronic toxicity.

- Require this facility operator to conduct WET testing to monitor compliance with an acute toxicity limit, a chronic toxicity limit, or both.

- Specify the procedures the facility operator must use to come back into compliance if toxicity exceeds the limits.

Ecology-accredited WET testing laboratories use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know how to calculate an NOEC, LC_{50}, EC_{50}, IC_{25}, etc. Ecology gives all accredited labs the most recent version of Ecology Publication # 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 each regulated facility send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

If the WET tests conducted during effluent characterization indicate no reasonable potential for effluent discharges to cause receiving water toxicity, PFF's NPDES permit will not impose WET limits. The facility must retest the effluent prior to submitting an application for permit renewal (to demonstrate that effluent toxicity has not increased).

- 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 toxicity in the effluent has increased. PFF may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

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 posing a risk to human health. Ecology determined this because data or process information indicates regulated chemicals occur in the discharge.

Ecology conducted a determination of 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 (Ecology Publication 92-109, July, 2006) to make this reasonable potential determination. Our evaluation in **Appendix C - Table 13** showed that the discharge has no reasonable potential to cause a violation of water quality standards, thus an effluent limit is not warranted.

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 (Chapter 173-204-400 WAC). 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. No sediment monitoring will be required in this permit.

I. 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 (Chapter 173-200-100 WAC).

PFF does not discharge wastewater to ground and therefore Ecology imposed no permit limits to protect ground water.

J. Comparison Of Effluent Limits With Limits of The Previous Permit Issued on July 1, 2004

Table 11 - Comparison of Effluent Limits

Parameter	Basis of Limit	Previous Effluent Limits: Daily Maximum		Proposed Effluent Limits: Daily Maximum	
		Outfall 001	Outfall 001B	Outfall 001	Outfall 001B*
pH	Technology	Daily minimum ≥ 6.0, daily maximum ≤ 9.0		Daily min ≥ 6.0, daily max ≤ 9.0 at outfall 001. No limits at outfall 001B	
Copper	Technology	50 µg/L	22 µg/L	50 µg/L	-
Lead	Technology	100 µg/L	89 µg/L	11 µg/L	-
Zinc	Technology	330 µg/L	147 µg/L	330 µg/L	-
Pentachlorophenol	Water quality	70 µg/L	-	-	-
Oil & grease	Technology	15 mg/L	-	15 mg/L	-

* Outfall 001B no longer exists. No limits are set for this outfall.

IV. MONITORING REQUIREMENTS

Ecology requires monitoring, recording, and reporting (Chapter 173-220-210 WAC 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.

PFF monitors for arsenic to further characterize the effluent. This pollutant could have a significant impact on the quality of the surface water.

Additional monitoring includes acetone and methylene chloride, which are chemicals present at the facility and could impact effluent toxicity. Ecology also requires influent and effluent monitoring for zinc and pentachlorophenol to ensure the system is operating efficiently. Zinc monitoring is to gather data for evaluating the treatment efficiency and setting a technology-based limit in the next permit cycle. Pentachlorophenol monitoring is to ensure the efficiency of activated carbon unit.

The monitoring schedule is detailed in the proposed permit under 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.

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).

V. OTHER PERMIT CONDITIONS

A. Reporting and Recordkeeping

Ecology based permit condition S3 on our authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (Chapter 173-220-210 WAC).

B. Non Routine and Unanticipated Discharges

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

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

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

C. Spill Plan

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

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

D. Treatment System Operating Plan

Ecology requires industries to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state and federal regulations (40 CFR 122.41(e) and Chapter 173-220-150 (1)(g)) WAC. The facility has prepared and submitted an operation and maintenance manual as required by state regulation for the construction of wastewater treatment facilities (Chapter 173-240-150 WAC). Implementation of the procedures in the Treatment System Operating Plan ensures the facility's compliance with the terms and limits in the permit.

E. Stormwater Pollution Prevention Plan

PFF prepared and submitted the Storm Water Pollution Prevention Plan (SWPPP) during the previous permit cycle. The proposed permit requires the facility to update and submit the SWPPP to Ecology.

F. General Conditions

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

VI. PERMIT ISSUANCE PROCEDURES

A. Permit Modifications

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

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

B. Proposed Permit Issuance

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

VII. REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

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

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

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

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

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

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

Washington State Department of Ecology.

1994. Permit Writer's Manual. Publication Number 92-109

Washington State Department of Ecology.

2007. Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees. Publication Number 07-10-024

Washington State Department of Ecology.

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

Washington State Department of Ecology and Westerrn States Petroleum Association

1998. Background Metals Concentrations in Selected Puget Sound Marine Receiving Water. Batelle Martine Sciences Laboratory, Sequim, Washington.

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

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

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

Ecology proposes to reissue a permit to Pacific Functional Fluids. The permit prescribes operating conditions and wastewater discharge limits. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice on December 8, 2010 in The News Tribune to inform the public and to invite comment on the proposed issuance of this National Pollutant Discharge Elimination System permit as drafted.

The Notice –

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

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

You may obtain further information from Ecology by telephone, (360) 407-6000, or by writing to the permit writer at the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Industrial Section
PO Box 47706
Olympia, WA 98504-7600

The primary author of this permit and fact sheet is Ha Tran.

APPENDIX B--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 period of time, 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 and Chapters 173-200-030(2)(c)(ii) and 173-216-110(1)(a) WAC.

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)—The 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.

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 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 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.

Chlorine--Chlorine is 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.

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 e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

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

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.

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.

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% 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 area of the authorized mixing zone is specified in a facility's permit and follows 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.

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.

Practical Quantificaiton Limit (PQL)—The lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

Quantitation Level (QL)-- The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision &bias) achieves the objectives of the intended purpose. This may also be called Minimum Level or Reporting Level.

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).

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to receiving waters 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.

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.

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.

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 facility. 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 on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into receiving waters.

APPENDIX C--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.

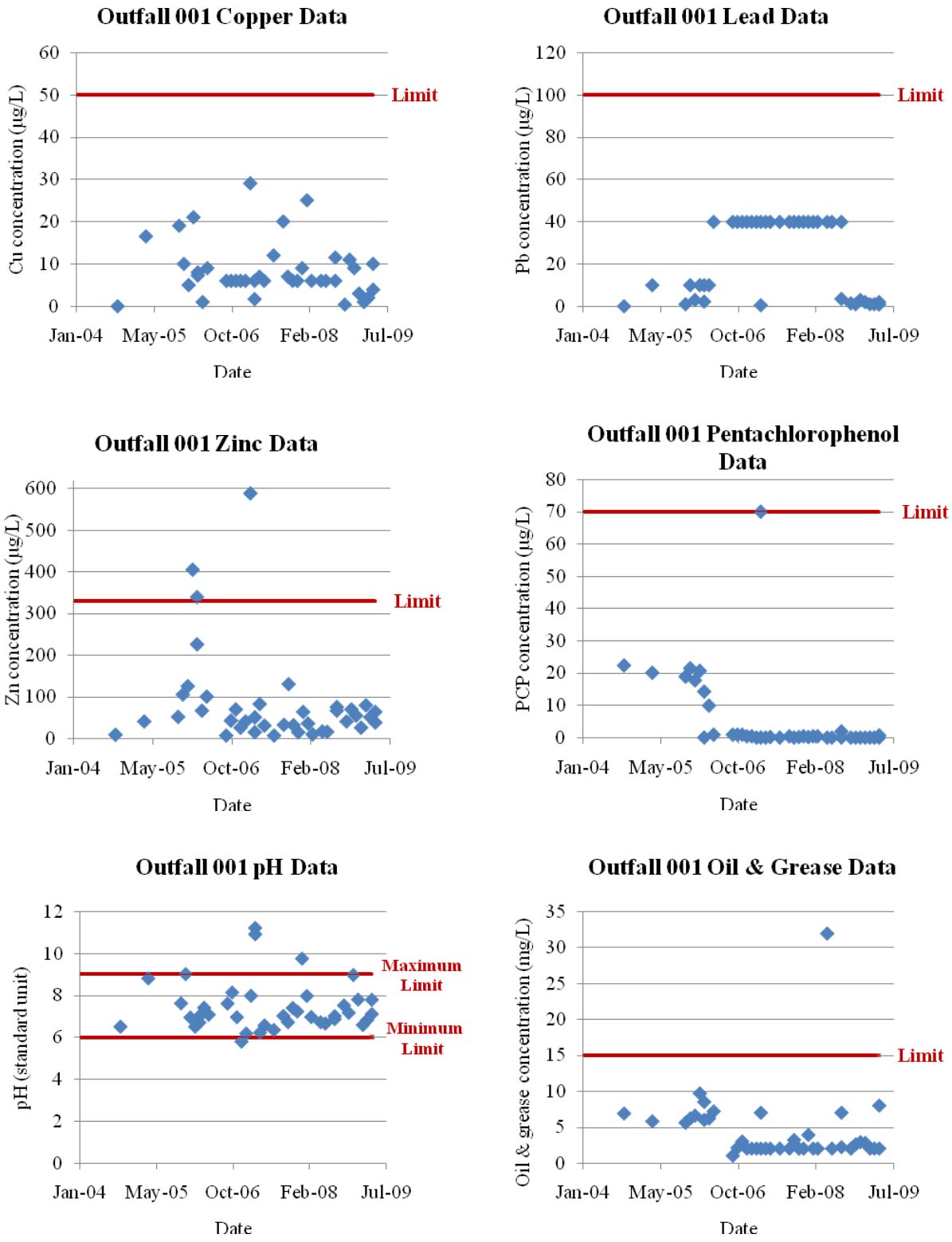


Figure 2 - History of Compliance: Concentration of Pollutants in the Discharge

Table 12 - Analysis of Reasonable Potential to Exceed Water Quality Criteria

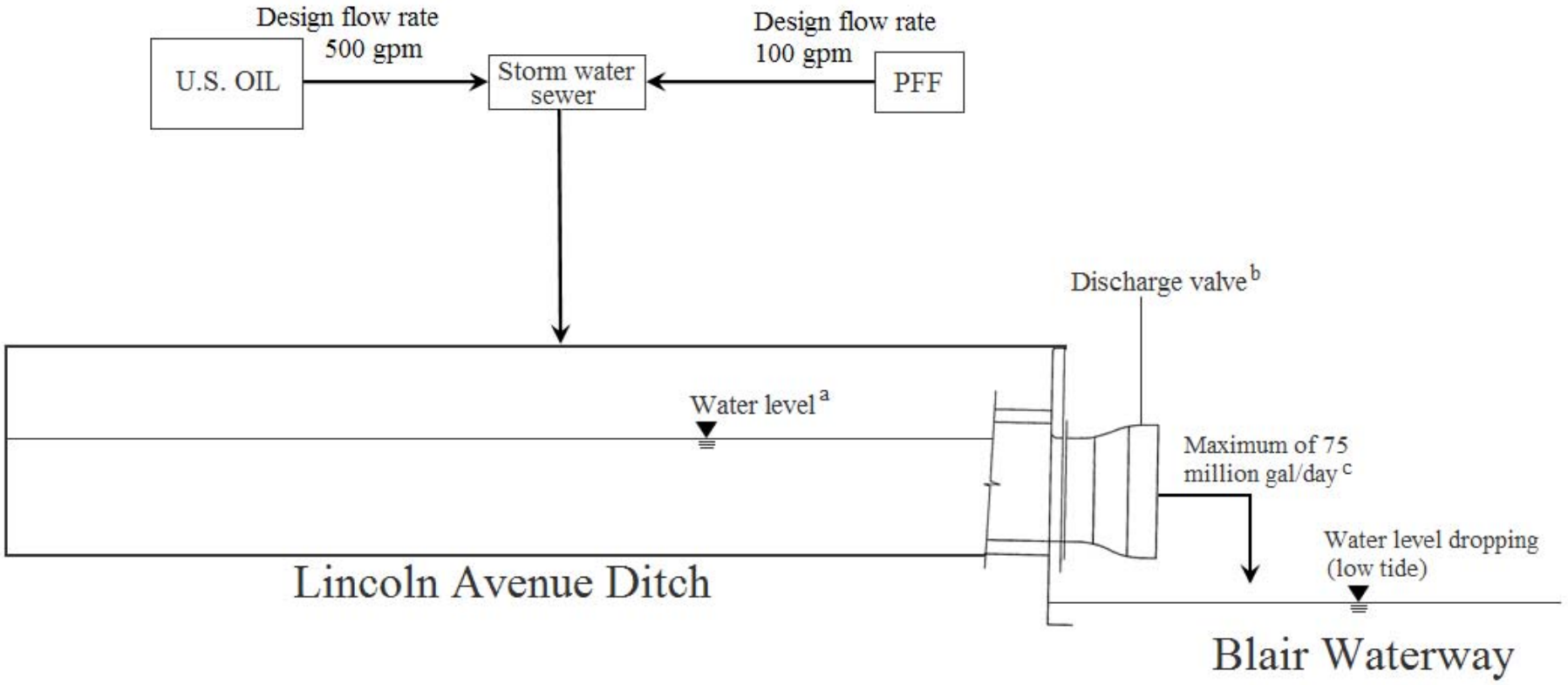
Parameter	Ambient conc. (metal as dissolved) µg/L	# of effluent samples	Acute DF	Chronic DF	Metal Criteria Translator Acute	Metal Criteria Translator Chronic	Max discharge (metal as total recoverable) µg/L	Multiplier	Maximum effluent conc. at mixing zone boundary (µg/L) Acute	Maximum effluent conc. at mixing zone boundary (µg/L) Chronic	Water quality criteria (µg/L) Acute	Water quality criteria (µg/L) Chronic	Limit Required?
Arsenic	1.6	41	1.7	76.3	1.0	1.0	51	1.10	33.48	2.31	69	36	NO
Cadmium	0.0988	1	1.7	76.3	0.994	0.994	< 0.81	6.20	2.97	0.16	42	9.3	NO
Copper	1.01	41	1.7	76.3	0.89	0.89	6.85	1.10	4.36	1.08	4.8	3.1	NO
Chromium (hex)	0.185	1	1.7	76.3	0.993	0.993	< 3.2	6.20	11.61	0.44	1100	50	NO
Lead	0.0198	41	1.7	76.3	0.95	0.95	< 7.7	1.10	4.77	0.13	210	8.1	NO
Nickel	0.616	1	1.7	76.3	0.99	0.99	13.41	6.20	48.66	1.69	74	8.2	NO
Zinc	2	41	1.7	76.3	0.94	0.94	125	1.10	77.05	3.67	90	81	NO
Pentachlorophenol	-	41	1.7	76.3	-	-	13.21	1.10	8.55	0.19	13	7.9	NO

Note: Maximum discharge concentration is the combined effluent of PFF and U.S. Oil in **Table 10**. Therefore, Ecology use the dilution factor corresponding to the combined discharge.

Table 13 - Analysis of Reasonable Potential to Exceed Water Quality Criteria for the Protection of Human Health

Parameter	Ambient conc., µg/L	DF	# of effluent samples n	50th percentile effluent conc. (n>10), µg/L	Multiplier	Maximum effluent conc., µg/L	Maximum conc. at mixing zone boundary, µg/L[a]	Water quality criteria for protection of human health, µg/L	Limit Required?
Copper	1.01	1	41	2.5	0.44	6.85	2.5	1000	NO
Nickel	0.616	1	1	-	2.49	13.41	33.38	4600	NO
Zinc	2	1	41	21.1	0.44	125	21.1	5000	NO
Chloroform	-	1	1	-	2.49	0.57	1.41	470	NO
Ethylbenzene	-	1	1	-	2.49	0.38	0.94	29,000	NO
Methylene chloride	-	1	1	-	2.49	2.99	7.44	1600	NO
Toluene	-	1	1	-	2.49	2.6	6.47	200,000	NO
Pentachlorophenol	-	1	41	0.047	0.44	13.21	0.047	8.2	NO

Note: Maximum effluent concentration is the concentration of the combined PFF and U.S. Oil effluents in **Table 10**. The concentration at the mixing zone boundary is based on estimated 95% confidence and coefficient variation of 0.6.



Notes: a) The water level determines the discharge rate at the valve. The water level is dependent on U.S. Oil and PFF's effluent flow and the discharge rate to the Blair Waterway. b) The valve discharges intermittently. It opens during low tide, when water level at the Blair is lower than the water level in the ditch, and closes at high tide. c) The discharge rate varies and decreases as the water level in the ditch lowers. Ecology estimated the maximum discharge in **Figure 4**.

Figure 3
Discharge Diagram
Source: Foster Wheeler 2000
(not to scale)

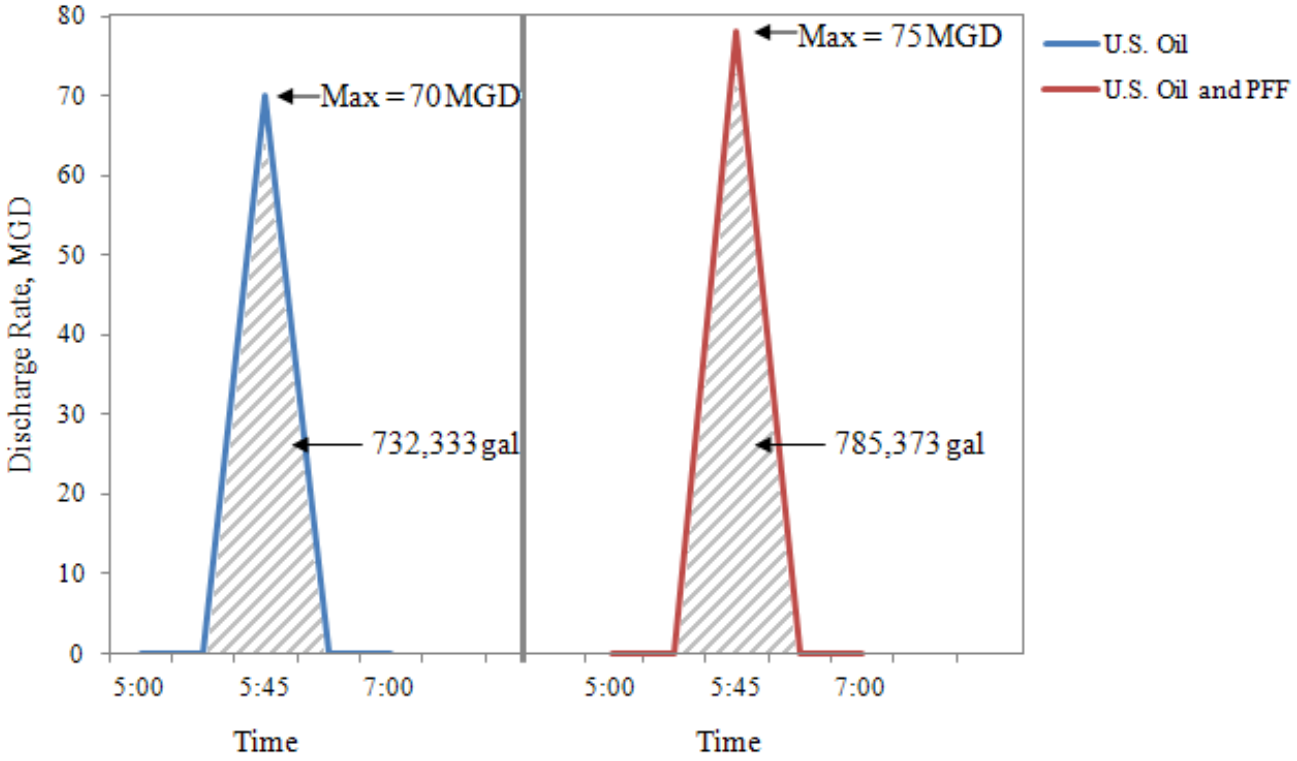


Figure 4 - Plot Estimate of Maximum Discharge Rate

Note: The left graph is the graph of the discharge of U.S. Oil's effluent from the ditch to the Blair Waterway (Foster Wheeler 2000). The right graph is the combined discharge of U.S. Oil and PFF to the Blair Waterway, as estimated by Ecology. The graphs were fitted to the following conditions: 1) PFF effluent flow rate is 100 gpm. 2) The effluent accumulated in the ditch during high tide period of 10 hr 24 minutes, and 3) The water accumulated in the ditch is released to the Blair over a 30 minute period at low tide. The maximum discharge ("Max") of 75 MGD is used to model the Acute Mixing Zone dilution factor.

Figure 5 – Outfall Map

Table 14 - Plumes Modeling: Acute Mixing Zone (AMZ) Dilution Factor

EFFLUENT DATA: MODEL INPUT					RESULTS	
Port No.	Depth (ft)	Port diameter (ft)*	Valve velocity (ft/s)*	Port flow (MGD)**	Initial DF	AMZ DF
1	1.05	2.186	7.73	18.75	1.02	1.69
2	2.57	2.186	7.73	18.75	1.58	2.48
3	4.09	2.186	7.73	18.75	2.10	3.13
4	5.61	2.186	7.73	18.75	2.64	3.78
Effluent temperature = 27.13°C			Maximum flow = 75 MGD**			
Horizontal angle = 90° deg			Vertical angle = 0°			
AMBIENT DATA: INPUT ***						
Depth (m)	Density (σ_t)	Temperature (C)	Current direction	Current speed (cm/s)		
0.6	15.17	9.43	0°	2.6		
1	21.23	9.34	0°	2.6		
6	22.08	9.28	0°	2.6		
9	22.45	9.25	0°	2.6		

* Port diameter is adjusted to match the velocity based on the valve's hydraulic characteristics.
** Flow is the maximum instantaneous discharge of 75 MGD (see **Figures 3** and **4**).
*** From Foster Wheeler's 2000 mixing zone study

Table 15 - Plumes Model: Chronic Mixing Zone (CMZ) Dilution Factor

EFFLUENT DATA: MODEL INPUT					RESULTS	
Port No.	Depth (ft)	Port diameter (ft)*	Valve velocity (ft/s)*	Port flow (MGD)**	CMZ DF	Adjusted DF****
1	0.63	1.889	1.368	2.4806	6.20	76.3
2	1.04	1.889	1.368	2.4806	6.29	77.4
3	1.45	1.889	1.368	2.4806	6.95	85.4
4	1.87	1.889	1.368	2.4806	7.81	96.0
Effluent temperature = 27.13°C			Average flow = 2.4806 MGD**			
Horizontal angle = 90°			Vertical angle = 0°			
AMBIENT DATA: INPUT ***						
Depth (m)	Density (σ_t)	Temperature (C)	Current direction	Current speed (cm/s)		
0.6	15.17	9.43	0°	6.7		
1	21.23	9.34	0°	6.7		
6	22.08	9.28	0°	6.7		
9	22.45	9.25	0°	6.7		

* Port diameter is adjusted to match the velocity based on the valve's hydraulic characteristics.
** Maximum 1-hour discharge from U.S. Oil (9.8 MGD) plus 85 gpm (0.1244 MGD) from PFF, and divided into 4 ports.
*** From Foster Wheeler's 2000 mixing zone study
**** CMZ DF times the ratio of 12.3 to represent a 4-day maximum discharge for chronic mixing.

Table 16 – Immediate Dissolved Oxygen Demand (IDOD) Modeling at Chronic Mixing Zone

INPUT	
1. Dilution Factor at Mixing Zone Boundary:	404
2. Ambient Dissolved Oxygen Concentration (mg/L)[a] :	7.9
3. Effluent Dissolved Oxygen Concentration (mg/L)[b]:	3.1
4. Effluent Immediate Dissolved Oxygen Demand (mg/L)[c]:	0
OUTPUT	
Dissolved Oxygen at Mixing Zone Boundary (mg/L):	7.84

[a] From Ecology's Marine Monitoring during critical condition in June 8, 2008. [b] Because there are no dissolved oxygen (DO) monitoring of the effluent, Ecology assumed the lowest DO measured during the WET tests from 2006 to 2008. [c] The immediate dissolved oxygen demand is considered to be negligible when the effluent DO is measureable, based on Ecology's Water Quality Program Permit Writer Manual.

Table 17 – Temperature Mixing Model for Marine Water*

INPUT	
1. Chronic Dilution Factor at Mixing Zone Boundary, from **Table 9**	76.3
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	15.2 °C
3. 1DADMax Discharge Temperature (95th percentile) for combined effluents from PFF and U.S. Oil	23.8 °C
4. Aquatic Life Temperature WQ Criterion	16.0 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	15.27 °C
6. Incremental Temperature Increase or decrease:	0.11 °C
7. Incremental Temperature Increase 12/(T-2) if T ≤ criteria	0.91 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	16.0 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temperature range?	NO
10. Temperature increase allowed at mixing zone boundary, if required:	---
B. If ambient temperature 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 temperature range?	NO
12. Temp increase allowed at mixing zone boundary, if required:	---
C. If ambient temperature is cooler than (WQ criterion-0.3) but within 12/(T_{amb}-2) of the criterion	
13. Does temp fall within this incremental temperature range?	YES
14. Temperature increase allowed at mixing zone boundary, if required:	NO LIMIT
D. If ambient temp is cooler than (WQ criterion - 12/(T_{amb}-2))	
15. Does temp fall within this incremental temperature range?	NO
16. Temperature increase allowed at mixing zone boundary, if required:	---
17. Do any of the above cells show a temp increase?	**NO**
18. Temperature Limit if Required?	**NO LIMIT**

*Model is is based on WAC 173-201A-200(1)(c)(i)-(ii) and Water Quality Program Guidance

Table 18 – Discharge Toxicity Ranking to Evaluate Toxicity

Part A. Toxicity Likelihood	
Uses, stores, produces as a product or waste, or transfers hazardous substances listed in 40 CFR 302.4 with a statutory code of 1 or 2 with adequate Best Management Practices	5 points
Discharges in the effluent any toxic pollutant listed in Appendix D of 40 CFR Part 122	15 points
Any facility with toxicity detected during past acute toxicity testing based on less than 80% survival in 100% effluent	10 points
Sum of Score in Part A:	**30 points**
B. Potential For Impact	
Average annual discharge flow volume < 0.5 mgd	5 points
Chronic critical effluent concentration at edge of mixing zone < 1% effluent	1 point
Sum of Score in Part B:	**6**
Total Score (Part A × Part B): 180	**Discharge Rank: #4**

APPENDIX D--RESPONSE TO COMMENTS