Fact Sheet for NPDES Permit WA0002984

Phillips 66 Ferndale Refinery

Date of Public Notice: September 06, 2023

Permit Effective Date:

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for Phillips 66 Ferndale Refinery.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for Phillips 66 Ferndale Refinery, NPDES permit WA0002984, are available for public review and comment from September 6, 2023 until October 06, 2023. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

Phillips 66 Ferndale Refinery reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft fact sheet for public notice.

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

Summary

The Phillips 66 Ferndale Refinery operates a wastewater treatment plant that discharges to the Strait of Georgia. Ecology issued the previous permit for this facility on March 11, 2014.

Effluent limits for the conventional pollutants Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Oil and Grease (O&G), phenols, ammonia, Fecal Coliform, and pH are unchanged from the permit issued in 2014.

The proposed permit includes the following changes:

- Adds average monthly and daily maximum limits for Total Chromium
- Adds average monthly limit for Hexavalent Chromium
- Adds Enterococci and nutrient monitoring at Outfall 001
- Adds daily maximum limit for Total Residual Chlorine
- Adds AKART analysis and Engineering Report requirement for Outfalls 004, 006, and 007
- Adds an acute toxicity limit for Whole Effuent Toxicity (WET) testing

- Adds new test species for WET testing
- Adds construction stormwater discharge authorization and monitoring
- Reduces monitoring frequencies for BOD, COD, ammonia, and hexavalent chromium
- Adds Per- and Polyfluoroalkyl Substances (PFAS) study

Table of Contents

I. Introduction

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

The following regulations apply to industrial NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (Chapter 173-220 WAC)
- Water quality criteria for surface waters (Chapter 173-201A WAC)
- Water quality criteria for ground waters (Chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (Chapter 173-205 WAC)
- Sediment management standards (Chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (Chapter 173-240 WAC)

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

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

II. Background Information

Table 1 — Facility Information

Applicant:	Phillips 66 Ferndale Refinery
Facility Name and Address	Phillips 66 Ferndale Refinery PO Box 8, Ferndale, Washington 98248
Contact at Facility	Name: Elisa de los Reyes Telephone #: (360) 384-8368
Responsible Official	Name: Carl Perkins Title: Refinery Manager Address: PO Box 8, Ferndale, Washington 98248 Telephone #: (360) 384-8343
Industry Type	Petroleum Refinery
Categorical Industry	40 CFR Part 419
Type of Treatment	Primary, biological, and tertiary treatment system
SIC Codes	2911
NAIC Codes	324110
Discharge Location: Outfall 001	Water Body Name: Strait of Georgia Latitude: 48.826667 Longitude: 122.715833
Discharge Location: Outfall 002	Water Body Name: Unnamed Tributary to Lummi Bay Latitude: 48.819722 Longitude: 122.684167
Discharge Location: Outfall 003	Water Body Name: Onsite Non-tidal Wetland Latitude: 48.822222 Longitude: 122.704167
Discharge Location: Outfall 004	Water Body Name: Unnamed Tributary to Strait of Georgia Latitude: 48.8275 Longitude: 122.709444
Discharge Location: Outfall 005	Water Body Name: Unnamed Tributary to Strait of Georgia Latitude: 48.829722 Longitude: 122.710278

Discharge Location: Outfall 006	Water Body Name: Onsite Non-tidal Wetland Latitude: 48.821667 Longitude: 122.696111
Discharge Location: Outfall 007	Water Body Name: Onsite Non-tidal Wetland Latitude: 48.8225 Longitude: 122.701667

Table 2 — Permit Status

Renewal Date of Previous Permit	March 11, 2014
Application for Permit Renewal Submittal Date	September 28, 2018
Date of Ecology Acceptance of Application	December 14, 2018

Table 3 — Inspection Status

Date of Last Sampling Inspection	May 1-2, 2019
Date of Last Non-sampling Inspection Date	October 19, 2022

Figure 1 — Facility Location Map

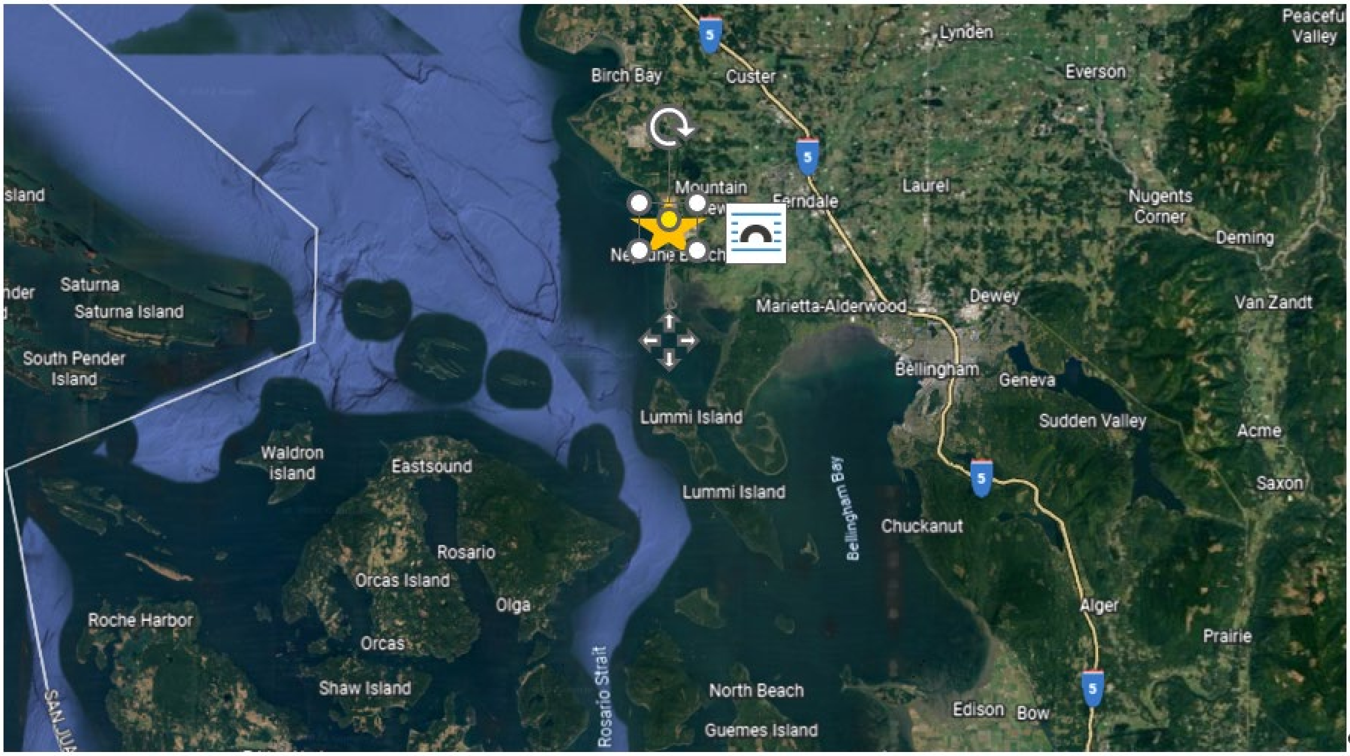


Figure 2 - Detailed Facility Map

A. Facility description

History

The Phillips 66 Ferndale Refinery is located in a rural area of Whatcom County, approximately five miles west southwest of the city of Ferndale, Washington, along the Strait of Georgia between Cherry Point and Sandy Point. The refinery encompasses an area of about 900 acres, bordered by Unick Road to the north, Slater Road to the south, and Lake Terrell Road to the east.

General Petroleum originally constructed the refinery in 1954. The refinery was later owned and operated by British Petroleum. On December 28, 1993, BP Oil Company notified Ecology that Tosco Corporation had purchased the refinery and planned to continue operating the refinery to process crude oil as Tosco Northwest Company (Tosco). On September 17, 2001, Ecology received notification that Phillips Petroleum completed its purchase of Tosco Corporation. Tosco Corporation is a wholly owned subsidiary of Phillips Petroleum Company.

The Phillips Petroleum Company merged with Conoco in 2002 to form ConocoPhillips. In late 2011, ConocoPhillips announced its intent to form a new company to be named the Phillips 66 Company (Phillips 66) and to transfer the ownership of the Ferndale refinery to the new company. The transition became official on May 1, 2012.

The refinery currently employs about 283 people with an additional 200 contract employees. The indirect employment associated with the refinery is about 900 people. The refinery operates 24 hours per day and 365 days per year, except during turnaround periods which occur about once every four to five years. The refinery runs two 12 hours shifts per day.

Cooling Water Intakes

CWA § 316(b) requires the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. Since July 2013, Ecology has required a supplemental application for all applicants using EPA Form 2-C. Phillips 66 selected “No” on this form when asked if a cooling water intake is associated with the facility. Phillips 66 receives their raw water from Public Utility District #1 of Whatcom County.

Industrial Processes

From April 2014 through December of 2019, Phillips 66 refinery processed an average of 95,700 bbls per day of crude oil. The refinery processed an average of 90,000 bbls per day of crude oil during the last two years from January 2019 – December 2020. The main source of crude oil is transported in by railcar from North America and additional sources are from tankers delivering oil from Alaska's Prudhoe Bay oil field and Canadian Crude oil via pipeline.

The refinery separates crude oil into its various components for further processing and blending into a variety of petroleum products. These products include gasoline, jet fuel, diesel oil, liquid petroleum gas, residual fuel oil, and marine bunker fuel oil.

The refinery processes use an average of 2.8 million gallons of water per day (MGD). Another 15,000 gallons per day are used for potable water purposes. The Public Utility District #1 of Whatcom County supplies raw water. The refinery makes potable drinking water from treated PUD water. Major process water uses include cooling tower water make-up (1.5 MGD), boiler feed water (0.72 MGD), and utility services (0.57 MGD).

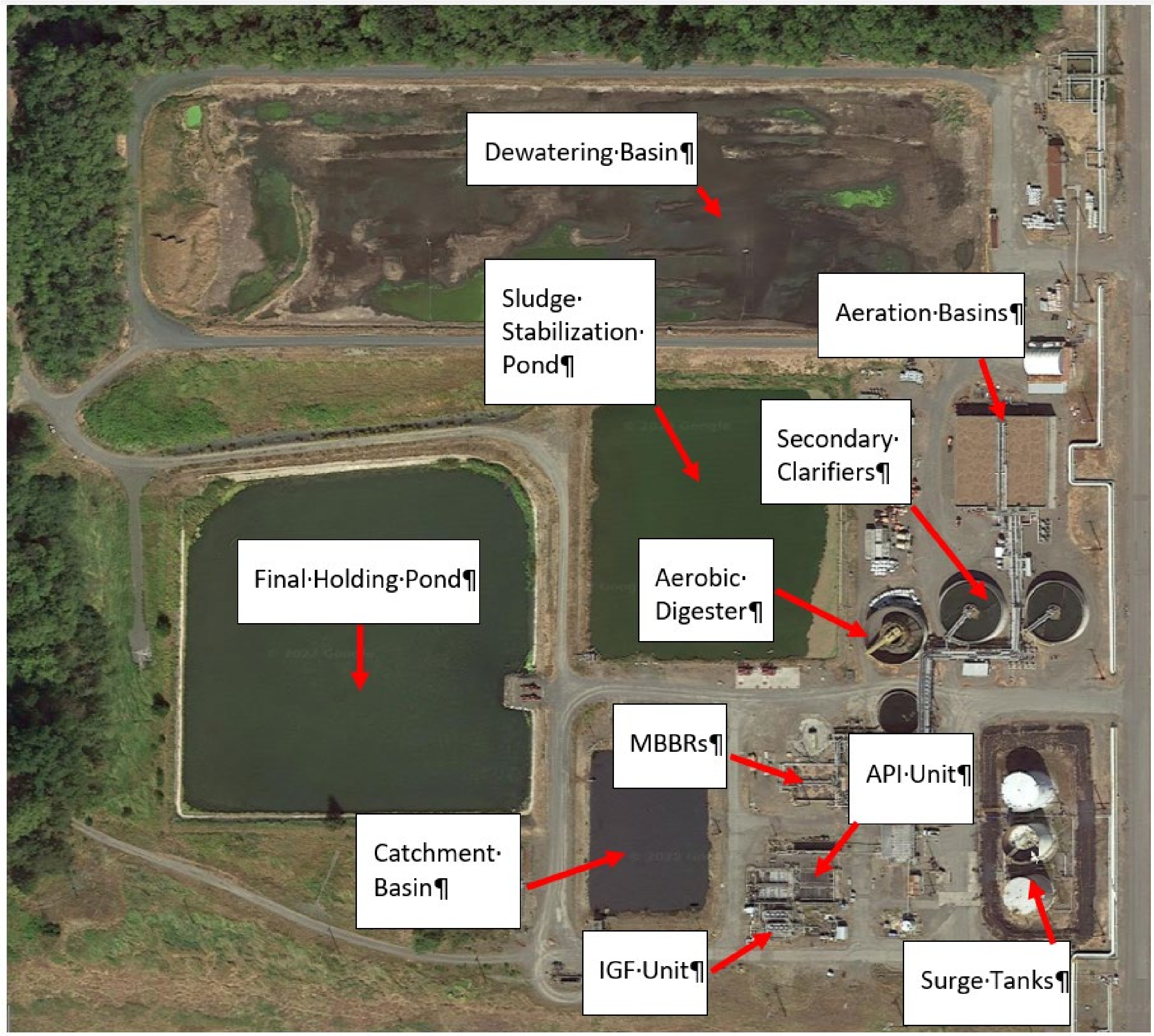
Wastewater Treatment processes

The refinery treats process wastewater using primary, secondary, and tertiary treatment in a wastewater treatment system consisting of:

- Three surge tanks (a chemical water surge tank, a chemical water retention tank, and an oily water surge tank)
- Two parallel API oil/water separators with skimmers (APIs)

- Two parallel Induced Gas Flotation (IGF) units
- Two parallel Moving Bed Biofilm Reactors (MBBRs)
- Two parallel aeration basins
- Two parallel secondary clarifiers
- An aerobic digester
- A sludge stabilization pond (formerly the clarification pond)
- A catchment basin
- A dewatering basin
- A stormwater basin
- A final holding pond
- A spill basin

Figure 3 - Wastewater Treatment System Map



In June 2007, the refinery completed construction of a conventional activated sludge system including two parallel aeration basins and two parallel clarifiers to replace the existing aero-accelators. Each year the refinery removes and disposes of the solids that settled out in the sludge stabilization pond. The solids are placed in the dewatering basin and tilled into the soil where aerobic bacteria consume the oily hydrocarbons and organic biomass.

The refinery sends the collected solids to a permitted landfill offsite for disposal. The water from the dewatering basin is routed to the sludge stabilization pond and then to the aeration basins.

The refinery's oily water sewer system collects stormwater falling within the process unit boundaries for treatment, along with process wastewater, at the refinery's wastewater treatment plant.

The stormwater sewer system collects stormwater falling on industrial areas of the refinery that are not within the curbed process unit boundaries. This stormwater is routed through the Stormwater Observation Channel (SWOC). Any oil present on the water surface as it enters the observation channel is skimmed off by a rotating surface skimmer at the head of the channel. The oil is routed to the API oil/water separators. The stormwater from the observation channel overflows into the stormwater holding pond which allows for solids settling. The operator observes the stormwater flow for contaminants. If the stormwater is considered "clean", it is routed to either the final holding pond or catchment basin where it commingles with the treated process wastewater before discharge to the Strait of Georgia. The operator samples the commingled water from the final holding pond for effluent parameters before discharge. If the stormwater is considered "contaminated", it is pumped to the wastewater treatment plant for treatment.

The refinery routes stormwater runoff from non-industrial areas, not collected in the stormwater sewer system, through onsite ditches to Outfalls 002, 003, 004, and 005. Each outfall includes underflow weirs and wood fiber filter cages. The refinery monitors the stormwater at the outfalls to prevent any possible spilled materials from exiting the refinery.

The facility routes non-contact stormwater runoff from the Railcar Unloading Facility (RUF), gravel roadways, and parking areas of the RUF to three detention ponds called the East Pond, West Pond, and Mid Pond. These ponds allow the solids in the stormwater runoff to settle in the ponds. Each pond has an outlet structure that controls the discharge flow rate.

The stormwater discharged from the East Pond flows through a wooded area and is discharged at Outfall 002. The stormwater discharged from the Mid Pond and the West Pond are discharged through Outfalls 006 and 007, respectively. The discharges from these outfalls flow through a wooded area to feed onsite wetlands before leaving the refinery property at the Slater Road ditch. Any contaminated stormwater associated with the unloading facility is routed to the refinery's wastewater treatment plant.

The spill basin is an additional environmentally protective feature used to temporarily hold emergency overflows from certain storage tank spill containment areas, and process wastewater overflows from the oily and phenolic sewer lift stations in the event of heavy rain storm flow exceeding lift station capacity or in the event of lift station pump extended failure. Lift station overflow initially is routed to tank 300x40 and is only diverted to the spill basin after tank 300x40 holding capacity is reached. Process wastewater captured in the spill basin is held until capacity is available for pumping back to the lift station or SWOC for normal routing and treatment through the WWTP. The facility is required to notify Ecology and obtains samples for benzene analysis when the process wastewater overflow from the oily and phenolic sewer lift stations is routed to the spill basin.

According to the Dangerous Waste Regulations in WAC 173-303, sludge at a petroleum refinery generated from the gravitational separation of oil and water; oil and solids; or oil, water, and solids during the storage or treatment of process wastewater may be listed hazardous/dangerous waste.

The refinery has a designated sanitary sewer system that conveys black water from septic tanks within the refinery to the Oily Water Sewer Lift Station. Most of the buildings in the refinery are serviced by a septic tank. For the trailers that have a septic tank but it is not connected to the sanitary sewer system, an on-site contract company removes the black water via vacuum truck from the water side of the septic tank, generally on a weekly basis. The black water is deposited in the Oily Water Sewer Junction box at the intersection of 6th and H Street. Water from the Oily Water Sewer Lift Station is pumped to the WWTP surge tank, 900x3. The water from 900x3 serves as one of the process sewer feed tanks for the WWTP.

Any solids pumped from septic tanks are stored in a poly tank until there is sufficient volume to allow for a fully loaded vacuum truck to deliver this sanitary waste mixture to the Bellingham Municipal treatment plant at the Post Point Plant in Bellingham.

Solid wastes

Phillips 66 manages various solid wastes onsite including: garbage, recyclables (paper, plastic, glass, metal, and wood), biosolids, non-hazardous vessel sludge, non-hazardous excavated soil, non-hazardous catalyst fines, asphalt, removed clay tower media, concrete, and refractory.

Discharge outfalls

Phillips 66 operates one process wastewater outfall (001) and six industrial stormwater outfalls (002, 003, 004, 005, 006, and 007). The discharge from each outfall is described below:

<u>Process Wastewater Outfall 001</u>

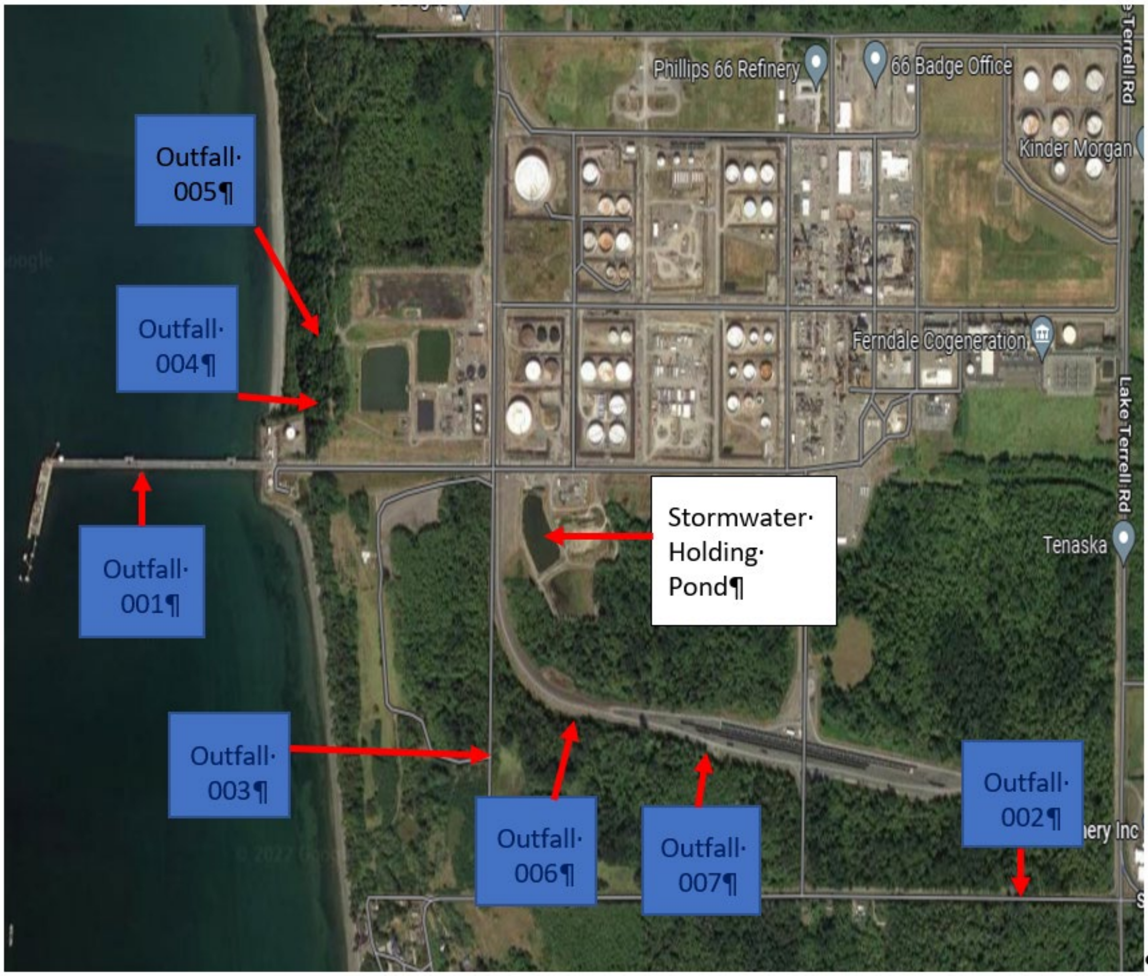
The refinery discharges treated sanitary wastewater, process water, ballast water, and stormwater via an 8.5-inch diameter multi-port submerged diffuser at Outfall 001. The diffuser has 4 ports which are oriented east, west, north, and south respectively. The diffuser is 1.4 feet from the bottom of the seabed and 31 feet below the mean lower low water (MLLW). Outfall 001 extends 1000 ft west from the shoreline into the Strait of Georgia.

The refinery discharges treated effluent to the Strait of Georgia on a continuous basis. During the permit term, the monthly average volume of effluent discharged ranged between 1.62 to 3.30 MGD. During heavy rainfall events the flow can reach levels as high as 5.44 MGD, which occurred in February 2016.

The refinery's outfall line also conveys treated wastewater from the Puget Sound Energy Ferndale Generating Station (PSE), a neighboring cogeneration facility for steam and electricity. The average flow rate from PSE is 177,000 gallons per day. PSE's operations are intermittent.

<u>Stormwater Outfalls 002, 003, 004, 005, 006 and 007</u>

Figure 4 – Stormwater Outfall Locations Map



Outfall 002 drains approximately 253.1 acres of wooded area, grasslands, wetlands, roadways, and gravel parking areas in the eastern portion of the refinery. The refinery collects the stormwater runoff from these areas in a small pond prior to discharging through a weir structure which include an underflow weir and excelsior fiber filters. The discharge from Outfall 002 flows south approximately 40' in a culvert which flows into a roadside ditch on the north side of Slater Road. The stormwater combines with stormwater from the Slater Road ditch and surface runoff from Slater Road and enters another culvert which flows to the south approximately 40' beneath Slater Road. The culvert flows into a wooded areas where it combines with stormwater from the southern portion of Slater Road. The stormwater travels approximately 6,800 feet through ditches, wooded areas, wetlands, and pastureland before it is discharged to the Lummi Bay.

Outfall 003 drains approximately 23.7 acres of forest, roadways, and gravel parking areas in the southwest portion of the refinery.

The refinery collects the stormwater runoff from these areas in a small pond prior to discharging through a weir structure which includes an underflow weir and excelsior fiber filters. The discharge from Outfall 003 flows through an approximately 1,520 feet of ditches, ponds, and wetlands before it is discharged to the Strait of Georgia.

Outfall 004 drains approximately 6.1 acres at the southwest corner of the wastewater treatment plant. The drainage area consists of gravel roadways, forest land, pasture, and parking areas. The refinery collects the stormwater runoff from these areas in a small pond prior to discharging through a weir structure which includes an underflow weir and excelsior fiber filters. The discharge from Outfall 004 flows down an approximately 450 feet of a steep forest bluff onto the beach before it is discharged to the Strait of Georgia.

Outfall 005 drains approximately 15.3 acres north of the wastewater treatment plant. The drainage area consists of gravel roadways, forested land, pasture, and parking areas. The refinery collects the stormwater runoff from these areas in a small pond prior to discharging through a weir structure which includes an underflow weir and excelsior fiber filters. The discharge from Outfall 005 flows down an approximately 400 feet of a steep forest bluff onto the beach before it is discharged to the Strait of Georgia.

Outfall 006 drains approximately 9.5 acres from the Rail Offloading Facility. The drainage area consists of gravel roadways, railways, and parking areas. All rail offloading activities, where active draining occurring, are conducted on a curbed concrete pad which drains to the refinery oily water sewer system. The refinery collects the stormwater runoff from these areas in a 560' x 25' x 4' deep retention pond. The pond outlet is routed through a flow control structure consisting of a bottom orifice and slotted vertical standpipe with an overflow. Outfall 006 is located at the outlet of the flow control structure downstream of the valve. The discharge from Outfall 006 travels through an approximately 1,950 feet of forest and wetlands; then commingles with offsite roadways and residential stormwater runoff; and then travels through an approximately 2,200 feet along the Slater Road ditch before it is discharged to the Strait of Georgia.

Outfall 007 drains approximately 3.6 acres from the Rail Offloading Facility. Similar to Outfall 006, the drainage area consists of gravel roadways, railways, and parking areas. All rail offloading activities, where active draining occurring, are conducted on a curbed concrete pad which drains to the refinery oily water sewer system. The refinery collects the stormwater runoff from these areas in a 200' x 60' x 4' deep retention pond. The pond outlet is routed through a flow control structure consisting of a bottom orifice and slotted vertical standpipe with an overflow. Outfall 007 is located at the outlet of the flow control structure downstream of the valve. The discharge from Outfall 007 travels through an approximately 1250 feet of forest and wetlands until leaving the refinery property. From there, the discharge comingles with offsite roadway and residential stormwater runoff and then travels through an approximately 2,200 feet along Slater Road, Beach Way, and Neptune Beach before it is discharged to the Strait of Georgia.

B. Description of the receiving water

Phillips 66 discharges treated process wastewater and stormwater from Outfall 001 to the Strait of Georgia. Other nearby point source outfalls include the BP refinery, Intalco aluminum smelter, and the Birch Bay POTW. Significant nearby non-point sources of pollutants include stormwater runoff and groundwater seeps/discharges from contaminated sites, in particular the abandoned Treoil Industries site.

The ambient background data used for this permit includes the following from Ecology's long-term core monitoring station GRG002 in the Straite of Georgia from 2015 and 2016 and the *Background Metals Concentrations in Selected Puget Sound Marine Receiving Waters* prepared by Eric Crecelius, Battelle Marine Sciences Laboratory, February 1998. Phillips 66 will conduct an updated receiving water metals study under Agreed Order No. 16820. The order requires Phillips 66 to submit a Sampling and Analysis Plan to Ecology and conduct the study during the next critical period following Ecology's approval of the plan.

Table 4 — Ambient Background Data

Parameter	Value Used
Temperature (highest annual 1-DADMax)	19.5 °C
pH (Mim / Max)	7.99 - 8.7 standard units
Salinity	30.27 mg/L as CaCO3
Ammonia	0.016 mg/L
Aluminum	45.2 mg/L
Cadmium	0.059 µg/L
Mercury	0.001 µg/L
Lead	0.146 µg/L
Copper	0.673 µg/L
Zinc	3.9 µg/L

C. Wastewater characterization

Phillips 66 reported the concentrations of pollutants in the discharge from Outfall 001 in their permit application dated September 18, 2018 and in discharge monitoring reports (DMRs.

The tabulated data represents the quality of the wastewater effluent discharged from 2016 - 2018. The wastewater effluent is characterized as follows:

Table 5 — Wastewater Characterization for Outfall 001

Parameter	Units	# of Samples	Long Term Average Value	Maximum Value
Biochemical Oxygen Demand (BOD_5)	mg/L	213	2.1	26
Total Suspended Solids (TSS)	mg/L	732	6.0	21.4
Chemical Oxygen Demand (COD)	mg/L	732	32.6	220
Ammonia (as N)	mg/L	136	0.4	13.1
Oil and Grease (O&G)	mg/L	732	1.0	3.8
Phenols, total	mg/L	111	0.023	0.958
Sulfide	mg/L	29	0.032	0.047
Fecal Coliform	CF#/100 ml	217	18	470
Antimony, Total	µg/L	4	0.2	0.4 J
Arsenic, Total	µg/L	4	7.5	15
Cyanide, Total	µg/L	4	33.1	35.2
Cadmium, Total	µg/L	4	0.013	0.03 J
Copper, Total	µg/L	4	3.5	10
Chromium, Total	µg/L	4	0.552	1.4
Lead, Total	µg/L	4	0.135	0.3 J
Mercury, Total	µg/L	4	0.0845	0.239
Nickel, Total	µg/L	4	3.8	8.2
Selenium, Total	µg/L	4	13.8	30

Parameter	Units	# of Samples	Long Term Average Value	Maximum Value
Thallium, Total	µg/L	4	0.04	0.12 J
Zinc, Total	µg/L	4	41.8	101
pH	standard units	730	5.9 mimimum	8.8 maximum
Temperature (winter) Temperature (summer)	°C °C	Continous Continous	20.1 32.6	32.2 36.1

D. Summary of compliance with previous permit Issued

The previous permit placed effluent limits on BOD5, COD, TSS, O&G, Phenol, Ammonia as N, Sulfide, Hexavalent Chromium, Fecal Coliform, and pH at Outfall 001.

Phillips 66 has consistenly complied with the effluent limits and permit conditions throughout the duration of the permit issued on March 11, 2014. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs), and on inspections.

The previous permit required monitoring of the stormwater discharges at Outfalls 002, 003, 004, 005, 006, and 007. The results of this monitoring was compared to stormwater benchmarks. Stormwater benchmarks are not limits but rather action levels that when exceeded require Phillips 66 to take actions defined in the permit. If Phillips 66 does not take the defined action, then they are in violation of the permit.

Table 6 summarizes the violations and permit triggers that occurred during the permit term. Ecology assessed the causes of each violation prior to determining whether to take a formal enforcement action. Ecology issued a penalty for a phenol maximum daily effluent limit violation on January 27, 2018. Phillips 66 had a number of exceedances of the stormwater benchmarks during the permit term. Heavy rain events mainly contributed to the exceedances. Phillips 66 actions to resolve the exceedances included conducting inspections upstream to identify the sources, installing new BMPs for source controls, and taking additional monitoring. Other violations/permit triggers are described in more detail under the enforcement section in PARIS.

Table 6 Violations/Stormwater Benchmark Exceedances

Date	Outfall	Parameter	Unit	Result	Benchmark	Limit MA	Limit DM	Violation/Permit Trigger
5/23/2014	2	Turbidity	NTU	120	25			Benchmark Exceedance
5/23/2014	2	TSS	mg/L	130	30			Benchmark Exceedance
5/23/2014	3	Turbidity	NTU	54	25			Benchmark Exceedance

Date	Outfall	Parameter	Unit	Result	Benchmark	Limit MA	Limit DM	Violation/Permit Trigger
5/23/2014	4	Turbidity	NTU	69	25			Benchmark Exceedance
5/23/2014	4	TSS	mg/L	32	30			Benchmark Exceedance
10/14/2014	2	Turbidity	NTU	26	25			Benchmark Exceedance
10/14/2014	4	Turbidity	NTU	38	25			Benchmark Exceedance
2/5/2015	4	Turbidity	NTU	54	25			Benchmark Exceedance
10/29/2015	4	TSS	mg/L	46	30			Benchmark Exceedance
10/29/2015	4	Turbidity	NTU	88	25			Benchmark Exceedance
2/1/2016	1	Sulfide	Lbs/Day	7			4.3	Numeric effluent violation
2/16/2016	4	Turbidity	NTU	44	25			Benchmark Exceedance
2/16/2016	5	Turbidity	NTU	43	25			Benchmark Exceedance
4/13/2016	2	Turbidity	NTU	39	25			Benchmark Exceedance
10/31/2016	7	Turbidity	NTU	33	25			Benchmark Exceedance
3/15/2017	1	Fecal Coliform	#/100ml	470			400	Numeric effluent violation
4/12/2017	4	Turbidity	NTU	62	25			Benchmark Exceedance
4/12/2017	5	Turbidity	NTU	26	25			Benchmark Exceedance
4/12/2017	2	Turbidity	NTU	32	25			Benchmark Exceedance
10/13/2017	7	Turbidity	NTU	69.1	25			Benchmark Exceedance
1/27/2018	1	Phenol	Lbs/Day	20.87			5.4	Numeric effluent violation
9/17/2018	6	Turbidity	NTU	33.5	25			Benchmark Exceedance
11/2/2018	7	Turbidity	NTU	65	25			Benchmark Exceedance
1/4/2019	5	Turbidity	NTU	29	25			Benchmark Exceedance
1/4/2019	7	Turbidity	NTU	39	25			Benchmark Exceedance
4/3/2019	2	Turbidity	NTU	26	25			Benchmark Exceedance
10/7/2019	6	Turbidity	NTU	40	25			Benchmark Exceedance
10/22/2019	7	Turbidity	NTU	35.7	25			Benchmark Exceedance
12/20/2019	7	Turbidity	NTU	27	25			Benchmark Exceedance
2/5/2020	7	Turbidity	NTU	29	25			Benchmark Exceedance

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

Table 7 Permit Submittals

Submittal Name	Due Date	Received Date	Review
Engineering Report	4/20/2015	4/18/2015	Complete
O&M - Review Confirmation Letter	Annually	Annually	Complete
Sediment Data Report	3/31/2019	3/15/2016	Complete
Application For Permit Renewal	10/1/2018	9/28/2018	Complete
Groundwater Monitoring Results	8/31/2014	8/20/2014	Complete
Groundwater Monitoring Results	12/29/2014	12/29/2014	Complete

Submittal Name	Due Date	Received Date	Review
Groundwater Monitoring Results	3/6/2015	3/6/2015	Complete
Groundwater Monitoring Results	5/5/2015	5/5/2015	Complete
Groundwater Monitoring Results	7/31/2015	7/31/2015	Complete
Groundwater Monitoring Results	11/30/2015	11/28/2015	Complete
Groundwater Monitoring Results	2/29/2016	1/8/2016	Complete
Groundwater Monitoring Results	5/31/2016	5/2/2016	Complete
Groundwater Monitoring Results	8/31/2016	8/31/2016	Complete
Groundwater Monitoring Results	11/30/2016	10/20/2016	Complete
Groundwater Monitoring Results	2/28/2017	1/6/2017	Complete
Groundwater Monitoring Results	5/31/2017	5/31/2017	Complete
Notice of Change in Authorization	As necessary	4/8/2016	Complete
Sediment Sampling And Analysis Plan	10/2/2014	10/2/2014	Complete
Pollution Prevention Biennial Progress Report	9/1/2017	9/1/2017	Complete
Pollution Prevention Biennial Progress Report	9/1/2019	8/5/2019	Complete
Updated Pollution Prevention Plan	10/1/2015	10/1/2015	Complete
Summary of Off-Site Dangerous Wastes	10/1/2018	11/1/2018	Complete
Treatment System Operating Plan Update	10/1/2018	9/28/2018	Complete
Outfall Evaluation Report	10/1/2018	12/26/2017	Complete

E. State Environmental Policy Act (SEPA) compliance

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

III. Proposed Permit Limits

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

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and Chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC), or the Federal Water Quality Criteria Applicable to Washington (40 CFR 131.45).

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

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.).

Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

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

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant in Phillips 66 engineering report dated August 4, 2006. The table below includes design criteria from the referenced report.

Table 8 Design Criteria for Phillips 66's Biological Wastewater Treatment System

Parameter	Design Quantity
Maximum Influent Flow to Induced Gas Floatation Unit	2380 gpm
Maximum COD Loading to MBBR Unit	1700 mg/L

Phillips 66 reported maximum influent flows to the induced gas flotation unit ranging from 660 to 1965 gpm and the daily maximum COD loading to the MBBR unit ranged from 79 to 1261 mg/l during the permit term. The refinery did not propose any material and substantial alterations to the refinery that could cause a material change in the quantity or composition of the influent processed by the wastewater treatment system during the previous permit term. The design criteria from the previous permit are retained in the proposed permit.

B. Technology-based effluent limits

Process Wastewater

In 1974, the Environmental Protection Agency (EPA) finalized the Petroleum Refining Effluent Guidelines and Standards (40 CFR Part 419) and amended the regulations in 1975, 1977, 1982, and 1985.

EPA conducted studies of the petroleum refining industry from 1992-1996, in 2004, and from 2014-2019 to determine whether revisions to the petroleum refinery guidelines were warranted.

Ecology calculated effluent limits for Phillips 66 refinery based on Best Conventional Pollutant Control Technology (BCT), Best Available Technology Economically Achievable (BAT), Best Practicable Control Technology Currently Available (BPT), and New Source Performance Standards (NSPS) developed by EPA. The guidelines were published August 12, 1985 under 40 CFR Part 419 by EPA for the cracking subcategory of petroleum refining.

The refinery effluent limitations are based on terms of a settlement agreement dated April 17, 1984, between EPA and the Natural Resources Defense Council resolving litigation about the EPA guidelines. The August 12, 1985 guidelines establish Best Available Technology (BAT) and Best Conventional Technology (BCT) as equal to Best Practicable Technology (BPT) for all parameters except phenols and chromium. Phenols and chromium are regulated by whichever guideline is more stringent.

In 1996, EPA completed a study of the petroleum refining industry (EPA-821-R-96-015) including treatment technologies, pollutants discharged, pollutant loadings, and potential water quality impacts. Based upon this review, EPA decided not to revise the refinery effluent guidelines. EPA determined that the best treatment technology currently available was essentially the same as that applied at the time the effluent guidelines were originally promulgated. EPA also determined that if the wastewater treatment systems at the refineries are properly operated and maintained, priority pollutants will be removed or treated to negligible or below detectable levels.

On December 31, 2003, EPA published its intention to review the petroleum refining industry again to decide the necessity for revising their effluent guidelines. EPA evaluated pollution prevention opportunities, emerging treatment technologies, revising the effluent guidelines, and expanding the list of regulated pollutants. EPA reviewed information and comments on several issues including: control technologies for polycyclic aromatic hydrocarbons (PAHs), dioxin sources and reduction/control technologies, sources of toxic metals, process modifications to reduce metals, and what toxics are being released and remain unreported.

On September 2, 2004 (Federal Register Volume 69 No. 170), EPA published its decision regarding revising the refinery effluent guidelines. EPA concluded that there was little evidence that PAHs were present in refinery wastewater discharges in concentrations above the detection limit. EPA also concluded that the concentration of metals being discharged by refineries is at or very near treatable levels, leaving little to no opportunity to reduce metals discharges through conventional end-of-pipe treatment.

EPA reviewed the available dioxin information collected by refineries nationwide much of which was collected at the Washington state refineries. The overall data indicated that dioxins are only occasionally discharged in relatively low concentrations in treated refinery effluent.

In EPA's opinion, this data did not warrant the development of national categorical limitations on dioxin in refinery wastewater discharges. EPA did note that on a case-by-case, best professional judgment basis, permit writers may decide to include effluent limitations for dioxin.

EPA also encouraged permit writers and refineries to consider pollution prevention opportunities. As a result of their evaluation, EPA concluded that there was no need to revise the federal effluent guidelines at this time.

In 2014, EPA initiated a new study of the petroleum refining industry to investigate concerns about increased discharges of metals due to implementation of wet air pollution controls and changes in crude oil feedstock. As part of this study, EPA also investigated discharges of dioxin and dioxin-like compounds to discern whether these pollutants were being discharged at detectible concentrations. EPA conducted extensive data collection activities during the study, including visiting 10 refineries, sending out detailed questionnaires to 21 refineries, and reviewing 80 NPDES permits.

The data EPA gathered showed that there was no impact from implementation of wet air pollution controls or changes in crude oil feedstock on the characteristics of the wastewater generated by the industry. The information EPA gathered on discharges of dioxin and dioxin-like compounds indicated that the dioxin discharges found were primarily from a single refiney that was in upset at the time they reported their effluent data.

EPA completed their study in 2019 and determined that no further action regarding the petroleum refining category was necessary at this time. Additional details about the study are provided in the Final 2019 Petroleum Refining Detailed Study Report, (September) EPA-HQ-OW-2018-0618.

Ecology requires facilities to use all known, available, and reasonable methods to control toxicants (AKART) in its wastewater as required under Washington State regulations. Because Ecology applies New Source Performance Standards (NSPS) on the basis of the AKART requirements, the refinery's NPDES permit limits are more stringent than those in other states. Ecology has applied the more stringent NSPS limits to all crude throughput increases since 1984.

Ecology must decide whether the federal effluent guidelines constitute all known, available and reasonable methods of treatment (AKART). As a general rule, if the effluent guidelines for a particular category are 5 years old or less, they are considered to be AKART. This will be immediately apparent in reviewing the development document. The development document describes production processes, pollutants generated, treatment efficiencies, and unit process designs present nationwide in the specific industry at the time of effluent guideline development.

Generally, when effluent guidelines are over 10 years old, Ecology will analyze unit process designs and efficiencies to determine that the effluent guidelines constitute AKART and meet the intent of RCW 90.48.520.

The 2002 NPDES permit required Phillips 66 to prepare a treatment efficiency study and an engineering report describing the treatment capacity of the wastewater facility. Phillips 66 also submitted an engineering report for the upgrades to the secondary wastewater treatment system.

Ecology compared Phillips 66's production processes, pollutants generated, and treatment technology to EPA's original development document and the results of EPA's 1996, 2004, and 2019 evaluations of the petroleum refining industry. Ecology also examined the treatability data base and Phillips 66's wastewater treatment design and efficiencies. Ecology determined that Phillips 66 is providing AKART for its wastewater.

The refinery's crude oil throughput rate has been slightly increased since Ecology issued the previous NPDES permit. During the previous permit term, , the refinery's highest 12 consecutive month rolling average crude throughput on a per stream day basis was 104,000 bbls/day for the period of July 2017 through June 2018. Phillips 66 anticipates being at or above this crude throughput rate during the proposed NPDES permit's term. The refinery process rate changes for the last several permits are shown below.

Table 9 Refinery Process Throughputs

Production Rates and Factors	Unit	1990 Permit	2002 Permit	2014 Permit	Proposed Permit
Actual Feed Stock	bbl/day	74,600	89,500*	103,000	104,000
Desalting	bbl/day	74,600	89,500	103,000	104,000
Atmospheric Distillation	bbl/day	74,600	89,500	103,000	104,000
Vacuum Distillation	bbl/day	29,400	42,600	52,100	40,800
Cracking	bbl/day	23,300	27,500	36,700	31,900
Catalytic Reforming **	bbl/day	12,700	15,400	17,400	18,700
Hydrotreating DHT+HDF**	bbl/day	5,100	26,700	44,000	45,900
Alkylation, bbl/day	bbl/day	0	4,200	10,000	0
Process Factor		0.74	0.74	0.88	0.74
Size Factor		1.04	1.13	1.23	1.23
Adjusted Feed Stock	bbl/day	57,400	74,840	111,487	94,661
New Source Performance Standards Increment	bbl/day		18,659	55,306	38,480

* All feedstock rates specified in this permit represent actual crude throughput less recycled oil and other recycled material.

** Baseline values for these processes are used to calculate BAT limitations for phenols and chromium.

The size and process factor determinations are documented in Appendix E. Ecology multiplied the size and process factors by the actual feedstock rate, to obtain an adjusted feedstock rate for our use in determining effluent limits, except for determining BAT limits for phenols and chromium.

Ecology applied New Sources Performance Standards to the increases in the feedstock rate above the 1984 baseline production levels on the basis of AKART. Ecology calculated these limits by multiplying the increase in adjusted feed stock, (94,661 – 56,181 = 38,480 barrels (bbls) per day) by the New Source Performance Standards (NSPS). The resulting NSPS limit increment (based upon the above calculated 38,480 bbls per day) was added to the BAT and BPT limitations (based upon the adjusted baseline feedstock rate of 56,181 bbls per day). Ecology did not include BCT limitations because they are equivalent to BPT limitations.

The EPA/NRDC settlement agreement provided separate factors for calculating phenols, total chromium, and hexavalent chromium for the BAT limitations. These calculations required feedstock rate data for additional processes including: hydrotreating, catalytic reforming, and alkylation. This information is included in the Table 9 above.

EPA determined federal effluent guidelines for total and hexavalent chromium when chromium was commonly used in cooling water systems and discharged at much higher levels in the effluent. Chromium was banned for use in cooling systems by EPA in the early 1990s and the only remaining source of chromium is in the crude oil. Because federal effluent guidelines still include limits for chromium, Ecology must include an effluent limit for chromium in the proposed permit to ensure that refineries in Washington are subject to the same requirements as refineries located in other states.

In the 2014 permit renewal, Ecology used a Best Professional Judgement (BPJ) to establish an average monthly 50 µg/L technology-based effluent limit for hexavalent chromium. At the time, Ecology believed the "federal effluent guideline-derived" limits for chromium (both total and hexavalent) were artificially high. For dischargers other than publicly owned treatment works, Ecology is allowed to establish technology-based effluent limitations on a case-by-case basis based on Best Professional Judgement (40 CFR §125.3(a)(2)). Ecology believed that a 50 µg/L technology-based effluent limit for hexavalent chromium was technologically achievable, reasonable, and protective of the receiving water quality.

When Ecology previously established the average monthly 50 µg/L hexavalent chromium limit on a BPJ basis, the "federal effluent guideline-derived" chromium limits (average monthly total chromium, max daily total chromium, and average monthly hexavalent chromium) were omitted from the permit. Ecology believes that limits based on all applicable federal effluent guidelines should be included in NPDES permits. EPA's recent 2019 study/review of the refinery effluent guidelines did not conclude that any chages were necessary.

For this reason, the "federal effluent guideline-derived" limits for average monthly total chromium, max daily total chromium, and average monthly hexavalent chromium have been included in this permit renewal.

The 50 µg/L average monthly technology-based effluent limit for hexavalent chromium remain on a BPJ basis and due to antibacksliding.

At a 1.93 MGD effluent flow (dry weather), the 50 µg/l limit converts to 0.8 lbs/day, which is greater than the federal effluent guideline BAT limit of 0.64 lbs/day. At lower effluent flows, this limit will continue to be more stringent than the federal effluent guideline BAT limit. However, at higher effluent flows, the federal effluent guideline limit will be more stringent. Therefore, the proposed permit includes both a concentration limit of 50 µg/l and a mass-based limit of 0.64 lbs/day to cover all flow situations that might occur.

If chromium levels change in the crude oil refined at Phillips 66 and result in concentration increases, Ecology will modify the permit to increase the limit as needed to allow continued facility compliance. Ecology will evaluate any revised limit to ensure that the effluent continues to meet water quality standards within the authorized mixing zone, the anti- backsliding requirements are met, and to ensure that chromium concentrations do not exceed limits allowed under the federal effluent guidelines. In the event that the federal effluent guidelines are promulgated without chromium limits, Ecology will drop the chromium limits from the permit unless the situation changes and a water quality-based limit is necessary. Phillips 66 will continue to perform total and hexavalent chromium monitoring.

The effluent limit calculations are tabulated in Appendix E. The calculated limits are based on the NSPS increment and the more stringent of the BAT and BPT determinations. BPT limitations are more stringent for phenols.

The state's antidegradation program is discussed later in this document (see Section III.C, "Surface Water Quality-Based Effluent Limits"). The federally mandated program has three tiers of protection.

The Tier II antidegradation provisions limit the conditions under which waters of higher quality than standards can be degraded. A Tier II analysis is required for new or expanded sources of pollution from specific activities regulated by Ecology. A greater than 10% increase to an existing effluent concentration or mass limit in an NPDES permit is considered an expanded action. The effective date of new or expanded actions is defined in WAC 173-201A-020 as those actions that result in an increase in pollution after July 1, 2003.

For purposes of evaluating a greater than 10 percent increase, Ecology set the baseline as those effluent limits that applied in July 2003. In this case, the baseline is the effluent limits in the NPDES permit issued to Phillips 66 on March 23, 2002.

Table 10 below compares the calculated effluent limits with the limits from the baseline permit issued in 2002.

Table 10 — Comparision of 2002 and 2021 Calculated Technology-Based Limits

Parameter	Units	Basis of Limit	2002 Average Monthly	2002 Maximum Daily	2021 Average Monthly	2021 Maximum Daily
Biochemical Oxygen Demand (5-day)	lbs/day	BPT	370	665	428	779
Chemical Oxygen Demand	lbs/day	BPT	2550	4930	2965	5754
Total Suspended Solids	lbs/day	BPT	295	460	343	542
Oil and Grease	lbs/day	BPT	110	200	126	234
Oil and Grease	mg/l		The concentration of oil and grease in the discharge shall at no time exceed 15 mg/l and shall not exceed 10 mg/l more than three days per month.	--	The concentration of oil and grease in the discharge shall at no time exceed 15 mg/l and shall not exceed 10 mg/l more than three days per month.	--
Phenolic Compounds	lbs/day	BPT & BAT	2.2	4.94	2.4	5.8
Ammonia as N	lbs/day	BPT	225	494	284	625
Sulfide	lbs/day	BPT	2.0	4.3	2.3	5.1
Hexavalent Chromium	lbs/day	BAT	0.37	0.81	0.28	0.64
Fecal Coliform	Colonies/100 mls		200	400	200	400
pH	SU		Minimum 6.0	Maximum 9.0	Minimum 6.0	Maximum 9.0

The 2021 calculated mass loading effluent limits for all parameters except hexavalent chromium, fecal coliform, and pH in Table 10 are increased more than 10 percent of the baseline limits issued in the 2002 permit.

The effluent limits in the current permit were already increased by 10% from the baseline effluent limits.

As demonstrated in the wastewater characterization and monthly discharge monitoring results, Phillips 66 has met the current effluent limits. Ecology has retained the effluent limits for Outfall 001 from the previous permit issued in 2014. The proposed limits for Outfall 001 are shown in Table 11. A Tier II analysis is not required unless Phillips 66 requests that the calculated effluent limits from Table 10 be used.

Table 11 — Proposed Effluent Limits

Parameter	Units	Monthly Average	Daily Maximum
Biochemical Oxygen Demand (5-day)	lbs/day	407	732
Chemical Oxygen Demand	lbs/day	2805	5423
Total Suspended Solids	lbs/day	325	506
Oil and Grease	lbs/day	121	220
Oil and Grease	mg/l	The concentration of oil and grease in the discharge shall at no time exceed 15 mg/l and shall not exceed 10 mg/l more than three days per month.	--
Phenolic Compounds	lbs/day	2.4	5.4
Ammonia as N	lbs/day	248	543
Sulfide	lbs/day	2.0	4.3
Chromium, Total	lbs/day	3.86	8.85
Hexavalent Chromium	lbs/day	0.28	0.05 mg/l and 0.64 lbs/day
Fecal Coliform	Colonies/ 100 mls	200	400
pH	SU	6.0 - Minimum	9.0 - Maximum

Ballast and Stormwater Allocations

Vessel personnel measure ballast water volumes offloaded from ships. The refinery pumps ballast water from the dock facilities to a tank in the wastewater treatment plant for treatment. The volume of ballast water is very small compared to process water and stormwater. The facility did not received any ballast water at the refinery during the previous permit term.

Contaminated stormwater from process areas and the wastewater treatment plant is collected in the oily water sewer system and conveyed to the wastewater treatment facility for treatment.

Contaminated stormwater is stormwater that has come in contact with raw material, intermediate product, finished product, by-product, or waste product. Stormwater from the tank farms, roads, and othere areas of the refinery is diverted into the stormwater system. The stormwater from the stormwater system is discharged into the stormwater observation channel adjacent to the stormwater pond at the wastewater treatment plant. Any oil or grease on the surface is removed by a skimmer that discharges to the oily water sewer. The water then cascades into the stormwater pond, where settling occurs. The stormwater pond discharges from an outlet located near the bottom of the pond into the final holding pond and commingles with treated process wastewater.

The total stormwater volume discharged from the refinery cannot be measured directly. Direct measurement of total stormwater is not possible since the precipitation that falls within process areas is discharged to the oily water sewer and mixed with process wastewater at many collection points throughout the refinery. Precipitation that falls onto roads and other areas outside of process areas is collected in the stormwater system. The refinery calculates stormwater flow during storm events by subtracting an estimated dry weather flow from the total flow discharged each day.

Ecology performed an average dry weather flow rate calculation using daily and monthly average flows from 2016 to 2019 for the months of June through September. The values used were from Phillips 66's DMRs for January 2016 through December 2019. Ecology calculated an average dry weather flow of 1.93 MGD to be used in the proposed permit (see Appendix F).

The ballast and stormwater allocations in the permit are based on guidelines in 40 CFR 419.12(c) and 419.22(e). The proposed permit does not include a stormwater allocation for chromium as provided for in the federal effluent guidelines because historic data shows that chromium is not present or present in very low concentrations in the stormwater.

The allocations for stormwater were developed to apply to stormwater runoff from areas associated with industrial activity. During the months of June through October, Phillips 66 may only claim the stormwater allocation when it can demonstrate that measurable rainfall has occurred at the refinery site during the previous **10** calendar days. Ecology chose ten days because when big storms hit it takes approximately that amount of time to discharge accumulated stormwater.

Phillips 66 retains stormwater within the tank dikes during rain events to the maximum extent possible and then slowly discharges it into the stormwater system following a rain event to maximize the settling that occurs through the stormwater system.

Should the on-site means of measuring rainfall be unavailable due to equipment malfunction, Phillips 66 may use rainfall data from other nearby industries or the National Weather Service station at Blaine.

Table 12 Outfall 001 Ballas Water Allocation

Parameter	Monthly Average (lbs/million gallons)	Daily Maximum (lbs/million gallons)
Biochemical Oxygen Demand (5-day)	210	400
Chemical Oxygen Demand	2000	3900
Total Suspended Solids	170	260
Oil and Grease	67	126
Phenolic Compounds	N/A	N/A

Table 13 Outfall 001 Stormwater Allocation

Parameter	Monthly Average (lbs/million gallons)	Daily Maximum (lbs/million gallons)
Biochemical Oxygen Demand (5-day)	220	400
Chemical Oxygen Demand	1500	3000
Total Suspended Solids	180	280
Oil and Grease	67	130
Phenolic Compounds	1.4	2.9

Phillips 66 claimed the stormwater allocation 5 times for TSS during the permit cycle.

Stormwater Discharge Monitoring (Outfalls 002, 003, 004, 005, 006, and 007)

Stormwater monitoring data for Outfalls 002, 003, 004, 005, 006 and 007 collected during the previous permit term are located at https://fortress.wa.gov/ecy/paris/PermitLookup.aspxare.

The facility exceeded the stormwater benchmarks 27 times from May 2014 through February 2020 (see Table 6). The parameter that most frequently exceeded the benchmarks was turbidity and TSS which usually occurred during the rainy season.

C. Surface water quality-based effluent limits

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

Numerical criteria for the protection of aquatic life and recreation

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

Numerical criteria for the protection of human health

In 1992, U.S. EPA published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State in its National Toxics Rule 40 CFR 131.36 (EPA, 1992). Ecology submitted a standards revision for 192 new human health criteria for 97 pollutants to EPA on August 1, 2016. In accordance with requirements of CWA section 303(c) (2) (B), EPA finalized 144 new and revised Washington specific human health criteria for priority pollutants, to apply to waters under Washington's jurisdiction. EPA approved 45 human health criteria as submitted by Washington. The EPA took no action on Ecology submitted criteria for arsenic, dioxin, and thallium. The existing criteria for these three pollutants remain in effect and were included in 40 CFR 131.45.

On May 13, 2020, the EPA published a rule in the federal register (85 FR 28494) to withdraw the new and revised federal human health criteria previously finalized by EPA. This withdrawal effectively approved of all but two of the revised standards that were originally submitted by Ecology on August 1, 2016. The EPA also approved Ecology's revised standards for dioxin and thallium. These changes were effective on June 12, 2020. All of the new federal human health criteria promulgated in 2016 at 40 CFR 131.45 were withdrawn with the exception of the criteria for arsenic, methyl mercury, and bis(2-chloro-1-methylethyl) ether. Ecology is appealing this action.

The criteria that are currently legally enforceable are located in WAC 173-201A-240 and 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.

Note that at the time of the creation of this fact sheet, criteria for inorganic arsenic, methyl mercury, and bis(2-chloro-2-methylethyl) ether have not yet be incorporated into WAC 173-201A-240, and instead can be found at 40 CFR 131.45.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2016) and of all marine waters (WAC 173-201A-210, 2016) in the state of Washington.

Antidegradation

Description – The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2016) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I: ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions.

Tier II: ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities.

Tier III: prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility Specific Requirements — This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in Chapter 173-201A WAC.

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

Ecology reviewed existing water quality data from Ecology's long-term monitoring station GRG002 and from Eric Crecelius (1998). The data show that the ambient water meets the temperature, dissolved oxygen, pH, turbidity, ammonia, cyanide and metals standards for marine waters extraordinary quality category given in Chapter 173-201A WAC. Therefore, Ecology uses the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

Mixing zones

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

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

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

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

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Each aquatic life *acute* criterion is based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Each aquatic life *chronic* criterion is based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two and four tenths (2.4) liters/day for drinking water (increased from two liters/day in the 2016 Water Quality Standards update).
- A one-in-one-million cancer risk for carcinogenic chemicals.

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

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

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

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

   Ecology has determined that the treatment provided at Phillips 66 meets the requirements of AKART (see Section III.B. "Technology-based Limits").

3. **Ecology must consider critical discharge conditions.**

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

   Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology uses the water depth at mean lower low water (MLLW) for marine waters. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: https://fortress.wa.gov/ecy/publications/documents/92109.pdf.

Table 14 — Critical Conditions Used to Model the Discharge at Outfall 001

Critical Condition	Value
Water depth at MLLW of 31 feet	31 feet
Density profile with a difference of 9 sigma-t units between 31 feet and the surface	
10th or 90th percentile current speeds for acute mixing zone	2.4 cm/sec

Critical Condition	Value
50th percentile current speeds for chronic and human health mixing zones	7.0 cm/sec
Maximum average monthly effluent flow for chronic and human health non-carcinogen	3.5 MGD
Annual average flow for human health carcinogen	2.4 MGD
Maximum daily flow for acute mixing zone	5.2 MGD
90th percentile maximum daily effluent temperature	32.8 °C

Ecology obtained ambient data at critical conditions in the vicinity of the outfall taken from the "Phillips 66's Mixing Zone Analysis" prepared by ANVIL Corporation in August 2006.

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

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

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

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

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

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

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics and the discharge location.

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

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

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

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

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

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

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

7. **Maximum size of mixing zone.**

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

8. Acute mixing zone.

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

Ecology determined the acute criteria will be met at 10% of the distance (231 ft) of the chronic mixing zone.

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

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

- Comply with size restrictions.

The mixing zone authorized for this discharge at Outfall 001 complies with the size restrictions published in Chapter 173-201A WAC.

9. Overlap of Mixing Zones.

This mixing zone for the discharge at Outfall 001 does not overlap another mixing zone.

D. Designated uses and surface water quality criteria

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

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

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

Marine Aquatic Life Uses and Associated Criteria

Table 15 — Extraordinary Quality

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

- To protect shellfish harvesting, fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.
- The *recreational use* is primary contact recreation. After December 31, 2020, all marine waters will be designated for primary contact recreation. This redesignation of the recreational use includes a change in the bacteria indicator from fecal coliform to enterococci and elimination of the secondary contact enterococci standard.

Table 16 Recreational Uses

Recreational Use	Criteria
Primary Contact Recreation (effective 1/1/2021)	Enterococci organism levels within an averaging period must not exceed a geometric mean of 30 CFR or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample values exist) obtained within the averaging period exceeding 110 CFU or MPN per 100 mL.

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

E. Water quality impairments

Ecology has not documented any water quality impairments in the receiving water in the vicinity of Outfall 001.

For more information on how Ecology assesses water quality data and determines if water bodies are polluted, see Water Quality Policy 1-11 at https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d/Assessmentpolicy-1-11.

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

Ecology must consider the narrative criteria described in WAC 173-201A-260 when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

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

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

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

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

With technology-based controls (AKART), predicted pollutant concentrations in the discharge at Outfall 001 exceed water quality criteria. Ecology therefore authorizes a mixing zone at Outfall 001 in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by Chapter 173-201A WAC.

Chronic Mixing Zone — WAC 173-201A-400(7)(c) specifies that mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports as measured during MLLW.

The horizontal distance of the chronic mixing zone is 231 feet. The mixing zone extends from the bottom to the top of the water column.

Acute Mixing Zone — WAC 173-201A-400(8)(b) specifies that in oceanic 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 for Outfall 001 is 23 ft. The mixing zone extends from the bottom to the top of the water column.

Ecology determined the dilution factors that occur within these zones at the critical condition using a dye study and modeling. The dilution factors for Outfall 001 are listed below in Table 16. Stormwater Outfalls 002, 003, 004, 005, 006, and 007 do not have mixing zones so the dilution factors are assumed to be 1.0 for these outfalls.

Table 17 — Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	27	94
Human Health, Carcinogen		103
Human Health, Non-carcinogen		103

Ecology determined the impacts of dissolved oxygen deficiency, pH, fecal coliform, chlorine, ammonia, metals, other toxics, and temperature for Outfall 001 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.

Dissolved Oxygen — BOD_5 and Ammonia Effects — Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand in the receiving water.

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

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

Fecal Coliform — In the previous permit cycle, Ecology modeled the number of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 mL and a dilution factor of 94. That analysis showed no violation of the fecal coliform water quality criterion under critical conditions.

The changes to the State's surface water quality criteria for bacteria did not affect the domestic technology based limits for fecal coliform in WAC 173-221. Without a site specific correlation between fecal coliform and Enterococci, Ecology cannot determine whether the discharge will violate the water quality criterion for Enterococci. Given that the characteristics of the receiving water and the discharge have not changed substantially since the analysis conducted in the previous permit cycle, the proposed permit will maintain the technology-based effluent limit for fecal coliform. In addition, the permittee will be required to monitor for both fecal coliform and Enterococci to develop a site specific correlation. Ecology will use this data to assess the reasonable potential to exceed the applicable water quality criterion in the next iteration of the permit. Per Agreed Order #21604, Phillips 66 had installed a disinfection system for fecal coliform treatment.

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 were detectd in the discharge at Outfall 001: ammonia, arsenic, cadmium, chromium, copper, cyanide, lead, manganese, mercury, nickel, nitrate/nitrite, phenol, selenium, sulfide, thallium, and zinc. Ecology conducted a reasonable potential analysis for these parameters to determine whether it would require effluent limits in this permit (see Appendix G).

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature, pH, and salinity of the receiving marine water. To evaluate ammonia toxicity, Ecology used the available receiving water information for ambient station GRG002 and Ecology spreadsheet tools.

Valid ambient background data were available for copper, lead, mercury, nickel, selenium, and zinc. Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards.

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

Temperature--The state temperature standards for marine waters (WAC 173-201A-210) include multiple elements:

- Annual 1-Day maximum criteria
- Incremental warming restrictions
- Protections against acute effects

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

- Annual 1-Day maximum criteria

  Each marine water body has an annual maximum temperature criterion [WAC 173-201A-210(1)(c)(i)-(ii) and WAC 173-201A-612]. These threshold criteria (e.g., 13, 16, 19, 22°C) protect specific categories of aquatic life by controlling the effect of human actions on water column temperatures. The threshold criteria apply at the edge of the chronic mixing zone. Criteria for marine waters and some fresh waters are expressed at the highest 1-Day annual maximum temperature (1-DMax). Ecology concludes that there is no reasonable potential to exceed the temperature standard when the mixture of ambient water and effluent at the edge of the chronic mixing zone is less than the criteria of 13°C.

- Incremental warming criteria

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

  At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment (T_i), calculated as:

$$T_i = \frac{12}{(T_{amb} - 2)}$$

  This increment is permitted only to the extent doing so does not cause temperatures to exceed the annual maximum 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 to address documented temperature impairments, 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 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
  1. Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C; unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.
  2. 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.
  3. Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

Reasonable Potential Analysis

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

(Teffluent95 – Criterion)/DF < 0.3.

Teffluent95 = 1DMax temperature of the effluent for conservative

DF = chronic dilution factor

A temperature difference of less than 0.3°C at the edge of the mixing zone is lower than the definition of a "measurable change" as defined in WAC 173-201A-320(3).

(36.1°C - 13°C)/94 = 0.25°C

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

Stormwater Outfalls 002, 003, 004, 005, 006, and 007

The toxic pollutants, copper and zinc, are present in the stormwater discharges at Outfalls 002, 003, 004, 005, 006, and 007.

Ecology used the marine acute aquatic life water quality criteria in the reasonable potential analysis of copper and zinc at the stormwater outfalls. The reasonable potential analysis compares values in the stormwater discharge to acute aquatic life criteria, not chronic aquatic life criteria. The effects of stormwater runoff on a receiving water are typically of a short duration.

Most acute water quality criteria are based on a 1-hour to 24-hour exposure time period whereas chronic water quality criteria are primarily based on a 4-day (96-hour) exposure period. Based on weather events in western Washington, exposure time periods that are 24-hour and less are considered to have potential acute effects.

Table C-2 in Appendix C of the Ecology's Permit Writer's Manual shows the aquatic life criteria durations for marine discharges for copper and zinc. The durations for chronic criteria for copper and zinc are 4-day exposure time periods therefore the chronic criteria was not evaluated in the reasonable potential analysis.

Using the monitoring data from 2014 to 2022, Ecology conducted a reasonable potential analysis of these parameters for marine water acute aquatic life water quality criteria. Phillips 66 must meet surface water quality standards at the end of pipe (without dilution) because the facility does not have an authorized mixing zone for stormwater discharges. Ecology determined that zinc poses no reasonable potential to exceed the marine acute aquatic life water quality criteria at all stormwater outfalls. Ecology determined that copper poses a reasonable potential to exceed the marine acute aquatic life water quality criteria at stormwater Outfalls 004, 006, and 007; however, based on the configuration of the stormwater outfalls, this reasonable potential analysis may not accurately reflect the actual discharge of pollutants to surface water and the impact on the environment.

The discharge from Outfalls 004 travels an approximately 450 feet of a steep forest bluff onto the beach before it is discharged to the Strait of Georgia.

The discharge from Outfall 006 travels through an approximately 1,950 feet of forest and wetlands; then commingles with offsite roadways and residential stormwater runoff; and then travels through an approximately 2,200 feet along the Slater Road ditch before it is discharged to the Strait of Georgia.

The discharge from Outfall 007 travels through an approximately 1250 feet of forest and wetlands until leaving the refinery property. From there, the discharge comingles with offsite roadway and residential stormwater runoff and then travels through an approximately 2,200 feet along Slater Road, Beach Way, and Neptune Beach before it is discharged to the Strait of Georgia.

The copper pollutant could be removed through physical, biological, and chemical processes as traveling through forest and wetlands. Based on this, Ecology has determined that the development of numeric stormwater limits are infeasible. Per 40 CFR 122.44(k)(3), Ecology has included non-numeric stormwater limits in this permit (in the form of benchmarks, corrective actions for benchmark exceedances, and BMPs). Ecology proposes to increase the copper monitoring frequency from quarterly to monthly and requires an AKART Analysis and Engineering Report for Outfalls 004, 006, and 007. Ecology will use the results from the AKART Analysis and Engineering Report to re-evaluate reasonable potential and establish numeric limits in the next permit cycle.

Ecology continues to impose the stormwater benchmarks as action level triggers for turbidity, O&G, pH, copper, and zinc at Outfalls 002, 003, 004, 005, 006, and 007.

H. Human health

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

Ecology determined that the effluent at Outfall 001 may contain chemicals of concern for human health, based on data or information indicating the discharge contains regulated chemicals that Ecology knows or expects is present in the discharge.

Ecology evaluated the discharge's potential to violate the water quality standards as required by 40 CFR 122.44(d) by following the procedures published in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001) and Ecology's Permit Writer's Manual to make a reasonable potential determination. The evaluation showed that the discharge at Ouftall 001 has no reasonable potential to cause a violation of human health-based water quality standards and effluent limits are not needed. See Appendix G.

Dioxin

Dioxins have been found in some Canadian and California refinery effluents. The dioxins were traced to an internal waste stream from the regeneration of catalytic reformer units. Periodic regeneration of the catalyst in these units is required to burn off coke and restore catalyst activity. Catalyst regeneration is know to produce dioxins and furans in the regeneration wash water.

The design of the Ferndale Refinery catalytic reformer unit is generically referred to as a "cyclic reformer". It is an Exxon licensed unit that has five reactors which contain the catalyst used in the reforming process. Four of the reactors are in oil operation at any given time with the fifth reactor off line for regeneration. Unlike other catalytic reformer designs, the Ferndale Refinery's unit does not incorporate any kind of water and/or caustic wash as part of the regeneration. In other units, the water/caustic wash is used to cool and neutralize the circulating regeneration gas.

The Ferndale Refinery's regeneration circuit was designed and built to withstand the high temperatures and corrosive nature of the regeneration process. There is no liquid waste stream leaving the regeneration circuit. The only discharge from the regeneration process is venting of excess regeneration gases to the atmosphere.

Dioxins and furans have not been detected in Phillips 66's final effluent.

I. Sediment quality

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

The refinery submitted a final Sediment Sampling and Analysis report dated on November 14, 2019. The results of the bioassay testing passed comparison with the Sediment Management Standards (SMS), therefore follow-up chemical analysis was not performed during the previous permit cycle. Per the Sediment Management Standards, sediment bioassay results override chemical results [WAC 173-204-310(2)]. The refinery also classified as having a low discharge volume with an average of 2.2 MGD. The refinery is not required to conduct a sediment monitoring for this permit cycle but will be required for next permit cycle.

J. Groundwater quality limits

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

All of the ponds in Phillips 66's wastewater treatment system have native clay bottoms and could potentially discharge to ground water. Based on an analysis of the water in these ponds, it has been determined that there is a potential for an impact to groundwater beneath the ponds. Phillips 66 installed groundwater monitoring wells around the basins. Appendix I shows the sampling results from the water in the basins and the wells.

The groundwater monitoring data was compared to risked-based MTCA groundwater criteria (WAC 173-340) and the Groundwater Quality Standards (WAC 173-200-040). Constituents detected above these standards included Total Dissolved Solids (TDS), arsenic, iron, manganese, and several semi-volatile organics. The arsenic and semi-volatile results are questionable because the detected concentrations were not confirmed in re-sampling the wells. Manganese and iron are common constituents in groundwater. TDS, manganese, and iron are not considered to be toxic but are listed by EPA as secondary (aesthetic) parameters, affecting the appearance and taste of the groundwater.

On January 24, 2017, Phillips 66 Ferndale Refinery (Phillips 66) submitted a letter to Ecology petitioning to reduce the frequency of groundwater monitoring from quarterly to semi-annually and to remove benzo(a)pyrene (B(a)P) from the list of constituents monitored.

Ecology reviewed Phillips 66's groundwater sampling data for the last ten consecutive quarters, since May 2014. The data shows that the concentrations of most constituents in the groundwater remained relatively stable throughout the ten quarters of sampling. B(a)P was not detected in any monitoring wells during this timeframe. Ecology determined that Phillips 66 qualifies for a reduction in groundwater monitoring frequency from quarterly to semi-annually (beginning June 2017) and a change to the list of constituents monitored. Phillips 66 continues to monitor groundwater semi-annually but will no longer monitors for B(a)P in the proposed permit.

K. Whole effluent toxicity

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

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

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate an NOEC, LC50, EC50, IC25, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (https://fortress.wa.gov/ecy/publications/documents/9580.pdf), which is referenced in the permit. Ecology recommends that Phillips 66 send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

Acute toxicity testing conducted during the previous permit term showed the facility's effluent has a reasonable potential to cause acute toxicity in the receiving water. The acute toxicity test was performed using 100% effluent, the acute critical effluent concentration (ACEC) 3.7%, and a control. The proposed permit will include an acute toxicity limit. **The effluent limit for acute toxicity is: No acute toxicity detected in a test sample representing the acute critical effluent concentration (ACEC) of 3.7%.** The acute critical effluent concentration (ACEC) is the concentration of effluent at the boundary of the acute mixing zone during critical conditions.

Compliance with an acute toxicity limit is measured by an acute toxicity test comparing test organism survival in the ACEC (using a sample of effluent diluted to equal the ACEC) to survival in nontoxic control water. Phillips 66 is in compliance with the acute toxicity limit if there is no statistically significant difference in test organism survival between the ACEC sample and the control sample.

Chronic toxicity testing conducted during the previous permit term showed a reasonable potential for the effluent to cause chronic toxicity in the receiving water.

The chronic toxicity test was performed using 100% effluent, the chronic critical effluent concentration (CCEC) 1.1%, and a control. The proposed permit will continue to include a chronic toxicity limit. **The effluent limit for chronic toxicity is: No toxicity detected in a test sample representing the chronic critical effluent concentration (CCEC) of 1.1%**. The CCEC is the concentration of effluent at the boundary of the mixing zone during critical conditions.

Compliance with a chronic toxicity limit is measured by a chronic toxicity test comparing the test organism response in effluent diluted to the CCEC, to test organism response in nontoxic control water. Phillips 66 is in compliance with the chronic toxicity limit if there is no statistically significant difference in test organism response between the CCEC sample and the control sample.

See Appendix J for a summary of the WET tests conducted during the last permit cycle.

Cherry Point Herring

The Pacific herring, *Clupea pallasi*, stock which spawns near Cherry Point was once the largest in Washington. The stock has dramatically declined in abundance in the last 45 years and remains at critically low levels. Cherry Point herring once had a spawning biomass equal to that of all other herring stocks in the state combined. The Cherry Point stock size has declined from 13,606 tons in 1973 to only 468 tons in 2016.

Although much of the decline may be due to natural factors (e.g., temperature increases, predation, disease, and a lack of food source), point and non-point sources of pollution may also be potential stressors. There was concern that pollutants in the discharges from the refineries and other industry in the Cherry Point area were contributing to the decline. Pacific herring are an important forage fish species in Puget Sound that spawn along shorelines potentially impacted by human activities. Petroleum hydrocarbons have been shown to be toxic to herring. However, there was not a definitive method to evaluate the impact of industry effluent on herring.

In response to these concerns, Ecology, academic and private entities worked together to develop and validate a suite of herring toxicity tests to evaluate the possible effects of industry effluent on herring. This effort produced methods for a 96-hour herring acute survival test, a herring embryo survival and development test, and a herring larval 7-day survival and growth test. Ecology declared the three herring tests ready for regulatory use in November 2005. However, the new tests were not approved for compliance monitoring or effluent characterization.

Once the herring protocols were developed, Ecology’s goal was to compare them to EPA standard test methods to find surrogate species for each of the tests. Then the EPA tests could be included in future permits in lieu of the herring tests. Ecology wants to get away from testing with herring because the test organisms are not commercially available, they are only available seasonally, and they are difficult to obtain. This limited availability is not reliable enough for routine effluent monitoring.

In addition, the herring protocols have not been approved for use in compliance testing. Ecology's hope was that in comparing the responses of herring toxicity tests to standard EPA toxicity tests might find an EPA test that was as sensitive as a herring test.

Acute Testing

In April 2006, Ecology issued a joint agreed order (Agreed Order No. 3192) to the BP Cherry Point Refinery, ConocoPhillips (Phillips 66) Ferndale Refinery, Shell Puget Sound Refinery, Tesoro Anacortes Refinery, and the Intalco Ferndale aluminum smelter requiring them to conduct herring larval acute toxicity testing. Under the agreed order, the industries tested split samples for acute toxicity (96-hour survival) to herring, topsmelt, and fathead minnow.

Ecology concluded that the EPA standard acute survival tests for topsmelt and fathead minnow are adequately protective of Pacific herring. In the majority of the tests conducted under Agreed Order No. 3192, refinery effluent showed no toxicity to any fish, resulting in equal sensitivity between herring and the other fish species. When there was toxicity, topsmelt were more sensitive twice as often as herring and fathead minnow were always more sensitive than herring.

Chronic Testing

In October 2013, Ecology signed individual agreed orders with BP, Phillips 66, Shell, Tesoro, and Intalco (Agreed Order Nos. 10296-10300, respectively) to conduct studies comparing the relative sensitivity of Pacific herring and standard EPA toxicity test species to the industries' effluents. The goal of the side-by-side testing was to determine if an EPA-approved WET test method would be a suitable surrogate for predicting herring toxicity. The herring tests were compared to a panel of EPA established toxicity tests (herring embryo survival and development to echinoderm (sea urchin) embryo; herring larval survival and growth to topsmelt, silverside minnow, and mysid shrimp larval).

In the situation where a herring test was shown to be more sensitive than comparable EPA tests, Ecology's intent was to define a correlation between the EPA standard tests and herring tests. The ratio of sensitivity could be used to adjust the ACEC and CCEC. This translator could be used in conjunction with an EPA test in future monitoring to assess the potential toxicity of an industry's effluent to herring.

Ecology concluded that the EPA echinoderm (sea urchin) embryo survival and development test is adequately protective of the Pacific herring embryo. The herring larval survival and growth test was shown to be more sensitive than the EPA tests to effluent from BP, Shell, and Tesoro. Ecology concluded that the EPA survival and growth test for mysid shrimp is adequately sensitive for protecting herring from effluent from Phillips 66 and Intalco.

Future WET Testing

The EPA topsmelt acute survival test, EPA echinoderm (sea urchin) chronic embryo test, and EPA mysid shrimp chronic larval test were shown to be more sensitive than the comparable herring tests. These tests are included in Phillips 66's draft NPDES permit renewal.

L. Comparison of proposed effluent limits with the previous permit limits

Ecology evaluated Phillip 66's monitoring results from the last permit term and determined that Phillips 66 can achieve the effluent limits at Outfall 001 from the previous permit. The proposed permit retains the limits for all parameter from the previous permit, except for Hexavalent Chromium.

Table 18 Comparison of Previous and Proposed Effluent Limits for Outfall 001

Parameter	Units	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Biochemical Oxygen Demand (5-day)	lbs/day	407	732	407	732
Chemical Oxygen Demand	lbs/day	2805	5423	2805	5423
Total Suspended Solids	lbs/day	325	506	325	506
Oil and Grease	lbs/day	121	220	121	220
Phenolic Compounds	lbs/day	2.4	5.4	2.4	5.4
Ammonia as N	lbs/day	248	543	248	543
Sulfide	lbs/day	2	4.3	2	4.3
Chromium, Total	lbs/day	--	--	3.86	8.85
Hexavalent Chromium		--	0.05 mg/l and 0.85 lbs/day	0.28	0.05 mg/l and 0.64 lbs/day
Fecal Coliform	Cfu/100 mls	200	400	200	400
pH	SU	6.0 Mininum	9.0 Maximum	6.0 Minimum	9.0 Maximum

IV. Monitoring Requirements

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

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects.

When a facility uses an alternative method as allowed by the permit, it must report the test method, detection level (DL), and quantitation level (QL) on the discharge monitoring report or in the required report.

A. Wastewater and stormwater monitoring

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

Ecology is requiring monitoring of both fecal coliform and Enterococci in the proposed permit. This dual monitoring will help Ecology to establish a site-specific correlation between the two bacterial indicators.

In addition to the parameters with limits, the proposed permit requires Phillips 66 to monitor the final effluent at Outfall 001 for priority pollutants to further characterize the effluent. Ecology will use this data to determine reasonable potential for exceeding water quality standards at the next permit renewal.

The proposed permit requires Phillips 66 to collect and report information in the monthly DMR about parameters that do not have limits established in the permit. Phillips 66 provides data on crude feedstock rates so that Ecology can calculate technology-based discharge limits in the next permit. Phillips 66 reports ballast water flow rate and the total final effluent flow rate to calculate ballast and stormwater allocations for several parameters. Phillips 66 also reports precipitation and temperature data. Ecology uses rainfall data to determine if the refinery can use the stormwater allocation. Ecology will use the temperature data to evaluate compliance with water quality standards in the receiving water.

The proposed permit also includes new monitoring for nutrients (particulate organic carbon, total organic carbon, dissolved organic carbon, ammonia as N, nitrate as N, nitrite as N, Total Kjeldahl Nitrogen filtered and unfiltered, total phosphorus filtered and unfiltered, soluble reactive phosphorus, carbonaceous biochemical oxygen demand five-day, and alkalinity) to accurately quantify the nutrients in the discharge at Outfall 001. This data will support the work of the Puget Sound Nutrient Reduction Project to evaluate dissolved oxygen impacts in the receiving water. Excess nutrients in the form of nitrogen and carbon can lead to low dissolved oxygen in Puget Sound which negatively affect aquatic life. Monitoring data is necessary to evaluate individual sources of anthropogenic nutrients for both near field and far field effects. Ecology intends to use this discharge data in both the Salish Sea Model and in future reasonable potential evaluations.

The proposed permit requires Phillips 66 to monitor the stormwater discharges at Outfalls 002, 003, 004, 005, 006, and 007 to compare to stormwater benchmarks. The monitoring includes sampling for hardness in the receiving water to help Ecology calculate the applicable water quality standards for these parameters.

Stormwater benchmarks are not water quality standards or permit limits. They are indicator values. Values at or below the benchmark are considered unlikely to cause a water quality violation.

The proposed permit also includes standard language regarding general prohibitions for stormwater associated with industrial activity and requires corrective actions in response to monitoring results above benchmark values.

Puget Sound Water Quality Management Plan

The Puget Sound Water Quality Management Plan (PSWQA Plan) of 2000 presents goals, strategies, and work elements to improve and protect the quality of Puget Sound (Puget Sound Water Quality Authority 2000).

The PSWQA Plan requires that Ecology consider the need for the following five types of monitoring when reissuing NPDES permits and include this monitoring as appropriate:

- Sediments in the vicinity of every significant outfall.
- Particulate fraction of the effluent from each significant outfall.
- Acute and chronic toxicity bioassays on the effluent and sediments near the outfall.
- Biota surveys in the vicinity of each significant outfall.
- Water quality at the boundary of the mixing zone.

Sediments in the vicinity of every significant outfall: In this case, Ecology considered Outfall 001 as the only significant outfall to Puget Sound. See Section III.I, “Sediment Quality” for more information describing Phillips 66’s most recent receiving water sediment sampling in 2019 and the proposed permit requirements.

Particulate fraction of the effluent: Phillips 66 and Ecology have conducted TSS sampling of the effluent at Outfall 001.

Acute and chronic toxicity of the effluent and sediments near the Outfall 001: Phillips 66 performs WET testing on the effluent at Outfall 001. See Section III.K, “Whole Effluent Toxicity” for more information on Phillips 66’s WET testing.

Biota surveys in the vicinity of each significant outfall: See Section III.I, “Sediment Quality”for more information describing Phillips 66’s most recent receiving water sediment sampling in 2019 and the proposed permit requirements.

Water quality at the boundary of the mixing zone: Phillips 66 routinely monitors the effluent at Outfall 001 for toxics pollutants. Phillips 66 has conducted mixing zone modeling which was used in evaluating water quality at the boundaries of the acute and chronic mixing zones. As shown in Appendix G, no reasonable potential exists at the boundaries of the mixing zones for Outfall 001 for parameters monitored in Phillips 66’s effluent.

Ecology believes that the effluent limits and monitoring requirements in the proposed permit are protective of the receiving water. Ecology will continue to evaluate Phillips 66's discharges as additional monitoring and information is available.

B. Monitoring reduction for exemplary performance

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

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

Appendix K summarizes the performance of the parameters monitored at Outfall 001 during the last permit term. The table in Appendix K compares the long term averages with the month average effluent limits from April 2014 through November 2020.

The guidance in Ecology's Permit Writer's Manual was used to evaluate the performance to determine if a parameter was eligible for reduced monitoring. For the parameters evaluated, Phillips 66's monitoring history has demonstrated the ability to consistently comply with regulatory limits. Ecology based the proposed monitoring frequencies on the guidance recommendations and best professional judgment.

Ecology elected to maintain the current monitoring frequencies for TSS, oil and grease, fecal coliform, phenolic compounds, and sulfide even though EPA's guidance would have allowed less frequent monitoring for these parameters. TSS, and oil and grease are good indicators of when there is an upset condition at the wastewater treatment facility. Ecology reduced the frequency of monitoring for BOD, COD, ammonia, and hexavalent chromium.

Ecology used best professional judgment to determine a reduced monitoring frequency to reward Phillips 66's good performance but also provide enough data to monitor the health of the wastewater treatment process. Phillips 66 must maintain good performance levels to continue to receive the reduced monitoring frequencies. If the facility's performance levels deteriorate, Ecology can require Phillips 66 to revert to the previous levels.

C. 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). Accreditation is required to be updated every year. Ecology has accredited the laboratory at this facility for: BOD5, COD, TSS, O&G, sulfide, phenols, ammonia, pH, and the hexane extractable method. Phillips 66 uses off-site accredited laboratories to analyze samples for priority pollutants and bioassay samples.

To find an accredited laboratory, visit https://fortress.wa.gov/ecy/laboratorysearch/

D. Effluent limits which are near detection or quantitation levels

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

V. Other Permit Conditions

A. Reporting and record keeping

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

B. Non routine and unanticipated wastewater

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

When Phillips 66 reconditions petroleum storage tanks, it thoroughly cleans and inspects them. The final step in the inspection is the hydrotest, which consists of filling the tank with clean water and monitoring the water level in the tank over time to see if any leakage has occurred. Discharging the hydrotest water to the wastewater treatment system reduces the efficiency of the treatment since the clean water dilutes the process water. Phillips 66 also tests its fire water system.

Phillips 66 may request to discharge this wastewater through stormwater outfalls, such as when its wastewater system is experiencing heavy hydraulic loadings or when local wildlife managers request water to keep local streams or ponds viable for habitat during very dry summer conditions. The permit authorizes the discharge of non-routine and unanticipated wastewater under certain conditions. The facility must characterize these waste waters for pollutants and examine the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and on any opportunities for reuse, Ecology may:

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

C. Mixing Zone Study

Ecology estimated the amount of mixing of the discharge with receiving water and the potential for the mixture to violate the water quality standards for surface waters at the edge of the mixing zone (chapter 173-201A WAC). Phillips 66 conducted the last mixing zone study in 2006. The data (flow, diffuser, ambient background, and effluent temperature) from the current permit were similar to the data used in the previous mixing zone study. Phillips-66 is not required to conduct the mixing zone study in the proposed permit.

D. Outfall evaluation

Phillips 66 conducted the final effluent Outfall 001 evaluation in 2017. The purpose of the evaluation was to determine the condition of the discharge pipe and diffusers and to document its integrity and continued function. Phillips 66 reported that the outfall structure is performing as designed.

The proposed permit requires Phillips 66 to conduct an outfall inspection and submit a report detailing the findings of that inspection (Special Condition S.10). The inspection must evaluate the physical condition of the discharge pipe and diffusers, and evaluate the extent of sediment accumulations in the vicinity of the outfall.

E. Operation and maintenance manual

Ecology requires industries to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state and federal regulations [40 CFR 122.41(e) and WAC 173-220-150 (1)(g)]. Phillips 66 has prepared and submitted an operation and maintenance manual as required by state regulation for the construction of wastewater treatment facilities (WAC 173-240-150). Implementation of the procedures in the operation and maintenance manual ensures the facility's compliance with the terms and limits in the permit.

F. Pollution prevention plan

The previous permit required Phillips 66 to submit and follow a NPDES Pollution Prevention Plan (PPP) to identify opportunities to prevent, reduce, eliminate, or control releases of pollutants to influent wastewater streams, stormwater, and other waters of the state. The previous permit required BP to implement pollution prevention opportunities that were technically and economically feasible. The PPP incorporates previous NPDES permit requirements for a spill plan, solid waste handling and disposal plan, and a stormwater pollution prevention plan.

The refinery 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 and follow best management practices to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080]. Phillips 66's PPP includes BMPs for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs.

Phillips 66 could cause pollution of the waters of the state through inappropriate disposal of solid waste or through the release of leachate from solid waste. The proposed permit requires the refinery to update the BMPs in the PPP to prevent solid waste from causing pollution of waters of the state.

The following are projects completed by Phillips 66 during the previous permit cycle that had a positive impact on wastewater treatment plant operations and provide protection to the receiving waters:

- Rerouted blowndown overflow from Outfall 002 to oily water sewer.
- Relocated wastewater treatment plant stormwater outfall to inlet cell of catchment basin.
- Rerouted Phenolic Sewer Lift Station Bypass to API inlet.
- Added closed-loop sampling where beneficial.
- Constructed the Moving Bed Biofilm Reactor unit to replace the former Trickling Filter unit.
- Constructed the new Activated Sludge System.
- Constructed railcar unloading station.

In addition to the operational changes helped reduce pollutants from entering the waste water stream, Phillips 66 also includes pollution prevention elements in its ongoing employee awareness and training at the facility.

The proposed permit includes a pollution prevention requirement to follow-up on the work done by the refinery in the previous permit cycle. It includes a requirement to:

- Continue to follow and update BMPs, SOPs, and other work practices to prevent or minimize the release of pollutants to the wastewater treatment system, stormwater, and waters of the state.
- Submit an update to the current PPP.
- Submit a biennial evaluation of the PPP.
- Conduct stormwater inspections to ensure the adequacy of BMPs and to identify any unknown improper discharges to stormwater.

- Continue to identify and evaluate pollution prevention opportunities in all decisions having environmental consequences.

Stomwater Pollution Prevention

Ecology has determined that Phillips 66 must update their PPP and implement adequate BMPs in order to meet the requirements of AKART for stormwater discharges. Phillips must identify potential sources of stormwater contamination from industrial activities in the PPP and identify how it plans to manage those sources of contamination to prevent or minimize contamination of stormwater. Phillips must continuously review and revise the PPP as necessary to assure that stormwater discharges do not degrade water quality.

Best Management Practices (BMPs)

BMPs are the actions identified in Phillips 66's PPP to manage, prevent contamination of, and treat stormwater. BMPs include 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 also include treatment systems, operating procedures, and practices used to control plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage. Phillips 66 must ensure that its PPP includes the operational and structural source control BMPs listed as "applicable" in Ecology's stormwater management manuals. Many of these "applicable" BMPs are sector-specific or activity-specific, and are not required at facilities engaged in other industrial sectors or activities.

Ecology-Approved Stormwater Management Manuals

Consistent with RCW 90.48.555 (5) and (6), the proposed permit requires the facility to implement BMPs contained in the *Stormwater Management Manual for Western Washington* (SWMMWW, 2012 edition as admended in December 2014), or any revisions thereof, or practices that are demonstrably equivalent to practices contained in stormwater technical manuals approved by Ecology. The manual can be found at https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals.

This should ensure that BMPs will prevent violations of state water quality standards, and satisfy the state AKART requirements and the federal technology-based treatment requirements under 40 CFR Part 125.3. Phillips 66's PPP must document that the BMPs selected provide an equivalent level of pollution prevention, compared to the applicable Stormwater Management Manuals, including: the technical basis for the selection for all stormwater BMPs (scientific, technical studies, and/or modeling) which support the performance claims for the BMPs selected and an assessment of how the BMPs will satisfy AKART requirements and the applicable technology-based treatment requirements under 40 CFR Part 125.3.

Operational Source Control BMPs

Operational source control BMPs include a schedule of activities, prohibition of practices, maintenance procedures, employee training, good housekeeping, and other managerial practices to prevent or reduce the pollution of waters of the state. These activities do not require construction of pollution control devices but are very important components of a successful stormwater pollution prevention. Employee training, for instance, is critical to achieving timely and consistent spill response.

Pollution prevention is likely to fail if the employees do not understand the importance and objectives of BMPs. Prohibitions might include eliminating outdoor repair work on equipment and certainly would include the elimination of intentional draining of crankcase oil on the ground. Good housekeeping and maintenance schedules help prevent incidents that could result in the release of pollutants. Operational BMPs represent a cost-effective way to control pollutants and protect the environment. Philliips 66's PPP must identify all the operational BMPs and how and where they are implemented. For example, the PPP must identify what training will consist of, when training will take place, and who is responsible to assure that employee training happens.

Structural Source Control BMPs

Structural source control BMPs include physical, structural, or mechanical devices or facilities intended to prevent pollutants from entering stormwater. Examples of source control BMPs include erosion control practices, maintenance of stormwater facilities (e.g., cleaning out sediment traps), construction of roofs over storage and working areas, and direction of equipment wash water and similar discharges to the sanitary sewer or a dead end sump. Structural source control BMPs likely include a capital investment but are cost effective compared to cleaning up pollutants after they have entered stormwater.

Treatment BMPs

Operational and structural source control BMPs are designed to prevent pollutants from entering stormwater. However, even with an aggressive and successful program, stormwater may still require treatment to achieve compliance with water quality standards. Treatment BMPs remove pollutants from stormwater. Examples of treatment BMPs are detention ponds, oil/water separators, biofiltration, and constructed wetlands.

Volume/Flow Control BMPs

Ecology recognizes the need to include specific BMP requirements for stormwater runoff quantity control to protect beneficial water uses, including fish habitat.

New facilities and existing facilities undergoing redevelopment must implement the requirements for peak runoff rate and volume control identified by Volume 1 of the *SWMMWW* as applicable to their development.

Chapter 3 of Volume 3 *SWMMWW* lists BMPs to accomplish rate and volume control. Existing facilities in western Washington should also review the requirements of Volume 1 (Minimum Technical Requirements) and Chapter 3 of Volume 3 in the *SWMMWW*. Although not required to implement these BMPs, controlling rate and volume of stormwater discharge maintains the health of the watershed. Existing facilities should identify control measures that they can implement over time to reduce the impact of uncontrolled release of stormwater.

G. Construction Stormwater

The proposed permit authorizes the discharge of stormwater associated with construction activity and construction support activity from Outfalls 002, 003, 004, 005, 006 and 007 subject to a number of requirements and limitations. Construction activity refers to the clearing, grading, excavation, and other land disturbing activities which result in the disturbance of one or more acres. Construction support activity includes equipment staging yards, material storage areas, borrow areas, etc.

The permit states that stormwater discharges must comply with water quality standards. Ecology presumes that discharges are in compliance with water quality standards if the Permittee is in compliance with permit conditions, unless site-specific information shows otherwise.

The proposed permit establishes a narrative technology-based effluent limitation of AKART for construction stormwater. AKART specifically includes the preparation and implementation of an adequate Construction Stormwater Pollution Prevention Plan (CSWPPP) with all appropriate BMPs installed and maintained in accordance with the CSWPPP and the terms and conditions of the permit.

The permit includes an enforceable adaptive management approach for construction stormwater that includes benchmarks. A turbidity benchmark is included in the permit because it is an effective management tool for highly variable stormwater discharges. A benchmark is not a water quality standard or a numeric effluent limit. It is an indicator value used to determine the effectiveness of BMPs onsite. Meeting the benchmark established in the proposed permit in no way precludes the requirement for discharges to be in compliance with applicable permit conditions and water quality standards. If the benchmark is exceeded, the Permittee is required to take appropriate actions to identify and correct the problems causing the exceedance.

The proposed permit also includes monitoring and reporting requirements.

H. Dangerous Wastes – Permit by Rule Requirements

The proposed permit authorizes Phillips 66 to treat dangerous wastes, generated on or off-site, at the wastewater treatment facility under the permit by rule provisions of Chapter WAC 173-303-802(5). This authorization is limited to the onsite and off-site waste streams identified on the permit application and application amendments as approved by Ecology.

Wastes received from off-site include ballast water and retail distribution water. Ecology determined that the waste streams from off-site are similar in nature to those generated on-site and concluded that Phillips 66's wastewater treatment facility should effectively treat them.

Effluent sampling and monitoring requirements established in the permit should adequately address the pollutants in the waste stream. Permit-by-rule provisions cover the identified waste streams as long as Phillips 66 complies with the conditions of the NPDES permit and with the following dangerous waste requirements in WAC 173-303, as required by WAC 173-303-802(5)(a), pertaining to:

- Notification and identification numbers
- Designation of dangerous wastes
- Performance standards
- General waste analysis
- Security
- Contingency plans and emergency procedures
- Emergencies
- Manifest system
- Operating record
- Facility reporting

I. Per- and Polyfluoroalkyl Substances (PFAS) Study

PFAS are a large group of perfluoroalkyl and polyfluoroalkyl substances. They are manufactured chemicals that are persistent in the environment and some PFAS are bioaccumulative. In the past, Phillips 66 used a type of firefighting foam (aqueous film-forming foam or AFFF) that contained PFAS in their fire training area and discontinued using it for fire training in 2019. The foam would have drained to the refinery's oily water sewer and potentially been discharged in the final effluent. Phillips 66 stores AFFF on-site but only uses it for real responses.

EPA's Office of Water and the Department of Defense's Strategic Environmental Research and Development Program have published draft Method 1633 for the determination of 40 per- and polyfluoroalkyl substances in wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate, and fish tissue. In December 2022, EPA issued a memo which provided guidance on how to address PFAS in NPDES permitting (Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment program and Monitoring Programs; December 5, 2022).

This memo recommends the use of draft Method 1633 for the quarterly evaluation of wastewater discharges for the presence of PFAS in industrial NPDES permits where PFAS are suspected. Ecology is aligning its approach to PFAS monitoring in NDPES permits with this EPA guidance.

The proposed permit requires Phillips 66 to submit a PFAS Sampling and Analysis Plan to Ecology for review and approval within one year of the permit effective date and to begin monitoring a year later. As stated in the permit, this requirement is being included in this permit to begin characterizing the wastewater for the potential presence of PFAS. This information will be used to inform monitoring or other requirements in future permit renewals.

J. General conditions

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

VI. Permit Issuance Procedures

A. Permit modifications

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

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

B. Proposed permit Issuance

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

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

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

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

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

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

1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C. Tsivoglou, E.C., and J.R. Wallace.

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

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

Washington State Department of Ecology

July 2018. *Permit Writer's Manual*. Publication Number 92-109 (https://fortress.wa.gov/ecy/publications/documents/92109.pdf)

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

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

February 2007. *Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees*, Publication Number 07-10-024. (https://fortress.wa.gov/ecy/publications/documents/0710024.pdf) Wright, R.M., and A.J. McDonnell.

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

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

Appendix A — Public Involvement Information

Ecology proposes to reissue a permit to Phillips 66 Ferndale Refinery. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on September 06, 2023 in the Ferndale Record to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

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

[Attach printed copy of the Public Notice mail-out]

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

You may obtain further information from Ecology by telephone, Liem Nguyen at (360) 790-4730, or by writing to 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 Liem Nguyen.

Appendix B — Your Right to Appeal

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

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

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

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

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

Table 19 Address and Location Information

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

Appendix C — Glossary

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

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

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

AKART – The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and RCW 90.48.520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

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

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

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

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

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

Average monthly discharge limit – The average of the measured values obtained over a calendar months' time.

Background water quality – The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples.

The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) – Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

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

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

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

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

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

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

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

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

Composite sample – A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples.

May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

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

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

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

Date of receipt – This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

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

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

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

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

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

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

Enterococci – A subgroup of fecal streptococci that includes *S. faecalis, S. faecium, S. gallinarum,* and *S. avium.* The enterococci are differentiated from other streptococci by their ability to grow in 6.5% sodium chloride, at pH 9.6, and at 10°C and 45°C.

E. coli – A bacterium in the family Enterobacteriaceae named Escherichia coli and is a common inhabitant of the intestinal tract of warm-blooded animals, and its presence in water samples is an indication of fecal pollution and the possible presence of enteric pathogens.

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

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

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

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

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

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

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

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

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

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

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

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

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

Method detection level (MDL) – See Detection Limit.

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

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

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

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

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

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

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

Point of compliance – The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards.

Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

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

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;
b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

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

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

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

Sample Maximum – No sample may exceed this value.

Significant industrial user (SIU) –

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

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

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

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

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

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

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

Soluble BOD_5 – Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria.

Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

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

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

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

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

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

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

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

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

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

Appendix D — Technical Calculations

Note: Include spreadsheets, calculations, background assumptions, and other technical information that support the decisions and limits presented in the permit and fact sheet. The sections below with red headers are optional.

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance.

Simple Mixing:

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

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

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

Reasonable Potential Analysis:

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

Calculation of Water Quality-Based Effluent Limits:

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

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

WLA_a = (acute criteria x DF_a) – [(background conc. x (DF_a - 1)]

WLA_c = (chronic criteria x DF_c) – [(background conc. x (DF_c -1)]

where: DF_a = Acute Dilution Factor

DF_c = Chronic Dilution Factor

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

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

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

$z = 2.326$

CV = coefficient of variation = std. dev/mean

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

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

$z = 2.326$

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

MDL=Maximum Daily Limit

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

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

z = 2.326 (99th percentile occurrence)

LTA = Limiting long term average

AML = Average Monthly Limit

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

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

n = number of samples/month

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

LTA = Limiting long term average

Appendix E — Technology-Based Effluent Limit Calculations

Process	Process Rate (1000 bbls per day)	Capacity Relative to Throughput	Weighting Factor	Process Configuration
BASELINE:				
Crude:				
Desalting	73	1.00		
Atmospheric Distillation	73	1.00		
Vacuum Distillation	20	0.27		
Crude Total	166	2.27	1	2.27
Cracking:				
Fluid Catalytic Cracking	22	0.30	6	1.81
Lubes:				
Butane Deasphalting	0	0.00	13	0.00
Total Baseline Process Configuration				**4.08**
NEW SOURCE PERFORMANCE STANDARDS:				
CURRENT PRODUCTION				
Crude:				
Desalting	104	1.00		
Atmospheric Distillation	104	1.00		
Vacuum Distillation	40.8	0.39		
Crude Total	248.8	2.39	1	2.39
Cracking:				
Fluid Catalytic Cracking	31.9	0.31		
Delayed Coker	0	0.00		
Cracking Total	31.9	0.31	6	1.84
Lubes:				
Butane Deasphalting	0	0.00	13	0.00
Total Current Process Configuration				**4.23**

The process rate information can be found tabulated in the fact sheet in the technology based limits section.
A comprehensive example of the above calculation can be found in **40 CFR Chapter 419.42(b)(3).**
A **process configuration** of **3.5 to 4.49** results in a **process factor** of **0.74** per the cracking subcategory in **40 CFR 419.22(b)(2)**.
Size factors are determined from the amount of feedstock per day. **50,000 to 74,900 bbls/day** results in a **size factor of 1.04**.
100,000 to 124,900 bbls/day results in a **size factor of 1.23** as found in **40 CFR 419.22(b)(1)**.

Baseline Process Factor = 0.74
Current Process Factors = 0.74

Baseline Size Factor =	1.04	Baseline condition =	73,000	bbls/day	[as per 419.22 (b)(1)]
Current Size Factor =	1.23	Current production =	104,000	bbls/day	[as per 419.22 (b)(1)]

Adjusted Production = Production (process factor) (size factor)

Adjusted Baseline Production	= 73,000 bbls/day * 0.74 * 1.04 =	**56,181**	**bbls/day**
Adjusted Current Production	= 104,000 bbls/day * 0.74 * 1.23 =	**94,661**	**bbls/day**

NSPS Increment = Adjusted Current Production - Adjusted Baseline = 38,480 bbls/day

Technology-based limits are based on the adjusted production levels, with the exception of BAT limits for phenols and chromium.

	BAT LIMITS lbs/1000 bbls		BASELINE PERMIT BAT LIMITS lbs/day		BPT LIMITS lbs/1000 bbls		BASELINE PERMIT BPT LIMITS lbs/day		NSPS LIMITS lbs/1000 bbls		NSPS INCREMENT lbs/day		TOTAL LIMIT BAT BASIS lbs/day		TOTAL LIMIT BPT BASIS lbs/day	
	MAX DAY	30 DAY AVE	MAX DAY	30 DAY AVE	MAX DAY	30 DAY AVE	MAX DAY	30 DAY AVE	MAX DAY	30 DAY AVE	MAX DAY	30 DAY AVE	MAX DAY	30 DAY AVE	MAX DAY	30 DAY AVE
BOD					9.9	5.5	556	309	5.8	3.1	223	119			779	428
TSS					6.9	4.4	388	247	4	2.5	154	96			542	343
COD	74	38.4	4157	2157	74	38.4	4157	2157	41.5	21	1597	808	5754	2965	5754	2965
OIL & GREASE			0	0	3	1.6	169	90	1.7	0.93	65	36			234	126
AMMONIA as N	6.6	3	371	169	6.6	3	371	169	6.6	3	254	115	625	284	625	284
SULFIDE	0.065	0.029	3.65	1.63	0.065	0.029	3.65	1.63	0.037	0.017	1.42	0.65	5.08	2.28	5.08	2.28
PHENOLIC CMPNDS					0.074	0.036	4.16	2.02	0.042	0.02	1.62	0.77	8.46	2.41	5.77	2.79
Crude	0.013	0.003	2.16	0.50												
Cracking	0.147	0.036	3.23	0.79												
Asphalt	0.079	0.019	0.00	0.00												
Lube	0.369	0.09	0.00	0.00												
Reforming & Alkylation	0.132	0.032	1.45	0.35												
TOTAL CHROMIUM					0.15	0.088	8.43	4.94	0.084	0.049	3.23	1.89	8.85	3.86	11.66	6.83
Crude	0.011	0.004	1.83	0.66												
Cracking	0.119	0.041	2.62	0.90												
Asphalt	0.064	0.022	0.00	0.00												
Lube	0.299	0.104	0.00	0.00												
Reforming & Alkylation	0.107	0.037	1.18	0.41												
HEX CHROMIUM					0.012	0.0056	0.67	0.31	0.0072	0.0032	0.28	0.12	0.64	0.28	0.95	0.44
Crude	0.0007	0.0003	0.12	0.05												
Cracking	0.0076	0.0034	0.17	0.07												
Asphalt	0.0041	0.0019	0.00	0.00												
Lube	0.0192	0.0087	0.00	0.00												
Reforming & Alkylation	0.0069	0.0031	0.08	0.03												
NOTES:																
Adjusted Baseline Production in bbls/day					56,181	(See Process Factor Determination)										
NSPS Increment in bbls/day					**38,480**	(See Process Factor Determination)										
For BAT Limitations:							For BAT limitations Calculations:									
Baseline Crude in 1000 bbls/day					166		Crude processes include desalting, atmospheric distillation, and vacuum distillation.									
Baseline Cracking in 1000 bbls/day					22			Crude in 1000 bbls/day = 73 + 73 + 20 =						166		
Baseline Asphalt in 1000 bbls/day					0		Cracking processes include fluid catalytic cracking and hydrotreating.									
Baseline Lube in 1000 bbls/day					0			Cracking in 1000 bbls/day = 22						22		
Baseline Reforming & Alkylation in 1000 bbls/day					11		Asphalt and lube in 1000 bbls /day =							0		
							Reforming and alkylation processes include catalytic reforming and sulfuric acid alkylation.									
								Reforming and alkylation in 1000 bbls/day = 11 + 0 =						11		

Appendix F — Dry Weather Flow Rate Calculation

(Data from January 2016 through December 2019)

Monthly Correlation Check (expecting high to low)	
Correlation (R^2)	Basis
0.547	Monthly Precipitation vs Average Flow
0.315	Monthly Production vs Average Flow
0.180	Monthly Precipitation vs Production

Correlation (R^2)	Dry Weather Flow (MGD)	Basis
0.320	1.88	Daily average flow and 10-day daily precip total, linear regression, flow at zero precip
0.432	1.96	10-day daily average flow and 10-day daily precip total, linear regression, flow at zero precip
0.547	1.91	Monthly average flow and monthly precip total, linear regression, flow at zero precip
-	1.84	Average flow (not using 10-day daily average) of days with no precip for 10 days on 10-day daily precip total
-	2.02	Average of June - September daily average flows
-	1.98	Average of June - September monthly average flows
-	**1.91**	Average of linear regression method
-	**1.95**	Average of average flow method
-	**1.93**	Average of both methods

Appendix G — Reasonable Potential Analysis for Outfall 001

Reasonable Potential Calculation Update

Facility	Phillips 66 Ferndale Refinery
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	27.0	94.0
Human Health Carcinogenic		103.0
Human Health Non-Carcinogenic		103.0

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	ARSENIC (dissolved) 7440382 2M	CADMIUM - 7440439 4M Hardness dependent	CHROMIUM(HEX) 18540299	COPPER - 744058 6M Hardness dependent	CYANIDE 57125 14M	LEAD - 7439921 7M Dependent on hardness	MANGANESE 7439965	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	NITRATES 14797558
Effluent Data	# of Samples (n)		136	8	4	4	4	2	4	1	4	4	1
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		1,375	16.65	0.03	1.4	10	35.2	0.3	32	0.239	8.2	2870
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L												
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	1,375	69	42	1100	4.8	9.1	210	-	1.8	74	-
		Chronic	207	36	9.3	50	3.1	2.8	8.1	-	0.025	8.2	-
	WQ Criteria for Protection of Human Health, ug/L		-	-	-	-	-	100	-	100	0.15	100	-
	Metal Criteria Translator, decimal	Acute	-	1	0.994	-	0.83	-	0.951	-	0.85	0.99	-
		Chronic	-	-	0.994	-	0.83	-	0.951	-	-	0.99	-
	Carcinogen?		N	Y	N	N	N	N	N	N	N	N	N

Aquatic Life Reasonable Potential

			AMMONIA	ARSENIC	CADMIUM	CHROMIUM(HEX)	COPPER	CYANIDE	LEAD	MANGANESE	MERCURY	NICKEL	NITRATES
Effluent percentile value			0.950	0.950	0.950	0.950	0.950	0.950	0.950		0.950	0.950	
s	$s^2=\ln(CV^2+1)$		0.555	0.555	0.555	0.555	0.555	0.555	0.555		0.555	0.555	
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.978	0.688	0.473	0.473	0.473	0.224	0.473		0.473	0.473	
Multiplier			1.00	1.90	2.59	2.59	2.59	3.79	2.59		2.59	2.59	
Max concentration (ug/L) at edge of…		Acute	51	1.170	0.003	0.134	0.795	4.947	0.027		0.019	0.777	
		Chronic	15	0.336	0.001	0.039	0.228	1.421	0.008		0.007	0.223	
Reasonable Potential? Limit Required?			**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**		**NO**	**NO**	

Aquatic Life Limit Calculation

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

Human Health Reasonable Potential

		AMMONIA	ARSENIC	CADMIUM	CHROMIUM(HEX)	COPPER	CYANIDE	LEAD	MANGANESE	MERCURY	NICKEL	NITRATES
s	$s^2=\ln(CV^2+1)$						0.55451		0.55451	0.55451	0.55451	
Pn	Pn=(1-confidence level)1/n						0.224		0.050	0.473	0.473	
Multiplier							1.5242		2.48953	1.03846	1.03846	
Dilution Factor							103		103	103	103	
Max Conc. at edge of Chronic Zone, ug/L							5.2E-01		0.77345	0.00241	0.08267	
Reasonable Potential? Limit Required?							**NO**		**NO**	**NO**	**NO**	

Reasonable Potential Calculation - Page 2

Facility	Phillips 66 Ferndale Refinery
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	27.0	94.0
Human Health Carcinogenic		103.0
Human Health Non-Carcinogenic		103.0

Pollutant, CAS No. & NPDES Application Ref. No.			PHENOL 108952 10A	SELENIUM 7782492 10M	SULFIDE, HYDROGEN SULFIDE 7783064	THALLIUM 7440280 12M	ZINC- 7440666 13M hardness dependent						
Effluent Data	# of Samples (n)		111	4	29	4	4						
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)			30	47	0.12	101						
	Calculated 50th percentile Effluent Conc. (when n>10)		980										
Receiving Water Data	90th Percentile Conc., ug/L												
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	-	290	-	-	90						
		Chronic	-	71	2	-	81						
	WQ Criteria for Protection of Human Health, ug/L		70000	200	-	0.27	1000						
	Metal Criteria Translator, decimal	Acute	-	-	-	-	0.946						
		Chronic	-	-	-	-	0.946						
	Carcinogen?		N	N	N	N	N						

Aquatic Life Reasonable Potential

			Phenol	Selenium	Sulfide	Thallium	Zinc
Effluent percentile value				0.950	0.950		0.950
s	$s^2=\ln(CV^2+1)$			0.555	0.555		0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$			0.473	0.902		0.473
Multiplier				2.59	1.00		2.59
Max concentration (ug/L) at edge of…		Acute		2.873	1.741		9.149
		Chronic		0.825	0.500		2.628
Reasonable Potential? Limit Required?				**NO**	**NO**		**NO**

Aquatic Life Limit Calculation

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

Human Health Reasonable Potential

		Phenol	Selenium	Sulfide	Thallium	Zinc
s	$s^2=\ln(CV^2+1)$	0.55451	0.55451		0.55451	0.55451
Pn	Pn=(1-confidence level)1/n	0.973	0.473		0.473	0.473
Multiplier		0.3424	1.03846		1.03846	1.03846
Dilution Factor		103	103		103	103
Max Conc. at edge of Chronic Zone, ug/L		9.51456	0.30246		0.00121	1.01829
Reasonable Potential? Limit Required?		**NO**	**NO**		**NO**	**NO**

Appendix H — Resonable Potential Analysis for Stormwater Outfalls

Reasonable Potential Calculation

Facility	Phillips 66 Ferndale Refinery
Water Body Type	Marine

Outfall 002

Dilution Factors:	Acute	Chronic
Aquatic Life	1.0	1.0
Human Health Carcinogenic		1.0
Human Health Non-Carcinogenic		1.0

Pollutant, CAS No. & NPDES Application Ref. No.				COPPER - 744058 6M Hardness dependent	ZINC- 7440666 13M hardness dependent								
Effluent Data	# of Samples (n)			24	16								
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)			4.3	38								
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L												
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute		4.8	90								
		Chronic											
	WQ Criteria for Protection of Human Health, ug/L			-	2900								
	Metal Criteria Translator, decimal	Acute		0.83	0.946								
		Chronic		0.83	0.946								
	Carcinogen?			N	N								

Aquatic Life Reasonable Potential

Effluent percentile value			0.950	0.950								
s	$s^2=\ln(CV^2+1)$		0.555	0.555								
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.883	0.829								
Multiplier			1.00	1.47								
Max concentration (ug/L) at edge of…	Acute		3.569	52.810								
	Chronic		3.569	52.810								
Reasonable Potential? Limit Required?			**NO**	**NO**								

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$			0.554513								
Pn	Pn=(1-confidence level)1/n			0.829								
Multiplier				0.590104								
Dilution Factor				1								
Max Conc. at edge of Chronic Zone, ug/L				22.42395								
Reasonable Potential? Limit Required?				**NO**								

Reasonable Potential Calculation

Facility	Phillips 66 Ferndale Refinery
Water Body Type	Marine

Outfall 003

Dilution Factors:	Acute	Chronic
Aquatic Life	1.0	1.0
Human Health Carcinogenic		1.0
Human Health Non-Carcinogenic		1.0

Pollutant, CAS No. & NPDES Application Ref. No.				COPPER - 744058 6M Hardness dependent	ZINC- 7440666 13M hardness dependent								
Effluent Data	# of Samples (n)			20	12								
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)			3.8	25								
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L												
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute		4.8	90								
		Chronic											
	WQ Criteria for Protection of Human Health, ug/L			-	2900								
	Metal Criteria Translator, decimal	Acute		0.83	0.946								
		Chronic		0.83	0.946								
	Carcinogen?			N	N								

Aquatic Life Reasonable Potential

			COPPER	ZINC
Effluent percentile value			0.950	0.950
s	$s^2=\ln(CV^2+1)$		0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.861	0.779
Multiplier			1.36	1.63
Max concentration (ug/L) at edge of…		Acute	4.304	38.436
		Chronic	4.304	38.436
Reasonable Potential? Limit Required?			**NO**	**NO**

Aquatic Life Limit Calculation

Human Health Reasonable Potential

			COPPER	ZINC
s	$s^2=\ln(CV^2+1)$			0.554513
Pn	Pn=(1-confidence level)1/n			0.779
Multiplier				0.652812
Dilution Factor				1
Max Conc. at edge of Chronic Zone, ug/L				16.3203
Reasonable Potential? Limit Required?				**NO**

Reasonable Potential Calculation

Facility	Phillips 66 Ferndale Refinery
Water Body Type	Marine

Outfall 004

Dilution Factors:	Acute	Chronic
Aquatic Life	1.0	1.0
Human Health Carcinogenic		1.0
Human Health Non-Carcinogenic		1.0

Pollutant, CAS No. & NPDES Application Ref. No.				COPPER - 744058 6M Hardness dependent	ZINC- 7440666 13M hardness dependent								
Effluent Data	# of Samples (n)			20	12								
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)			6.3	22								
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L												
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute		4.8	90								
		Chronic											
	WQ Criteria for Protection of Human Health, ug/L			-	2900								
	Metal Criteria Translator, decimal	Acute		0.83	0.946								
		Chronic		0.83	0.946								
	Carcinogen?			N	N								

Aquatic Life Reasonable Potential

				COPPER	ZINC
Effluent percentile value				0.950	0.950
s	$s^2=\ln(CV^2+1)$			0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$			0.861	0.779
Multiplier				1.36	1.63
Max concentration (ug/L) at edge of…		Acute		7.135	33.824
		Chronic		7.135	33.824
Reasonable Potential? Limit Required?				**YES**	**NO**

Aquatic Life Limit Calculation

			COPPER
# of Compliance Samples Expected per month			1
LTA Coeff. Var. (CV), decimal			0.6
Permit Limit Coeff. Var. (CV), decimal			0.6
Waste Load Allocations, ug/L		Acute	4.8
		Chronic	-
Long Term Averages, ug/L		Acute	1.5412
		Chronic	-
Limiting LTA, ug/L			1.5412
Metal Translator or 1?			0.83
Average Monthly Limit (AML), ug/L			**4.0**
Maximum Daily Limit (MDL), ug/L			**5.8**

Human Health Reasonable Potential

			ZINC
s	$s^2=\ln(CV^2+1)$		0.554513
Pn	Pn=(1-confidence level)1/n		0.779
Multiplier			0.652812
Dilution Factor			1
Max Conc. at edge of Chronic Zone, ug/L			14.36186
Reasonable Potential? Limit Required?			**NO**

Reasonable Potential Calculation

Facility	Phillips 66 Ferndale Refinery
Water Body Type	Marine

Outfall 005

Dilution Factors:	Acute	Chronic
Aquatic Life	1.0	1.0
Human Health Carcinogenic		1.0
Human Health Non-Carcinogenic		1.0

Pollutant, CAS No. & NPDES Application Ref. No.				COPPER - 744058 6M Hardness dependent	ZINC- 7440666 13M hardness dependent								
Effluent Data	# of Samples (n)			21	13								
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)			4	19								
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L												
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute		4.8	90								
		Chronic											
	WQ Criteria for Protection of Human Health, ug/L			-	2900								
	Metal Criteria Translator, decimal	Acute		0.83	0.946								
		Chronic		0.83	0.946								
	Carcinogen?			N	N								

Aquatic Life Reasonable Potential

				COPPER	ZINC
Effluent percentile value				0.950	0.950
s	$s^2=\ln(CV^2+1)$			0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$			0.867	0.794
Multiplier				1.00	1.58
Max concentration (ug/L) at edge of…		Acute		3.320	28.382
		Chronic		3.320	28.382
Reasonable Potential? Limit Required?				**NO**	**NO**

Human Health Reasonable Potential

				COPPER	ZINC
s	$s^2=\ln(CV^2+1)$				0.554513
Pn	Pn=(1-confidence level)1/n				0.794
Multiplier					0.634278
Dilution Factor					1
Max Conc. at edge of Chronic Zone, ug/L					12.05128
Reasonable Potential? Limit Required?					**NO**

Reasonable Potential Calculation

Facility	Phillips 66 Ferndale Refinery
Water Body Type	Marine

Outfall 006

Dilution Factors:	Acute	Chronic
Aquatic Life	1.0	1.0
Human Health Carcinogenic		1.0
Human Health Non-Carcinogenic		1.0

Pollutant, CAS No. & NPDES Application Ref. No.				COPPER - 744058 6M Hardness dependent	ZINC- 7440666 13M hardness dependent								
Effluent Data	# of Samples (n)			19	14								
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)			5.9	25.5								
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L												
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute		4.8	90								
		Chronic											
	WQ Criteria for Protection of Human Health, ug/L			-	2900								
	Metal Criteria Translator, decimal	Acute		0.83	0.946								
		Chronic		0.83	0.946								
	Carcinogen?			N	N								

Aquatic Life Reasonable Potential

			COPPER	ZINC
Effluent percentile value			0.950	0.950
s	$s^2=\ln(CV^2+1)$		0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.854	0.807
Multiplier			1.39	1.54
Max concentration (ug/L) at edge of…		Acute	6.794	37.107
		Chronic	6.794	37.107
Reasonable Potential? Limit Required?			**YES**	**NO**

Aquatic Life Limit Calculation

		COPPER
# of Compliance Samples Expected per month		1
LTA Coeff. Var. (CV), decimal		0.6
Permit Limit Coeff. Var. (CV), decimal		0.6
Waste Load Allocations, ug/L	Acute	4.8
	Chronic	-
Long Term Averages, ug/L	Acute	1.5412
	Chronic	-
Limiting LTA, ug/L		1.5412
Metal Translator or 1?		0.83
Average Monthly Limit (AML), ug/L		**4.0**
Maximum Daily Limit (MDL), ug/L		**5.8**

Human Health Reasonable Potential

		ZINC
s	$s^2=\ln(CV^2+1)$	0.554513
Pn	Pn=(1-confidence level)1/n	0.807
Multiplier		0.617892
Dilution Factor		1
Max Conc. at edge of Chronic Zone, ug/L		15.75626
Reasonable Potential? Limit Required?		**NO**

Reasonable Potential Calculation

Facility	Phillips 66 Ferndale Refinery
Water Body Type	Marine

Outfall 007

Dilution Factors:	Acute	Chronic
Aquatic Life	1.0	1.0
Human Health Carcinogenic		1.0
Human Health Non-Carcinogenic		1.0

Pollutant, CAS No. & NPDES Application Ref. No.				COPPER - 744058 6M Hardness dependent	ZINC- 7440666 13M hardness dependent								
Effluent Data	# of Samples (n)			9	8								
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)			5	39								
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L			3.4									
	Geo Mean, ug/L												
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute		4.8	90								
		Chronic											
	WQ Criteria for Protection of Human Health, ug/L			-	2900								
	Metal Criteria Translator, decimal	Acute		0.83	0.946								
		Chronic		0.83	0.946								
	Carcinogen?			N	N								

Aquatic Life Reasonable Potential

			Copper	Zinc
Effluent percentile value			0.950	0.950
s	$s^2=\ln(CV^2+1)$		0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.717	0.688
Multiplier			1.81	1.90
Max concentration (ug/L) at edge of…		Acute	7.517	70.026
		Chronic	7.517	70.026
Reasonable Potential? Limit Required?			**YES**	**NO**

Aquatic Life Limit Calculation

		Copper
# of Compliance Samples Expected per month		1
LTA Coeff. Var. (CV), decimal		0.6
Permit Limit Coeff. Var. (CV), decimal		0.6
Waste Load Allocations, ug/L	Acute	4.8
	Chronic	-
Long Term Averages, ug/L	Acute	1.5412
	Chronic	-
Limiting LTA, ug/L		1.5412
Metal Translator or 1?		0.83
Average Monthly Limit (AML), ug/L		**4.0**
Maximum Daily Limit (MDL), ug/L		**5.8**

Human Health Reasonable Potential

		Zinc
s	$s^2=\ln(CV^2+1)$	0.554513
Pn	Pn=(1-confidence level)1/n	0.688
Multiplier		0.762405
Dilution Factor		1
Max Conc. at edge of Chronic Zone, ug/L		29.7338
Reasonable Potential? Limit Required?		**NO**

Appendix I — Groundwater Monitoring Data

GROUNDWATER MONITORING DATA (FLOW DIRECTION - SOUTHWEST)											
			Well Identification No.								
Parameters	Units	GWQS	MWGWIS-2	MWGWIS-3	MWGWIS-5	MWGWIS-6	MWGWIS-7	MWGWIS-8	MWGWIS-9	MWCIII-91-8	MWCIII-91-9
2014 Second Quarter			5/7/2014	5/7/2014	5/7/2014	5/7/2014	5/7/2014	5/6/2014	5/6/2014	5/6/2014	5/6/2014
pH	6.5-8.5		7.07	7.21	7.44	7.25	7.52	7.15	7.67	7.76	7.67
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	0.95	ND	0.92	ND	4.00	0.83	ND	2.20	5.60
Iron	µg/l	300	ND	ND	ND	ND	ND	ND	ND	ND	ND
Manganese	µg/l	50	7460.0	ND	0.7	744.0	3.1	1880.0	345.0	1.5	ND
Chloride	mg/l	250	86.4	14.0	5.5	10.1	7.2	11.0	21.8	3.7	26.3
Sulfate	mg/l	250	11.1	19.8	14.3	197.0	27.8	90.3	40.3	52.0	85.2
Total Dissolved Solids	mg/l	500	971.0	383.0	218.0	762.0	424.0	507.0	458.0	388.0	343.0
NWTPH-Dx (Diesel Range)	mg/l		0.57	ND	ND	0.77	ND	0.63	1.20	ND	ND
NWTPH-Dx (Oil Range)			ND	ND	ND	ND	ND	ND	0.48	ND	ND
2014 Third Quarter			8/22/2014	8/22/2014	8/22/2014	8/22/2014	8/22/2014	8/21/2014	8/21/2014	8/21/2014	8/21/2014
pH	6.5-8.5		8.33	8.43	8.46	7.85	8.47	7.58	8.11	7.92	8.02
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	8.1	ND	0.69	0.71	2.90	4.90	0.72	2.00	5.60
Iron	µg/l	300	4990	ND	ND	ND	ND	274.0	187.0	ND	ND
Manganese	µg/l	50	6130	8.4	62.0	1640.0	383.0	3490.0	835.0	53.2	7.1
Chloride	mg/l	250	58.1	19.3	3.0	11.2	8.6	13.2	18.2	4.4	26.8
Sulfate	mg/l	250	13.2	26.0	23.0	186.0	31.1	92.5	40.5	53.4	92.5
Total Dissolved Solids	mg/l	500	774	368.0	202.0	696.0	417.0	512.0	448.0	385.0	329.0
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	0.82	ND	1.90	1.30	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.43	ND	ND	0.52	ND	ND
2014 Fourth Quarter			11/18/2014	11/18/2014	11/18/2014	11/18/2014	11/17/2014	11/17/2014	11/17/2014	11/17/2014	11/17/2014
pH	6.5-8.5		7.36	7.55	7.44	7.21	7.77	7.54	7.68	8.03	8.09
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	5.80	ND	0.68	0.80	3.60	6.20	0.64	2.20	6.20
Iron	µg/l	300	4800.00	ND	ND	139.00	ND	492.00	212.00	ND	ND
Manganese	µg/l	50	8510.0	12.7	ND	1230.0	56.5	3220.0	728.0	29.1	42.7
Chloride	mg/l	250	99.5	21.5	3.0	10.5	12.9	13.6	18.1	3.8	30.8
Sulfate	mg/l	250	11.2	28.2	24.4	192.0	37.5	95.5	41.1	54.8	89.2
Total Dissolved Solids	mg/l	500	939.0	305.0	107.0	729.0	469.0	429.0	379.0	284.0	304.0
NWTPH-Dx (Diesel Range)	mg/l		0.66	ND	ND	0.97	ND	1.70	2.10	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.52	ND	ND	0.84	ND	ND
2015 First Quarter			2/17/2015	2/17/2015	2/17/2015	2/17/2015	2/17/2015	2/18/2015	2/18/2015	2/18/2015	2/18/2015
pH	6.5-8.5		6.38	6.68	6.57	5.79	6.9	7.45	7.49	8.08	7.74
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	12.4	ND	0.78	1	2.7	2	ND	1.9	5.8
Iron	µg/l	300	15200	ND	ND	180	180	362	ND	ND	ND
Manganese	µg/l	50	5090	0.77	6	1500	41.4	2010	441	3.9	35.2
Chloride	mg/l	250	18.2	21.1	2.9	8.1	10.5	6.3	18.5	3.4	27.5
Sulfate	mg/l	250	15.2	27.3	24.6	177	34.9	66	41.5	53.8	87.9
Total Dissolved Solids	mg/l	500	469	361	209	716	426	426	424	367	336
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	0.78	ND	0.45	1.1	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.49	ND	ND	0.69	ND	ND
2015 Second Quarter			5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/18/2015	5/18/2015	5/18/2015	5/18/2015
pH	6.5-8.5		6.78	6.8	6.8	6.79	6.8	6.8	6.78	6.77	7.74
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	10.5	ND	0.87	1.3	2.9	6.6	ND	2	6.2
Iron	µg/l	300	6490	ND	ND	357	ND	957	ND	ND	ND
Manganese	µg/l	50	5730	1.1	6	1270	55	3270	355	24.7	23.1
Chloride	mg/l	250	51.1	21	2.8	8.1	9.7	11	20.7	3.3	29.2
Sulfate	mg/l	250	13.1	27.5	23.7	163	30.1	79.5	41.4	53.1	90.5
Total Dissolved Solids	mg/l	500	675	362	212	716	441	517	450	382	361
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	0.77	ND	1.8	1	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.61	ND	0.51	0.87	ND	ND

GROUNDWATER MONITORING DATA (FLOW DIRECTION - SOUTHWEST)											
			Well Identification No.								
Parameters	**Units**	**GWQS**	**MWGWIS-2**	**MWGWIS-3**	**MWGWIS-5**	**MWGWIS-6**	**MWGWIS-7**	**MWGWIS-8**	**MWGWIS-9**	**MWCIII-91-8**	**MWCIII-91-9**
2015 Third Quarter			9/2/2015	9/2/2015	9/2/2015	9/2/2015	9/2/2015	9/1/2015	9/1/2015	9/2/2015	9/2/2015
pH	6.5-8.5		6.84	6.85	6.84	6.84	6.84	6.83	6.8	6.84	6.82
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	10.7	ND	0.78	1.3	3.1	8.5	ND	1.8	5.2
Iron	µg/l	300	7310	ND	ND	474	ND	1090	86.3	ND	ND
Manganese	µg/l	50	7600	20.8	0.53	1610	70.4	3450	779	20.1	3
Chloride	mg/l	250	81.1	24.3	3	9.5	12.3	11.4	17.6	3.5	28.9
Sulfate	mg/l	250	9.5	27.8	20.5	174	35.8	82.5	41.3	52.9	91
Total Dissolved Solids	mg/l	500	770	388	243	733	462	527	436	370	348
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	0.68	ND	2.4	1.4	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.44	ND	0.64	0.6	ND	ND
2015 Fourth Quarter			11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/3/2015	11/2/2015	11/3/2015	11/3/2015
pH	6.5-8.5		6.83	6.84	7.65	6.84	7.7	6.83	6.81	7.87	6.83
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	7.5	ND	0.58	0.67	2.4	6.3	ND	2	5.1
Iron	µg/l	300	3920	ND	ND	75.8	ND	712	ND	ND	ND
Manganese	µg/l	50	7220	13.7	ND	817	4.4	3380	492	113	16.7
Chloride	mg/l	250	94.7	20.8	2.5	10.8	14.2	11.2	20.1	3.3	27.9
Sulfate	mg/l	250	7.3	27.5	22.2	175	47.7	82.1	39.9	50.7	89.1
Total Dissolved Solids	mg/l	500	1000	354	203	764	466	517	452	371	345
NWTPH-Dx (Diesel Range)	mg/l		0.74	ND	ND	1.2	ND	2.6	1.6	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.64	ND	0.75	0.65	ND	ND
2016 First Quarter			2/16/2016	2/17/2016	2/17/2016	2/16/2016	2/17/2016	2/16/2016	2/16/2016	2/17/2016	2/17/2016
pH	6.5-8.5		6.87	7.21	7.09	6.74	7.55	6.49	6.72	7.28	7.4
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	16.8	ND	0.69	ND	2.2	6	0.57	1.7	4.8
Iron	µg/l	300	21300	ND	ND	ND	ND	987	119		ND
Manganese	µg/l	50	4640	ND	1.8	1180	9.7	2670	237	4.1	2.3
Chloride	mg/l	250	9.8	21.6	2.6	9.5	10.2	9.6	26.4	3.3	29.5
Sulfate	mg/l	250	10.9	26	22.8	168	36.2	85	38.3	49.9	89.9
Total Dissolved Solids	mg/l	500	476	361	201	715	450	488	486	370	356
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	0.81	ND	1.1	2	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.46	ND	ND	0.81	ND	ND
2016 Second Quarter			5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/25/2016	5/24/2016	5/24/2016	5/24/2016	5/24/2016
pH	6.5-8.5		7.42	7.8	7.81	7.69	8.33	7.69	7.5	8.23	8.27
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	9.9	ND	0.84	0.85	2.5	6	1.2	2	5.9
Iron	µg/l	300	10400	ND	ND	250	ND	987	72.8	ND	ND
Manganese	µg/l	50	4720	0.95	1.7	1140	38.6	2670	407	5	6.8
Chloride	mg/l	250	41.4	19.3	2.7	8.4	9.2	9.6	29.8	3.3	29
Sulfate	mg/l	250	12.8	28.5	23.5	170	30.8	85	41.1	51.7	96
Total Dissolved Solids	mg/l	500	655	363	248	711	444	488	541	395	385
NWTPH-Dx (Diesel Range)	mg/l		ND	0.78	ND	0.76	ND	1.1	1.4	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	0.43	ND	ND	ND	ND	0.67	ND	ND
2016 Third Quarter			8/3/2016	8/4/2016	8/2/2016	8/2/2016	8/2/2016	8/2/2016	8/2/2016	8/2/2016	8/2/2016
pH	6.5-8.5		6.74	7.07	7.9	6.93	7.68	7.22	7.42	7.66	7.87
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	6.8	ND	1.1	1.1	2.3	4.7	0.81	2	5.3
Iron	µg/l	300	3670	ND	ND	650	ND	407	127	ND	ND
Manganese	µg/l	50	4960	7.6	0.84	1440	12.3	3590	558	7.8	11
Chloride	mg/l	250	63.5	2.8	2.8	9.8	10	8.6	23.6	3.3	29.1
Sulfate	mg/l	250	10.1	21.1	21.3	177	34.6	67.9	41.4	51.3	98.2
Total Dissolved Solids	mg/l	500	730	346	227	763	440	476	490	384	368
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	0.47	1.3	ND	2.3	2	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.51	ND	0.49	0.8	ND	ND
2016 Fourth Quarter			11/9/2016	11/8/2016	11/9/2016	11/9/2016	11/8/2016	11/7/2016	11/7/2016	11/8/2016	11/7/2016
pH	6.5-8.5		7.78	8	7.77	8.28	8.28	7.47	7.53	8.33	8.2
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/l	0.05	16.2	ND	0.68	0.54	2.9	4.9	ND	2	5.9
Iron	µg/l	300	10100	ND	ND	ND	ND	539	144	ND	ND
Manganese	µg/l	50	7940	8.9	0.62	759	22.8	4240	605	7.8	95.3
Chloride	mg/l	250	46.5	13.5	2.4	11.6	11.2	9.9	17	3.3	29.7
Sulfate	mg/l	250	9.5	33.4	23.7	185	40.1	66.9	42.6	51.3	93
Total Dissolved Solids	mg/l	500	638	332	207	747	460	527	437	384	366
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	1.1	0.43	1.7	2.1	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.51	ND	ND	0.71	ND	ND

GROUNDWATER MONITORING DATA (FLOW DIRECTION - SOUTHWEST)											
			Well Identification No.								
Parameters	**Units**	**GWQS**	**MWGWIS-2**	**MWGWIS-3**	**MWGWIS-5**	**MWGWIS-6**	**MWGWIS-7**	**MWGWIS-8**	**MWGWIS-9**	**MWCIII-91-8**	**MWCIII-91-9**
2017 First Quarter			1/26/2017	1/24/2017	1/25/2017	1/26/2017	1/25/2017	1/25/2017	1/25/2017	1/26/2017	1/25/2017
pH	6.5-8.5		6.99	7.56	7.55	6.96	8.08	7.15	7.1	8.02	8.25
Benzo (a) pyrene	µg/l	0.008	ND	ND	ND	ND	ND	ND	ND	ND	0.077
Arsenic	µg/l	0.05	11.9	ND	0.78	ND	2.5	2.2	ND	1.8	5.5
Iron	µg/l	300	12100	ND	ND	ND	ND	596	ND	ND	ND
Manganese	µg/l	50	5710	ND	0.62	1420	30.4	2460	454	1.4	5.4
Chloride	mg/l	250	19.5	22.3	2.4	10.9	10.9	2.7	19.8	3.3	29.8
Sulfate	mg/l	250	10.5	28.2	23.7	183	39.1	72.5	48.2	51.6	99.1
Total Dissolved Solids	mg/l	500	495	367	207	747	442	447	423	376	369
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	1	ND	0.42	0.88	ND	ND
NWTPH-Dx (Oil Range)	mg/l		ND	ND	ND	0.42	ND	ND	ND	ND	ND
2017 Semi-annually											
Arsenic	µg/l	0.05	10.8	0.26	0.64	1	2.2	9	0.34	2	5.2
Iron	µg/l	300	11700	ND	ND	570	ND	1590	50.7	ND	ND
Manganese	µg/l	50	5900	2.4	4.8	1530	197	3980	274	5.1	35.4
Chloride	mg/l	250	22.9	17.2	2.4	9.9	9.6	18.4	16.6	3.2	29.4
Sulfate	mg/l	250	10.3	28.5	25.1	168	34.9	57.5	42.2	50.3	103
Total Dissolved Solids	mg/l	500	658	336	207	721	444	495	419	376	384
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	0.13	0.08	1.6	0.21	ND	ND
2018 1st Semi-annually											
Arsenic	µg/l	0.05	18.1	0.33	0.82	0.47	2.7	7.1	0.36	2.1	6.6
Iron	µg/l	300	23300	6.9	12.7	25.7	10.8	1960	28.1	ND	9.5
Manganese	µg/l	50	5100	0.46	2.5	1190	84.3	2980	288	4.6	42.5
Chloride	mg/l	250	13.3	17.2	2.3	9.7	9.3	14.2	17.2	3.1	29.5
Sulfate	mg/l	250	9.4	28.9	21.4	163	41.5	65.4	40.3	46.7	100
Total Dissolved Solids	mg/l	500	530	348	203	697	440	456	394	368	354
NWTPH-Dx (Diesel Range)	mg/l		0.088	ND	ND	0.7	0.3	1.3	1.3	ND	ND
2018 2nd Semi-annually											
Arsenic	µg/l	0.05	11.2	0.28	0.67	0.96	2.5	6.4	0.74	2.2	5.5
Iron	µg/l	300	11700	19.5	9.7	390	20.9	3870	159	ND	ND
Manganese	µg/l	50	6060	7.9	10.4	1560	114	2880	607	46.6	37.4
Chloride	mg/l	250	23.6	18.3	2	10.8	10	16	15.2	3	28.4
Sulfate	mg/l	250	9.1	26.8	24.2	169	40	71.6	40.2	46.3	98.4
Total Dissolved Solids	mg/l	500	597	334	193	690	444	506	418	350	344
NWTPH-Dx (Diesel Range)	mg/l		0.2	0.11	0.1	0.81	0.3	1.7	1	0.14	0.11
2019 1st Semi-annually											
Arsenic	µg/l	0.05	12.8	0.25	0.76	0.54	2.8	4.3	0.43	2	5.9
Iron	µg/l	300	16300	5.4	ND	46.1	ND	710	24	ND	ND
Manganese	µg/l	50	4500	0.7	0.28	1090	21.1	2330	92.8	2.3	11.3
Chloride	mg/l	250	10.2	17.9	2.2	15.9	9.4	14.4	17	3.2	31
Sulfate	mg/l	250	9.2	30	22.4	196	86.3	57.2	43.1	50.2	106
Total Dissolved Solids	mg/l	500	576	350	208	818	506	415	415	362	381
NWTPH-Dx (Diesel Range)	mg/l		0.096	ND	ND	0.72	0.15	1.2	0.36	ND	ND
2019 2nd Semi-annually											
pH	6.5-8.5										
Arsenic	µg/l	0.05	15.1	0.28	0.71	0.76	2.3	8.2	0.48	2.1	5.5
Iron	µg/l	300	19100	11.5	ND	196	ND	1400	56.2	ND	ND
Manganese	µg/l	50	5680	0.6	0.5	2050	389	2790	603	25.2	111
Chloride	mg/l	250	13.9	12.3	2.3	17.6	9.3	14.4	15.9	3.2	31.5
Sulfate	mg/l	250	11.1	34.9	25	274	78.9	57.9	49.4	56.5	125
Total Dissolved Solids	mg/l	500	625	340	209	862	490	414	430	381	359
NWTPH-Dx (Diesel Range)	mg/l		0.08	ND	ND	0.74	0.36	1.1	0.47	ND	ND
NWTPH-Dx (Oil Range)	mg/l										

GROUNDWATER MONITORING DATA (FLOW DIRECTION - SOUTHWEST)											
			Well Identification No.								
Parameters	Units	GWQS	MWGWIS-2	MWGWIS-3	MWGWIS-5	MWGWIS-6	MWGWIS-7	MWGWIS-8	MWGWIS-9	MWCIII-91-8	MWCIII-91-9
2020 1st Semi-annually											
Arsenic	µg/l	0.05	15.6	0.29	0.68	0.49	2.4	1.7	0.22	2.1	5.5
Iron	µg/l	300	21600	11.5	ND	26.8	ND	345	11.5	ND	ND
Manganese	µg/l	50	5160	0.54	0.24	1300	28.8	2220	209	0.56	13.6
Chloride	mg/l	250	4.5	15.9	1.8	9.3	8.3	9.4	15.6	2.9	29.5
Sulfate	mg/l	250	11.7	32.6	21.9	187	73	72.2	43.9	50.3	103
Total Dissolved Solids	mg/l	500	606	356	205	758	481	364	422	362	389
NWTPH-Dx (Diesel Range)	mg/l		0.098	ND	ND	0.2	ND	0.32	0.13	ND	ND
2020 2nd Semi-annually											
Arsenic	µg/l	0.05	12.9	0.29	0.72	1.1	2.6	8.6	0.41	2.3	6.1
Iron	µg/l	300	21100	12	ND	523	ND	1050	47.2	ND	ND
Manganese	µg/l	50	5200	0.59	0.25	2080	148	3180	441	0.8	107
Chloride	mg/l	250	7.1	12.5	1.5	8.6	6.5	8.9	14.8	2.5	27.6
Sulfate	mg/l	250	14.8	26.8	19.6	164	54.6	41.2	41.5	42.7	95.8
Total Dissolved Solids	mg/l	500	622	330	218	834	467	422	427	389	395
NWTPH-Dx (Diesel Range)	mg/l		ND	ND	ND	0.27	0.1	1.1	0.16	ND	ND

Appendix J — WET Test Summary

Scheduled	Duration	Organism	Endpoint	NOEC	LOEC	PMSD	Effluent Survival (100%)	Met Performance Standard?
		Atherinops affinis	96-Hour Survival	100%	>100%	n/a		
2019 November	Acute	topsmelt					90.0%	Yes
		Atherinops affinis	7-Day Survival	75%	100%	n/a		
2019 November	Chronic	topsmelt	7-Day Biomass	75%	100%	22.10%	N/A	Yes
			7- Day Weight	100%	>100	35.90%		
		Americamysis bahia	7-Day Survival	3.7%	10.0%	27.03%		
2019 July	Chronic	Mysid Shrimp	7-Day Biomass	1.1%	3.7%	90.91%	N/A	**No
			7- Day Weight	10.0%	>10	10.00%		
		Americamysis bahia	Survival	12.5%	25	68.4%		
2019 July	Acute	Mysid Shrimp					30.0%	*No
		Atherinops affinis	96-Hour Survival	75%	100%	9.6%		
2019 April	Acute	topsmelt					7.5%	*No
		Atherinops affinis	7-Day Survival	30%	75%	n/a		
2019 April	Chronic	topsmelt	7-Day Biomass	30%	75%	15.30%	N/A	Yes
			7- Day Weight	75%	100%	15.50%		
		Americamysis bahia	48-Hour Survival	100%	>100%	4.6%		
2019 January	Acute	Mysid Shrimp					92.5%	Yes
		Americamysis bahia	7-Day Survival	3.7%	10	14.7%		
2017 January	Acute	Mysid Shrimp	7-Day Biomass	3.7%	10	13.8%	N/A	Yes
			7- Day Weight	3.7%	10	15.9%		
		Americamysis bahia	48-Hour Survival	25%	50%	12.7%		
2017 January	Acute	Mysid Shrimp					27.5%	*No
		Americamysis bahia	48-Hour Survival	25%	50%	11.3%		
2016 August	Acute	Mysid Shrimp					32.5%	*No
		Americamysis bahia	7-Day Survival	1.1%	3.70%	17.3%		
2016 February	Chronic	Mysid Shrimp	7-Day Biomass	3.7%	10%	25.0%	N/A	**No
			7- Day Weight	10.0%	>10%	31.4%		
		Atherinops affinis	96-Hour Survival	50%	100%	9.3%		
2016 June	Acute	topsmelt					30.0%	*No
		Atherinops affinis	7-Day Survival	30%	100%	12.5%		
2016 June	Chronic	topsmelt	7-Day Biomass	30%	100	16.7%	N/A	Yes
			7- Day Weight	30%	>30	16.3%		
		Atherinops affinis	7-Day Survival	100%	>100	17.5%		
2015 November	Chronic	topsmelt	7-Day Biomass	100%	>100	26.20%	N/A	Yes
			7- Day Weight	100%	>100	24.80%		
		Atherinops affinis	96-Hour Survival	100%	>100%	14.7%		
2015 November	Acute	topsmelt					85.0%	Yes
		Americamysis bahia	48-Hour Survival	25%	50%	17.5%		
2015 August	Acute	Mysid Shrimp					17.5%	*No
		Americamysis bahia	7-Day Survival	1.1%	3.7	19.6%		
2015 August	Chronic	Mysid Shrimp	7-Day Biomass	1.1%	3.7	23.2%	N/A	**No
			7- Day Weight	1.1%	>10	33.0%		
		Atherinops affinis	7-Day Survival	30%	>100%	16.2%		
2015 June	Chronic	topsmelt	7-Day Biomass	100%	>100%	29.7%	N/A	Yes
			7- Day Weight	100%	>100%	22.9%		
		Atherinops affinis	96-Hour Survival	100%	>100%	5.6%		
2015 January	Acute	topsmelt					100.0%	Yes
		Atherinops affinis	7-Day Survival	100%	>100%	9.7%		
2015 January	Chronic	topsmelt	7-Day Biomass	100%	>100%	15.2%	N/A	Yes
			7- Day Weight	100%	>100%	16.0%		
		Americamysis bahia	48-Hour Survival	12.5%	25%	13.7%		
2015 January	Acute	Mysid Shrimp					2.5%	*No
		Americamysis bahia	7-Day Survival	10%	30%	15.1%		
2014 December	Chronic	Mysid Shrimp	7-Day Biomass	10%	30%	19.2%	N/A	Yes
			7- Day Weight	10%	30%	22.7%		
		Americamysis bahia	48-Hour Survival	50%	100%	7.5%		
2014 December	Acute	Mysid Shrimp					52.5%	*No
		Atherinops affinis	7-Day Survival	100%	>100%	8.2%		
2014 December	Chronic	topsmelt	7-Day Biomass	100%	>100%	16.3%	N/A	Yes
			7- Day Weight	100%	>100%	18.6%		
		Americamysis bahia	48-Hour Survival	3.7%	40%	10.9%		
2014 December	Acute	Mysid Shrimp					20.0%	*No

2014 August	Acute	*Atherinops affinis* topsmelt	96-Hour Survival	50%	100%	8.9%	20.0%	*No
2014 August	Chronic	*Atherinops affinis* topsmelt	7-Day Survival	30%	100%	13.0%	N/A	Yes
			7-Day Biomass	30%	100%	13.50%		
			7- Day Weight	100%	>100%	31.20%		
2014 August	Acute	*Americamysis bahia* Mysid Shrimp	48-Hour Survival	3.7%	12.5	12.1%	0.0%	*No
2014 August	Chronic	*Americamysis bahia* Mysid Shrimp	7-Day Survival	3.7%	10.0%	14.9%	N/A	**No
			7-Day Biomass	1.1%	3.7%	13.90%		
			7- Day Weight	3.7%	10.0%	18.20%		
2014 June	Chronic	*Americamysis bahia* Mysid Shrimp	7-Day Survival	1.1%	3.7%	10.5%	N/A	**No
			7-Day Biomass	1.1%	3.70%	12.6%		
			7- Day Weight	3.7%	>3.7	17.9%		
2014 April	Acute	*Atherinops affinis* topsmelt	96-Hour Survival	50%	100%	8.3%	0.0%	*No
2014 April	Acute	*Americamysis bahia* Mysid Shrimp	48-Hour Survival	12.5%	25%	15.1%	2.5%	*No
2014 April	Chronic	*Americamysis bahia* Mysid Shrimp	7-Day Survival	<6.25%	6.25%	17.5%	N/A	Unkown
			7-Day Biomass	<6.25%	6.25%	22.30%		
			7- Day Weight	6.25%	12.50%	40.10%		
2014 April	Chronic	*Atherinops affinis* topsmelt	7-Day Survival	50%	100%	21.2%	N/A	No
			7-Day Biomass	50%	100%	21.70%		
			7- Day Weight	50%	>50	22.30%		

Appendix K — Monitoring Reduction for Exemplary Performance

Table 20 Monitoring Reduction for Exemplary Performance

Parameter	Baseline Monitoring Frequency	Previous Permit Monitoring Frequency	Long Term Average (lbs/day)	Previous Average Monthly Limit (lbs/day)	Ratio of Long Term Average to the Average Monthly Limit	Guidance Monitoring Frequency Recommendations	Proposed Monitoring Frequencies
BOD5	2/Week	2/Week	45	407	11%	1/mos	1/wk
COD	7/Week	7/Week	579	2805	21%	1/wk	3/wk
TSS	7/Week	7/Week	102	325	31%	3/wk	7/wk
O&G	7/Week	7/Week	21	121	17%	1/wk	7/wk
Phenolic Compounds	1/Week	1/Week	0.38	2.4	16%	1/2mos	1/wk
Ammonia as N	5/Week	5/Week	5.1	248	2%	1/wk	3/wk
Sulfide	1/month	1/month	0.66	2	33%	1/6mos	1/mo
Hexavalent Chromium	2/year	2/year	0.001	0.85	0%	No Guidance	annually
Fecal Coliform	2/Week	2/Week	20	200	10%	1/mos	2/wk

Appendix L — Response to Comments

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