INVESTIGATION AND RESPONSE PLAN
SWMU 14 - OILY WATER SEWER
PHILLIPS 66 FERNDALE REFINERY
3901 UNICK ROAD
FERNDALE, WA 98248

Prepared for:

Industrial Section
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January 11, 2022

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1.0 INTRODUCTION

This Investigation and Response Plan (Plan) has been prepared by the Phillips 66 Ferndale Refinery in accordance with the requirements in Agreed Order No. DE 16297 (AO). The specific requirements for this Plan are listed in Section VII.A of the AO. This Plan describes the measures that will be taken to investigate the Oily Water Sewer (OWS) and respond to releases or threatened releases, if any, that are discovered during the investigation.

The purpose of the Agreed Order is provided on Page 3 of the AO:

"*This Order requires Phillips 66 to conduct an interim action at the Oily Water Sewer (OWS) that includes the inspection of all major trunk lines for releases or threatened releases, addressing the cause of the releases or threatened releases, and implementing interim remedial actions, if necessary, consistent with the requirements of the Model Toxics Control Act (MTCA), RCW 70.105D, and its implementing regulations at WAC 173-340, in order to ensure that there is no threat to human health due to direct contact exposure and to minimize the migration of contaminants. The interim action at the OWS also includes tracking and reporting of releases and financial assurance.*"

Per the AO Section VII.A:

"Investigation and Response Plan – Prepare a plan to investigate the OWS and develop a plan to respond to any releases or threatened releases from the OWS that are discovered during the investigation."

2.0 SEWER INSPECTIONS

Per the AO, inspections are required to be conducted on major OWS trunk lines.

2.1 INSPECTION MAP AND SCHEDULE

Per the AO Section VII.A(1): *"The Investigation and Response Plan shall include: A proposed schedule and map showing the segments of the OWS that will be inspected each year."*

A map of the major OWS trunk lines is provided as Figure 1. Figure 1 also shows the proposed inspection schedule for the major trunk lines. Table 1 lists manholes that will be inspected and Table 2 lists the sewer line segments that will be inspected as part of this Plan. Table 1 and Table 2 also include the proposed inspection schedule.

2.2 INSPECTION METHODS

Per the AO Section VII.A(2): *"The Investigation and Response Plan shall include: The procedures that will be followed to inspect the internal integrity of all major trunk lines of the OWS (as depicted on the map in Exhibit A) over a 10-year cycle."*

The internal integrity of the oily water sewer trunk lines shown on Figure 1 will be evaluated by inspecting the OWS using hydrostatic testing, camera, use of tracers, a combination of these methods, or an equivalent method approved by the Washington Department of Ecology (Ecology). The inspection data will be gathered in a way that ensures the data related to the conditions within the pipe are collected in a consistent a reliable manner. Sewer defects will be accurately coded and assigned a condition grade in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP).

The refinery plans on utilizing sewer camera inspections as the preferred inspection method, however, limitations on the use of sewer cameras may occur due to the nature of the liquids in the sewer (highly corrosive, toxic, and flammable), the continuous operation of the refinery and flow in the OWS, the depth to the OWS, and the

risk to personnel from sewer gases. In the event that, due to safety concerns, sewer camera inspections cannot be conducted on OWS trunk lines, an alternate inspection methodology may be used. Prior to using a methodology other than hydrostatic testing, camera, use of tracers, or a combination of these methods, the inspection procedures will be provided to Ecology.

2.3 INSPECTION PROCEDURES

Per the AO Section VII.A(3): *"The Investigation and Response Plan shall include: The method(s) that will be used to assess the internal integrity of the major trunk lines of the OWS. The integrity assessment must include hydrostatic testing, camera, use of tracers, a combination of these methods, or an equivalent method approved by Ecology capable of assessing the integrity of the system and identifying areas where releases may have occurred or are ongoing. The method(s) used to assess sewer integrity shall be appropriate for the type of pipe and shall follow standard industry protocols and good engineering practices."*

In order to conduct camera inspections of the OWS trunk lines, the sewers must be cleaned and bypassed prior to inspection. Sewer cleaning involves using high pressure water or other methods to flush solids from the sewer lines. The solids are then removed using vacuum trucks.

Bypassing sewer lines allows the camera to fully inspect the internal integrity of the lines as the normal sewer flow is pumped around the sewer segment being inspected. Bypassing involves temporarily blocking the sewer flow using a plug or other means and pumping the oily water through temporary pipes to a downstream location.

Plant operating conditions and weather (particularly high precipitation events) can create dangerous conditions during the bypassing operations. Bypass operations must be carefully planned and monitored to minimize the safety risk. There may be sewers that cannot be safely bypassed during particular times of the year or, due to the type and composition of the sewer flow, may not be able to be safely bypassed at all. If sewers are unable to be bypassed safely, an alternate inspection methodology may be used. These methods include hydrostatic testing, use of tracers, a combination of these methods, or an equivalent method approved by Ecology. If an alternate inspection methodology is used, the inspection procedures will be provided to Ecology.

3.0 RESPONSE TO POTENTIAL RELEASES

Per the AO Section VII.A(4): *"The Investigation and Response Plan shall include: Where the integrity testing identifies potential leaks in the OWS, procedures for determining whether a release to the environment has occurred."*

3.1 SITE CHARACTERIZATION

If a potential release is identified during the sewer inspection, a site characterization investigation will be initiated. A potential release includes a sewer defect which indicates that the sewer has failed and there is the potential for contaminants from the oily sewer to impact soil or groundwater. If a potential release of hazardous substances is discovered during the sewer inspection, a site characterization will be conducted to investigate the nature of the release as well as the horizontal and vertical extent of the release.

Site characterization activities will be conducted in accordance with WAC 173-340-350 (6) and (7) and Ecology's Guidance for Remediation of Petroleum Contaminated Sites (Publication 10-09-057) (Guidance).

The site characterization investigation will include the collection of soil and groundwater sample(s) (if groundwater is present) to determine whether the soil or groundwater exceed the target cleanup levels specified in Section 3.5 of this Plan. Samples will be collected in close proximity (as allowed by site conditions) to the identified potential release location. Soil samples may be collected from a test pit or soil boring. Standard operating procedures for field screening of soil samples are included in Appendix A.

The site characterization investigation may also include other methods for determining whether a leak has occurred. These other methods include soil gas surveys, ground penetrating radar investigations, or infrared energy pattern analysis.

3.2 SAMPLING AND ANALYSIS PLAN

For each potential release, Phillips 66 will prepare a concise sampling and analysis plan (SAP) that is generally consistent with the Guidance Table 6.4. The SAP will describe the number of soil samples to be collected, the depth and lateral extent of sample locations, the methods of sample collection, the constituents of concern and laboratory analytical methods, and QA/QC procedures.

The SAP will describe the number of groundwater monitoring wells to be installed, the locations of the wells, the depth of the screened portions of the wells, the methods of well development, the methods of groundwater sample collection, the schedule for groundwater sample collection, the constituents of concern and laboratory analytical methods, and QA/QC procedures.

The SAP prepared for each potential release from the oily water sewer will evaluate the soil and groundwater contaminants of concern listed in Table 7.2 of the Guidance. The SAP will include contaminants known or suspected of being present in the wastewater conveyed by the specific section of oily water sewer piping, including "Other Site Contaminants" such as PFAS if appropriate for the particular section of piping.

3.3 SOIL INVESTIGATION

Per the AO Section VII.A(7): *"The Investigation and Response Plan shall include: Procedures for determining the nature and extent of soil contamination related to releases from the OWS in accordance with WAC 173-340-350(6) and (7) and Ecology's Guidance for Remediation of Petroleum Contaminated Sites, 2016, Publication No. 10-09-057 and the proposed schedule for implementing these procedures. Ecology may later approve changes to the schedule for individual releases."*

The geologic units underlying the Ferndale Refinery have been mapped in detail. A description of the geology is provided in Appendix B. Soil investigations undertaken at the site will attempt to adequately characterize the horizontal and vertical distribution and concentrations of contaminants of concern due to releases from the OWS.

As part of the site characterization activities, the geology at the suspected release location will be investigated to determine migration potential and pathways. The geology of the site and the horizontal and vertical distribution of soil contamination will allow for the preparation of a conceptual site model which will be used to determine data gaps and the feasibility of remedial actions for the site.

During the site characterization, an investigation schedule will be created or updated to reflect the estimated time frame needed to assess and determine the nature and extent of soil contamination. The schedule and the status of on-going investigations will be provided in the annual reports submitted to Ecology.

3.4 GROUNDWATER INVESTIGATION

Per the AO Section VII.A(8): *"The Investigation and Response Plan shall include: Methods for assessing whether or not groundwater has been impacted, including, but not limited to, the shallow uppermost aquifer. Groundwater quality shall be compared with the groundwater cleanup standards in WAC 173-340-720."*

And per AO Section VII.A(9): *"Procedures for implementation of a groundwater monitoring program when an impact to groundwater from an OWS release has been identified."*

And per AO Section VII.A(10): "Procedures for determining the nature and extent of groundwater contamination from an OWS release in accordance with WAC 173-340-350(7) and Ecology's Guidance for Remediation of Petroleum Contaminated Sites, 2016, Publication No. 10-09-057 and the proposed schedule for implementing these procedures. Ecology may later approve changes to the schedule for individual releases."

The hydrogeologic units underlying the Ferndale Refinery have been mapped in detail. A description of the hydrogeology is provided in Appendix B.

Standard operating procedures for groundwater monitoring well installation, development, and sampling are included in Appendix A.

For purposes of this IRP, groundwater is defined as the uppermost aquifer. The uppermost aquifer will be the aquifer nearest the ground surface which yields significant amounts of groundwater. If the uppermost aquifer can be used for potable groundwater

in accordance with WAC 173-340-720(2), groundwater remediation levels will be based on potential use of the aquifer for drinking water use.

Groundwater investigations conducted in response to releases from the OWS will attempt to adequately characterize the horizontal and vertical distribution of contaminants of concern in the uppermost aquifer. The hydrogeology of the site will be investigated to determine groundwater flow rate and direction, which will allow for the preparation of a conceptual site model to be used in determining data gaps and the feasibility of remedial actions at the site.

During the site characterization, an investigation schedule will be created or updated to reflect the estimated time frame needed to assess and determine the nature and extent of groundwater contamination. The schedule and the status of on-going investigations will be provided in the annual reports submitted to Ecology.

3.5 CLEANUP LEVELS

For the purposes of this Plan, the MTCA Method C Cleanup Levels for soil (developed in accordance with WAC 173-340-745) and the MTCA Method A Cleanup Levels for groundwater (developed in accordance with WAC 173-340-720) will be considered the interim remedial action levels. Soil or groundwater contaminant concentrations discovered during this investigation which exceed the interim remedial action levels will be reported, mitigated, and/or remediated in accordance with the Interim Action requirements of Section VII.B in the AO.

3.6 CONTAMINANTS OF CONCERN

Contaminants of concern at the site include gasoline and diesel range total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), and metals. Table 7.2 from the Guidance titled *Best Management Practices Testing Recommendations for Various Petroleum Products* lists contaminants of concern for waste oil and crude oil.

The SAP prepared for each potential release from the oily water sewer will list the soil and groundwater contaminants of concern as listed in Table 7.2 of the Guidance. The SAP will include contaminants known or suspected of being present in the wastewater

conveyed by the specific section of oily water sewer piping, including “Other Site Contaminants” such as PFAS, if appropriate for the particular section of piping.

4.0 SEWER REPAIR MEASURES

Per the AO Section VII.A(5): *"The Investigation and Response Plan shall include: Implementation of measures to correct the cause of the release or threatened release."*

There are numerous types of sewer integrity problems that could potentially be encountered during the sewer inspection which include:

- Cracks in sewer lines
- Corrosion of sewer lines
- Displacement of bell and spigot joints (either vertical or horizontal)
- Crushed or collapsed sewer lines
- Sewer line/manhole joint leakage
- Manhole riser leaks
- Cracks or severe spalling in concrete manholes
- Build-up of sediment in sewer line causing flow restriction
- Bellies in sewer line
- Damage to underground sewer lines from nearby construction
- Infiltration of perched water into the sewer system
- Exfiltration of sewer water into trench backfill

If a potential or threatened release is identified during sewer inspection activities, the potential or threatened release will be investigated and/or characterized in accordance with Section 3.0 of this Plan. Should a release be confirmed per Section 3.0, P66 will prepare a repair plan for the sewer. The repair plan will evaluate the severity of the release, the accessibility of the sewer in the release location, the potential impact to human health or the environment, and the feasibility of the repair options coupled with required remedial action at the release location.

There are numerous repairs which may be considered for releases including:

- Line abandonment
- Replacement
- External encasement or patching of sewer line at the release location
- In situ repair methods including liner installation or grouting

Repairs may be prioritized on portions of the oily water sewer that may pose a more immediate threat to human health or the environment due to the characteristics of the oily water sewer or due to the proximity of the sewer to potential receptors.

Inaccessible sewers may not be able to be repaired due to the presence of structures or utilities at the release location. Release mitigation measures, including ongoing monitoring, will be put in place for inaccessible sewers. The mitigation measures will include measures to assess and prevent the migration of soil and groundwater contamination.

5.0 WORKPLAN SUBMITTAL

Per the AO Section VII.A(11): *"The Investigation and Response Plan shall include: Provisions for submittal of a work plan to Ecology within 60 days of completing the site characterization and before initiating one of the presumptive interim actions referenced in Section VII.B. or within 120 days of completing the site characterization and before initiating an interim action, as provided in Section VII.B."*

And per AO Section VII.B: "Implementing Interim Actions – Should data obtained under the Investigation and Response Plan show that a release or releases of hazardous substances above applicable MTCA cleanup standards from the OWS has occurred, Phillips 66 shall implement an Interim Action to address the release or releases to the extent areas are accessible."

Following completion of the site characterization work, a workplan for initiating an interim remedial action will be submitted to Ecology within 120 days. If a presumptive interim action is selected, the workplan will be submitted to Ecology within 60 days of the completion on the site characterization work.

The interim remedial actions for accessible portions of the site will be conducted in accordance with Section VII.B of the AO. If contamination is inaccessible due to the presence of buildings, utilities, roadways, process equipment, or other structures, measures will be implemented to assess and prevent the risk of migration of soil and groundwater contamination in accordance with Section 7.0 of this Plan.

The workplan for initiation of interim remedial actions for accessible portions of the site that are not following one of the presumptive interim actions described in the AO will provide the information required by WAC 173-340-430(7) including site overview, sampling and analysis plan, evaluation of cleanup standards, description of interim action, proposed schedule for implementing the interim action, compliance monitoring, and description of the reporting and documentation required during the interim action.

The workplan for initiation of interim remedial actions for accessible portion of the site that are following one of the presumptive interim actions in the AO will provide the results of the site characterization, procedures for remediation of contaminated soil

and contaminated groundwater, the presumptive interim action that is being implemented, and the schedule for implementing the remedial action.

6.0 INACCESSIBLE CONTAMINATION

Per the AO Section VII.A(12): *"The Investigation and Response Plan shall include: Measures to assess and prevent the risk of migration of soil and groundwater contamination in inaccessible areas."*

If contamination discovered during the site characterization is inaccessible due to the presence of buildings, utilities, roadways, process equipment, or other structures, measures will be implemented to assess and prevent the risk of migration of soil and groundwater contamination.

Point of compliance monitoring will be conducted to verify that inaccessible contamination is not migrating and posing a threat to groundwater. Institutional or engineered controls may be implemented to reduce site risk or to prevent or limit the movement of, or the exposure to, hazardous substances. The type of controls implemented will depend on the site conditions and the location of the contamination in relation to groundwater or other receptors. Some measures which may be used to reduce the risk of the migration of soil and groundwater in inaccessible areas include:

- Capping or paving the site to reduce groundwater infiltration
- Groundwater extraction systems to collect contaminated groundwater
- Other in situ remediation systems (vapor extraction, air sparge, injection methods, etc.)
- Monitored natural attenuation
- Other effective methods for reducing the quantity, migration risk, or toxicity or inaccessible contamination

7.0 DOCUMENTATION AND REPORTING

Per the AO Section VII (A)(6): *"The Investigation and Response Plan shall include: Procedures for reporting any releases of hazardous substances from the OWS that are discovered in accordance with WAC 173-340-300(2), including providing written notification to Ecology within 90 days of discovery, the location and circumstances of the release, and any remedial actions planned, completed, or underway, to the extent known. Phillips 66 may refer to the work plan required in Section VII.B. in the report."*

And per AO Section VII.A(13): "The Investigation and Response Plan shall include: Procedures for documenting inspection dates, findings, the location of a release, the cause of a release or threatened release, corrective actions or interim measures taken or planned, and areas where soil or groundwater contamination is left in place."

And per AO Section VII.C: "Annual Progress Report – Phillips 66 shall submit an annual progress report to Ecology by April 1st of each year following implementation of the Investigation and Response Plan."

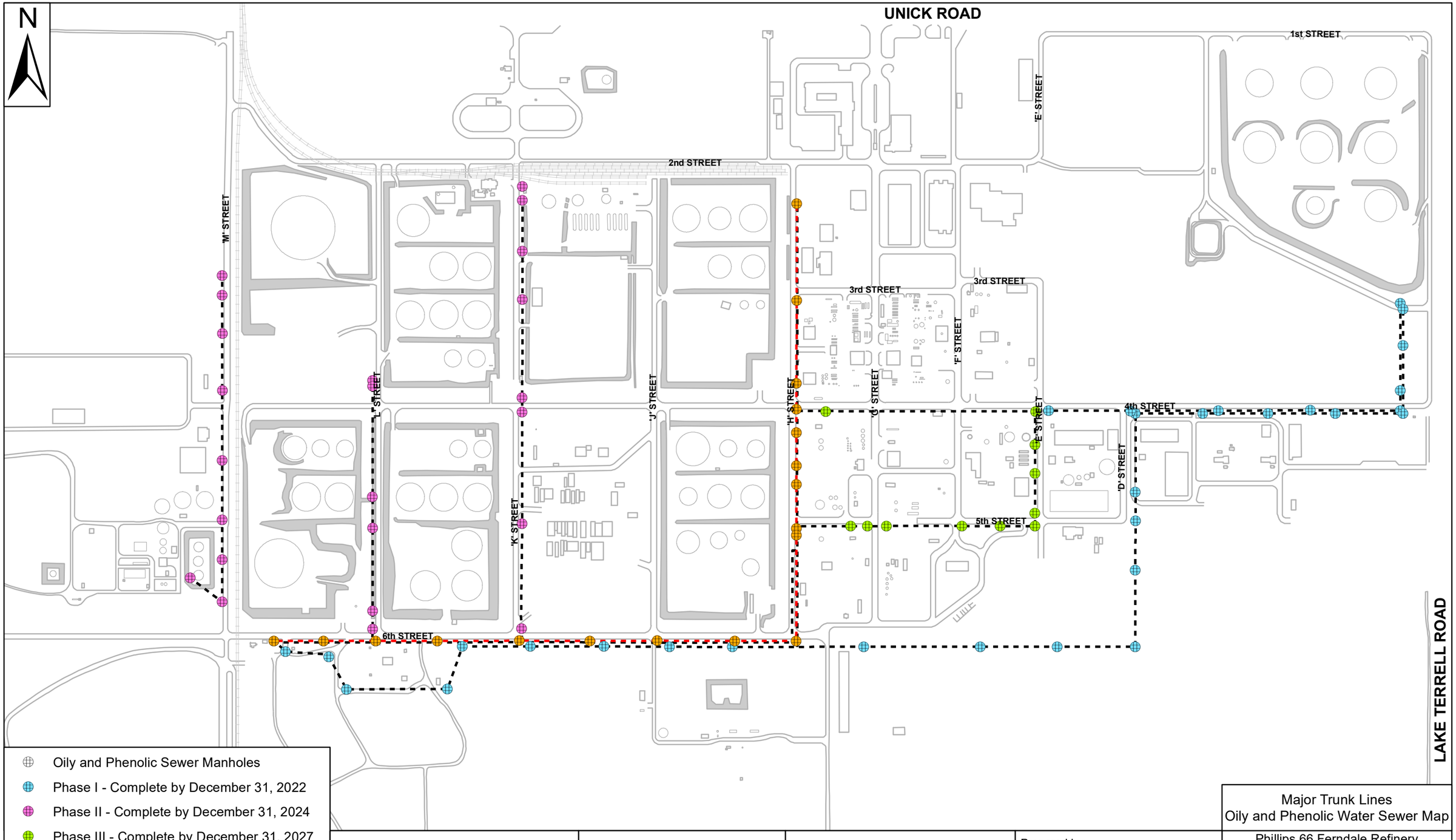
Work completed as part of the investigation and response plan scope will be documented in the facility record. This documentation will include inspections, findings, and corrective or interim actions taken. The documentation will include dates, findings, and locations of activities conducted as part of this Plan. Camera inspections will be documented by retaining video records and by plotting known defects along with the condition grade onto a site map. Other required inspection records will also be kept and known defects identified and/or confirmed through these other inspection methods will also be plotted on a site map. The location of inspections, releases (or threatened releases), corrective actions, and areas where soil and groundwater contamination is left in place will be documented in the facility Geographic Information System (GIS).

Environmental sampling data will be submitted to Ecology in both printed form and entered into the Environmental Information Management (EIM) database per Section VIII.E of the Agreed Order.

Releases from the OWS discovered during the implementation of this Plan will be reported to Ecology within 90 days of discovery. The release report will include the

location and circumstance of the release and remedial actions planned, completed, or underway.

An annual progress report will be submitted to Ecology by April 1st for the prior year. The progress report will include the items specified in AO Section VII.C.



- Oily and Phenolic Sewer Manholes
- Phase I - Complete by December 31, 2022
- Phase II - Complete by December 31, 2024
- Phase III - Complete by December 31, 2027
- Phase IV - Complete by December 31, 2029
- Oily Water Sewer Major Trunk Lines
- Phenolic Sewer Major Trunk Lines

Phillips 66 Base Map:
Carbon Canister and Conservation Vent Location Map
(27-BS-207 R.7)

All data are approximate and should be used for relative location reference only.

0 200 400 600 800 Feet

1 inch = 400 feet

Prepared by:

PHILLIPS 66

Major Trunk Lines
Oily and Phenolic Water Sewer Map

Phillips 66 Ferndale Refinery
3901 Unick Road
Ferndale, WA 98248

Prepared on:
06/11/21

Figure 1

Table 1. P66 Oily Water Sewer - Manhole Inspection Schedule

Manhole ID	Associated Sewer	Location Description	Plant Coordinates (x)	Plant Coordinates (y)	Reference Map	Rim Elevation	Invert Elevation (in)	Invert Elevation (out)
Phase I - Complete by December 31, 2022								
MH 4C-1	OWS	In field south of Crude Hill	165	1205	27-AS-167	NS	208.17	208.17
MH 4C-FS (X-3)	OWS	In field south of Crude Hill	165	1585	27-AS-167	197.67	193.57	193.52
MH 2-4-1	OWS	East of 4th and A St.	165	1670	27-AS-168	195.50	191.58	191.48
MH 3-4-1	OWS	4th St., N of PSE Cogen	556	1670	27-AS-169	192.81	188.72	188.72
MH 6-4-1	OWS	4th St., N of PSE Cogen	956	1670	27-AS-169	191.00	186.81	186.71
MH 7-4-1	OWS	4th and D St intersection	1338	1670	27-AS-170	188.50	185.20	185.10
MH 9-4 FS	OWS	4th and E St. intersection	1695	1670	27-AS-170	190.25	183.88	183.78
MH X-1	OWS	In field south of Crude Hill	152.5	1248	27-AS-167	NS	NS	NS
MH X-2	OWS	In field south of Crude Hill	152.5	1400	27-AS-167	NS	NS	NS
MH STA. 36 + 62 (X-7)	OWS	East of 4th and A St.	152.5	1682	27-AS-168	196.00	190.77	190.55
MH STA. 33 + 68 (X-8)	OWS	4th St., N of PSE Cogen	447	1682	27-AS-168	194.00	188.43	188.43
MH STA. 30 + 74 (X-9)	OWS	4th St., N of PSE Cogen	744	1682	27-AS-169	192.00	186.32	186.32
MH STA. 27 + 90 (X-10)	OWS	4th St., N of PSE Cogen	1025	1682	27-AS-169	191.00	184.27	184.27
MH STA. 24 + 97 (X-11)	OWS	4th and D St intersection	1318	1682	27-AS-170	190.00	182.16	182.16
MH STA. 21 + 55 (X-12)	OWS	N. of 5th and D St. intersection	1318	2024	27-AS-170	187.00	179.91	179.91
New MH (X-12.2)	OWS	East of 5th and D	1318	2149.5	27-AS-170	NS	179.19	179.19
MH STA. 18 + 15 (X-13)	OWS	South of Switchhouse #1	1318	2364	27-AS-192	182.00	177.87	177.87
MH STA. 14 + 83 (X-14)	OWS	In field south of Switchhouse #1	1318	2696	27-AS-197	181.00	175.45	175.43
MH STA. 11 + 45 (X-15)	OWS	In field south of Bunkers	1658	2696	27-AS-197	180.00	175.02	175.02
MH STA. 8 + 08 (X-16)	OWS	In field south of SFOC	1993	2696	27-AS-198	183.00	174.62	174.62
MH STA. 3 + 08 (X-17)	OWS	South of 6th and G St.	2493	2696	27-AS-199	186.00	174.02	174.02
MH 9 FS	OWS	6th St., between J and H Streets	3070	2696	27-AS-199	175.98	170.98	170.98
MH 10-FS	OWS	6th and J St. intersection, SE side	3345	2696	27-AS-200	177.87	169.71	169.71
MH 11-FS	OWS	6th St., between J and K Streets	3630	2696	27-AS-200	179.82	168.98	168.98
MH 12-FS	OWS	6th and K St. intersection, SE side	3950	2696	27-AS-201	183.00	168.19	168.19
MH 13-FS	OWS	6th St., between L and K Streets	4246	2696	27-AS-201	181.45	167.45	167.45
MH G (X-22)	OWS	South of 6th St., east of OPL	4311	2880	27-AS-201	185.34	166.96	166.96
MH F (X-23)	OWS	South of 6th St., SW corner of OPL	4750	2880	27-AS-202	NS	160.50	163.00
MH E (X-24)	OWS	South of 6th St., west of OPL	4828	2740	27-AS-202	NS	162.50	159.00
MH CC (X-25)	OWS	South of 6th St., near liftstation	5030	2724	27-AS-203	NS	155.50	158.00

Table 1. P66 Oily Water Sewer - Manhole Inspection Schedule

Manhole ID	Associated Sewer	Location Description	Plant Coordinates (x)	Plant Coordinates (y)	Reference Map	Rim Elevation	Invert Elevation (in)	Invert Elevation (out)
Phase II - Complete by December 31, 2024								
MH 5K-RE	OWS	K St., east of LPG tanks	3986	694	27-AS-150	195.00	186.82	186.03
MH 5K-FS	OWS	K St., east of LPG tanks	3986	754	27-AS-150	194.25	NS	NS
MH 6K-FS	OWS	K St., NE of Tank 800x143	3986	976	27-AS-150	192.50	184.09	184.09
MH 7K-RE	OWS	K. St., NE of Tank 800x145	3986	1185	27-AS-161	191.50	181.70	181.60
MH 7K-FS	OWS	N of 4th and K St intersection	3986	1612	27-AS-161	187.72	179.06	179.06
MH 9K-RE	OWS	S of 4th and K St intersection	3986	1676	27-AS-174	187.00	178.66	178.56
MH 11K-RE	OWS	K St., NE of Tank 900x1	3986	2162	27-AS-188	189.54	175.65	175.55
MH 13K-FS	OWS	6th and K St. intersection	3986	2620	27-AS-188	183.72	NS	NS
MH 1L-1RE	OWS	6th and K St. intersection	3986	1549	27-AS-160	NS	NS	NS
MH 1L-FS	OWS	NW of 4th and L St.	4637	1564	27-AS-160	185.34	NS	NS
MH 6L-RE	OWS	L St., W. of 800x150	4637	2044	27-AS-175	115.50	171.85	171.75
MH 6L-FS	OWS	L St., E of Tank 100x91	4637	2181	27-AS-187	175.19	NS	NS
MH 7L-FS	OWS	M St., SW of Tank 900x3	4637	2540	27-AS-187	171.50	167.25	166.29
MH 10L-FS	OWS	6th and L St. intersection	4637	2620	27-AS-187	174.96	NS	NS
MH 10M DET. #3	OWS	M St., SW of Tank 6000x1	5292	1084	27-AS-152	167.00	162.60	162.60
MH 10M-A	OWS	M St., SW of Tank 6000x1	NLR	NLR	27-AS-159	NS	165.19	165.19
MH 8M DET. #3	OWS	M St., North of 4th Street	5292	1334	27-AS-159	166.00	160.74	160.72
MH 6M DET. #3	OWS	M St., north of Dewatering Basin	5292	1586	27-AS-159	166.00	158.86	158.84
MH 4M DET. #3	OWS	M St., SW of Tank 550x105	5292	1884	27-AS-176	163.00	156.61	156.59
MH 2M DET. #3	OWS	M St., at WWTP entrance	5292	2143	27-AS-176	160.00	154.59	154.59
MH 1M	OWS	M St., East of Tank 100x95	5292	2318	27-AS-186	158.00	152.28	152.25
MH 2T-FS	OWS	M St., SE of Tank 100x99	5292	2502	27-AS-186	156.54	151.90	150.44
MH 5T	OWS	Inside berm SW of Tank 100x99	5430	2398	NMR	153.50	149.84	148.91

Table 1. P66 Oily Water Sewer - Manhole Inspection Schedule

Manhole ID	Associated Sewer	Location Description	Plant Coordinates (x)	Plant Coordinates (y)	Reference Map	Rim Elevation	Invert Elevation (in)	Invert Elevation (out)
Phase III - Complete by December 31, 2027								
MH 12-4	OWS	5th and G St. intersection, W side	2664	1673	27-AS-172	NS	NS	NS
MH 9-4	OWS	4th and E St. intersection, W side	1752	1674	27-AS-170	171.50	183.44	183.34
MH 1E-FS	OWS	E St., SE of Tank 50x306	1754	1817	27-AS-170	188.79	NS	NS
MH 1E-1	OWS	E St., south of Tank 50x306	1754	1942	27-AS-170	187.00	181.09	181.04
MH 1B-E	OWS	5th and E St. intersection, N side	1754	2114	27-AS-170	184.00	179.67	179.67
MH 7-5	OWS	5th and E St. intersection, S side	1754	2172	27-AS-192	183.50	179.30	178.96
MH 3-5-FS	OWS	5th St., between F and E Streets	1905	2172	27-AS-191	186.50	NS	NS
MH 4-5	OWS	5th and F St. intersection, S side	2071	2172	27-AS-191	189.78	178.17	177.50
MH 9-5	OWS	5th and G St. intersection, E side	2399	2172	27-AS-191	189.66	177.01	177.01
MH 1-5	OWS	5th and G St. intersection	2485	2170	27-AS-190	189.74	176.90	176.82
MH 1-5-FS	OWS	West of 5th and G	2557	2170	27-AS-190	186.82	176.80	176.26

Table 1. P66 Oily Water Sewer - Manhole Inspection Schedule

Manhole ID	Associated Sewer	Location Description	Plant Coordinates (x)	Plant Coordinates (y)	Reference Map	Rim Elevation	Invert Elevation (in)	Invert Elevation (out)
Phase IV - Complete by December 31, 2029								
MH 2H	OWS	H St., NE of Tank 800x141	2789	782	27-AS-148	199.11	191.36	191.20
MH 2H-FS	OWS	H St., SE of Tank 800x142	2789	902	27-AS-148	193.81	NS	NS
MH 3H-FS	OWS	3rd and H St. intersection, N side	2789	1113	27-AS-148	191.73	NS	NS
MH 4H-RE	OWS	3rd and H St. intersection, S side	2789	1180	27-AS-163	190.23	187.46	184.38
MH 4H-FS	OWS	H St., north of 4th St	2789	1513	27-AS-163	186.91	179.53	179.50
MH 8H-1	OWS	4th and H St. intersection, S side	2789	1673	27-AS-172	184.10	177.12	176.49
MH 8H-FS	OWS	H St., NE of Tank 300x35	2789	1766	27-AS-172	183.25	176.30	175.78
MH 8A-H-1	OWS	H St., SE of Tank 300x35	2789	1877	27-AS-172	181.62	NS	NS
MH 10H-1	OWS	5th and H St. intersection, S side	2789	2170	27-AS-190	180.75	175.15	175.05
UK-MH-1 OW	OWS	H St., south of H and 5th	2789	2275	27-BS-460	Unk	Unk	Unk
MH 4-6-1	OWS	6th and H St. intersection, S side	2779	2696	27-AS-199	177.45	172.25	172.25
MH (unnumbered MH)	OWS	H St., SE of Tank 100x93	2810	2279	27-BS-460	Unk	Unk	Unk
MH (unnumbered MH)	OWS	Corner of 6th and H Streets	2812	2653	27-BS-461	Unk	Unk	Unk
MH 3-6-FS	OWS	6th and H St. intersection, S side	2796	2677	27-AS-199	177.66	166.91	166.13
MH 6-6	OWS	6th St., between J and H Streets	3069	2624	27-AS-199	177.00	165.05	165.03
MH 9-6	OWS	6th and J St. intersection, SE side	3365	2676	27-AS-200	177.00	166.42	163.77
MH 16-6	OWS	6th St., between J and K Streets	3680	2676	27-AS-200	179.00	162.59	162.57
MH 21-6	OWS	6th and K St. intersection, SE side	3986	2676	27-AS-201	183.00	161.37	161.35
MH 26-6	OWS	6th St., between L and K Streets	4330	2676	27-AS-201	181.00	159.33	159.31
MH 33-6-1	OWS	6th and L St. intersection, S side	4638	2676	27-AS-202	178.00	157.78	157.76
MH E/33-6FS	OWS	6th and L St. intersection, S side	4722	2676	27-AS-202	NS	NS	NS
MH 36-6	OWS	6th St., between L and M Streets	4860	2676	27-AS-202	166.00	156.55	156.53
Div Box	OWS	6th St., NW corner of OPL	5060	2679	27-AS-203	NS	NS	NS
MH 1-H	PWS	H St., NE of Tank 800x141	2792	770	27-AS-148	199.00	192.25	192.20
MH 5H	PWS	H St., East of tank 50x300	2792	1190	27-AS-163	190.37	183.90	183.78
MH 5H FS	PWS	H St., North of 4th and H intersection	2792	1550	27-AS-163	185.79	178.35	178.25
MH 6-H-1	PWS	H St., 4th and H intersection	2792	1666	27-AS-172	184.18	176.96	175.34
MH 6H FS	PWS	H St., South of 4th and H intersection	2792	1766	27-AS-172	184.45	NS	174.97
MH 6A-H-1	PWS	H Street, SE of Tank 300x35	2792	1891	27-AS-172	181.49	174.48	174.48

Table 1. P66 Oily Water Sewer - Manhole Inspection Schedule

Manhole ID	Associated Sewer	Location Description	Plant Coordinates (x)	Plant Coordinates (y)	Reference Map	Rim Elevation	Invert Elevation (in)	Invert Elevation (out)
Phase IV - Complete by December 31, 2029								
MH 7H-FS	PWS	H St., NE of Tank 550x102	2792	1990	27-AS-172	183.04	NS	174.16
MH 12H	PWS	South of 5th and H St intersection	2792	2180	27-AS-190	NS	173.48	165.38
MH 12-H FS	PWS	H St., East of Tank 100x92	2792	2210	27-AS-190	180.00	NS	NS
MH 4-6	PWS	6th and H St. intersection, S side	2792	2670	27-AS-199	177.45	171.48	166.12
MH 8-6	PWS	6th St., between J and H Streets	3065	2670	27-AS-199	177.00	165.06	165.04
MH 12-6	PWS	6th and J Street intersection	3398	2670	27-AS-200	177.00	163.71	163.69
MH 18-6	PWS	6th St., between J and K Streets	3690	2670	27-AS-200	179.00	162.53	162.51
MH 23-6	PWS	6th and K Street intersection	3997	2670	27-AS-201	183.00	161.31	161.29
MH 28-6	PWS	6th Street, between K and L Streets	4345	2670	27-AS-201	181.00	159.33	159.31
MH 29-6	PWS	6th and L St. intersection	4622	2670	27-AS-202	178.50	157.86	157.84
MH 34-6	PWS	6th St., SE of Tank 3000x1	4850	2670	27-AS-202	166.00	156.60	156.58
MH 40-6-1	PWS	6th Street, near lift station	5065	2670	27-AS-203	158.00	152.00	152.00

NLR - No Coordinate Location Reference
NMR - No Map Referenced
NS - Not Shown on Map
Unk - Unknown
OWS - Oily Water Sewer
PWS- Phenolic Water Sewer

Table 2. P66 Oily Water Sewer - Sewer Line Segment Inspection Schedule

Segment ID	Sewer Trunk Segment (MH to MH)	Associated Sewer	Location Description	Plant Coordinates ((x) MH to MH)	Plant Coordinates ((y) MH to MH)	Sewer Segment Type	Sewer Size (in)
Phase I - Complete by December 31, 2022							
1-1	MH 4C-1 to MH 4C-FS	Oily	In field south of Crude Hill	165	1205 to 1585	Vitrified Clay	8
1-2	MH 4C-FS to MH 2-4-1	Oily	In field south of Crude Hill	165	1585 to 1670	Vitrified Clay	8
1-3	MH 2-4-1 to MH 3-4-1	Oily	East of 4th and A St.	165 to 556	1670	Vitrified Clay	8
1-4	MH 3-4-1 to MH 6-4-1	Oily	4th St., N of PSE Cogen	556 to 956	1670	Vitrified Clay	8
1-5	MH 6-4-1 to MH 7-4-1	Oily	4th St., N of PSE Cogen	956 to 1338	1670	Vitrified Clay	8
1-6	MH 7-4-1 to MH 9-4 FS	Oily	4th and D St. intersection	1338 to 1695	1670	Vitrified Clay	8
1-7	MH X-1 to MH X-2	Oily	North of 4th St, near A St.	152.5	1248 to1400	Vitrified Clay	12
1-8	MH X-2 to X-7	Oily	North of 4th St, near A St.	152.5	1400 to 1682	Vitrified Clay	15
1-9	MH STA. 36 + 62 to MH STA. 33 + 68 MH X-7 to MH X-8	Oily	East of 4th and A St.	153 to 447	1682	Vitrified Clay	18
1-10	MH STA. 33 + 68 to MH STA. 30 + 74 MH X-8 to MH X-9	Oily	4th St., N of PSE Cogen	447 to 744	1682	Vitrified Clay	18
1-11	MH STA. 30 + 74 to MH STA. 27 + 90 MH X-9 to MH X-10	Oily	4th St., N of PSE Cogen	744 to 1025	1682	Vitrified Clay	18
1-12	MH STA. 27 + 90 to MH STA. 24 + 97 MH X-10 to MH X-11	Oily	4th St., N of PSE Cogen	1025 to 1318	1682	Vitrified Clay	18
1-13	MH STA. 24 + 97 to MH STA. 21 + 55 MH X-11 to MH X-12	Oily	4th and D St intersection	1318	1682 to 2024	Vitrified Clay	18
1-14	MH STA. 21 + 55 to NEW MH MH X-12 to MH X-12.2	Oily	N. of 5th and D St. intersection	1318	2024 to 2149.5	Vitrified Clay	18
1-15	NEW MH to MH STA. 18 + 15 MH X-12.2 to MH X-13	Oily	N. of 5th and D St. intersection	1318	2149.5 to 2364	Vitrified Clay	18
1-16	MH STA. 18 + 15 to MH STA. 14 + 83 MH X-13 to MH X-14	Oily	South of Switchhouse #1	1318	2364 to 2696	Vitrified Clay	24
1-17	MH STA. 14 + 83 to MH STA. 11 + 45 MH X-14 to MH X-15	Oily	In field south of Switchhouse #1	1318 to 1658	2696	Vitrified Clay	24
1-18	MH STA. 11 + 45 to MH STA. 8 + 08 MH X-15 to MH X-16	Oily	In field south of Bunkers	1658 to 1993	2696	Vitrified Clay	24
1-19	MH STA. 8 + 08 MH STA. 3 + 08 MH X-16 to MH X-17	Oily	In field south of SFOC	1993 to 2493	2696	Vitrified Clay	24
1-20	MH STA 3 + 08 to MH 4-6-1 (Phase IV) MH X-17 to MH 4-6-1	Oily	South of 6th St., between H and G St.	2493 to 2779	2696	Vitrified Clay	24
1-21	MH 9 FS to MH 10-FS	Oily	6th St., between J and H Streets	3070 to 3345	2696	Vitrified Clay	24
1-22	MH 10-FS to MH 11-FS	Oily	6th and J St. intersection	3345 to 3630	2696	Vitrified Clay	24
1-23	MH 11-FS to MH 12-FS	Oily	6th St., between J and K Streets	3630 to 3950	2696	Vitrified Clay	24
1-24	MH 12-FS to MH 13-FS	Oily	West of 6th and K St. intersection	3950 to 4246	2696	Vitrified Clay	24
1-25	MH 13-FS to MH G MH 13-FS to MH X-22	Oily	South of 6th St., east of OPL	4246 to 4311	2696 to 2880	Vitrified Clay	24
1-26	MH G to MH F MH X-22 to MH X-23	Oily	South of 6th St., SW corner of OPL	4311 to 4750	2880	Ductile Iron	24
1-27	MH F to MH E MH X-23 to MH X-24	Oily	South of 6th St., west of OPL	4750 to 4828	2880 to 2740	Ductile Iron	24
1-28	MH E to MH CC MH X-24 to MH X-25	Oily	West of OPL	4828 to 5030	2740 to 2724	Ductile Iron	24

Table 2. P66 Oily Water Sewer - Sewer Line Segment Inspection Schedule

Segment ID	Sewer Trunk Segment (MH to MH)	Associated Sewer	Location Description	Plant Coordinates ((x) MH to MH)	Plant Coordinates ((y) MH to MH)	Sewer Segment Type	Sewer Size (in)
Phase II - Complete by December 31, 2024							
2-1	MH 5K-RE to MH 5K-FS	Oily	K St., east of LPG tanks	3986	694 to 754	Vitrified Clay	10
2-2	MH 5K-FS to MH 6K-FS	Oily	K St., east of LPG tanks	3986	754 to 976	Vitrified Clay	10
2-3	MH 6K-FS to MH 7K-RE	Oily	K St., NE of Tank 800x143	3986	976 to 1185	Vitrified Clay	10
2-4	MH 7K-RE to MH 7K-FS	Oily	K. St., NE of Tank 800x145	3986	1185 to 1612	Vitrified Clay	10
2-5	MH 7K-FS to MH 9K-RE	Oily	4th and K St intersection	3986	1612 to 1676	Vitrified Clay	10
2-6	MH 9K-RE to MH 11K-RE	Oily	S of 4th and K St intersection	3986	1676 to 2162	Vitrified Clay	10
2-7	MH 11K-RE to MH 13K-FS	Oily	N of 6th and K St. intersection	3986	2162 to 2620	Vitrified Clay	10
2-8	MH 13K-FS to MH 21-6 (Phase IV)	Oily	6th and K St. intersection	3986	2620 to 2676	Vitrified Clay	10
2-9	MH 1L-1RE to MH 1L-FS	Oily	4th and L St. intersection	4637	1549 to 1564	Carbon Steel	10
2-10	MH 1L-FS to MH 6L-RE	Oily	L St., W. of 800x150	4637	1564 to 2044	Carbon Steel	10
2-11	MH 6L-RE to MH 6L-FS	Oily	L St., E of Tank 100x91	4637	2044 to 2181	Carbon Steel	10
2-12	MH 6L-FS to MH 7L-FS	Oily	M St., SW of Tank 900x3	4637	2181 to 2540	Vitrified Clay	10
2-13	MH 7L-FS to MH 10L-FS	Oily	6th and L St. intersection	4637	2540 to 2620	Vitrified Clay	10
2-14	MH 10L-FS to MH 33-6-1 (Phase IV)	Oily	6th and L St. intersection	4637 to 4638	2620 to 2676	Vitrified Clay	10
2-15	MH 10M DET. #3 to MH 10M-A	Oily	M St., SW of Tank 6000x1	5292	1084 to 1168	Ductile Iron	12
2-16	MH 10M-A to MH 8M DET. #3	Oily	M St., north of 4th Street	5292	1168 to 1334	Ductile Iron	12
2-17	MH 8M DET. #3 to MH 6M DET. #3	Oily	M St., north of Dewatering Basin	5292	1334 to 1586	Ductile Iron	12
2-18	MH 6M DET. #3 to MH 4M DET. #3	Oily	M St., SW of Tank 550x105	5292	1586 to 1884	Ductile Iron	12
2-19	MH 4M DET. #3 to MH 2M DET. #3	Oily	M St., at WWTP entrance	5292	1884 to 2143	Ductile Iron	12
2-20	MH 2M DET. #3 to MH 1M	Oily	M St., East of Tank 100x95	5292	2143 to 2318	Ductile Iron	12
2-21	MH 1M to MH 2T-FS	Oily	M St., SE of Tank 100x99	5292	2318 to 2398	Ductile Iron	12
2-22	MH 2T-FS to MH 5T	Oily	Inside Berm SW of Tank 100x99	5292 to 5430	2502 to 2398	Ductile Iron	12

Table 2. P66 Oily Water Sewer - Sewer Line Segment Inspection Schedule

Segment ID	Sewer Trunk Segment (MH to MH)	Associated Sewer	Location Description	Plant Coordinates ((x) MH to MH)	Plant Coordinates ((y) MH to MH)	Sewer Segment Type	Sewer Size (in)
Phase III - Complete by December 31, 2027							
3-1	MH 8H-1 (Phase IV) to MH 12-4	Oily	4th and H St intersection	2789 to 2664	1673	Vitrified Clay	18
3-2	MH 12-4 to MH 9-4	Oily	4th St. from H St to E St	2664 to 1752	1673 to 1674	Vitrified Clay	18
3-3	MH 9-4 to MH 10-4	Oily	4th and E St. intersection	1695 to 1752	1670 to 1674	Vitrified Clay	8
3-4	MH 9-4 to MH 1E-FS	Oily	E Street, East of Tank 50x306	1754	1670 to 1817	Vitrified Clay	8
3-5	MH 1E-FS to MH 1E-1	Oily	E St., SE of Tank 50x306	1754	1817 to 1942	Vitrified Clay	8
3-6	MH 1E-1 to MH 1B-E	Oily	5th and E St. intersection, N side	1754	1942 to 2114	Vitrified Clay	8
3-7	MH 1B-E to MH 7-5	Oily	5th and E St. intersection	1754	2114 to 2172	Vitrified Clay	8
3-8	MH 7-5 to MH 3-5-FS	Oily	5th St., between F and E Streets	1754 to 1905	2172	Vitrified Clay	10
3-9	MH 3-5-FS to MH 4-5	Oily	6th St., between F and E Streets	1905 to 2071	2172	Vitrified Clay	10
3-10	MH 4-5 to MH 9-5	Oily	5th and F St. intersection, S side	2071 to 2399	2172	Vitrified Clay	18
3-11	MH 9-5 to MH 1-5	Oily	5th and G St. intersection	2399 to 2485	2172	Vitrified Clay	18
3-12	MH 1-5 to MH 1-5-FS	Oily	West of 5th and G	2485 to 2557	2170	Vitrified Clay	18
3-13	MH 1-5-FS to MH 10H-1 (Phase IV)	Oily	5th and H St. intersection	2557 to 2789	2170	Vitrified Clay	18

Table 2. P66 Oily Water Sewer - Sewer Line Segment Inspection Schedule

Segment ID	Sewer Trunk Segment (MH to MH)	Associated Sewer	Location Description	Plant Coordinates ((x) MH to MH)	Plant Coordinates ((y) MH to MH)	Sewer Segment Type	Sewer Size (in)
Phase IV - Complete by December 31, 2029							
4-1	MH 2H to MH 2H-FS	Oily	H St., East of Tank 800x141	2789	782 to 902	Vitrified Clay	6
4-2	MH 2H-FS to MH 3H-FS	Oily	H St., East of Tank 550x103	2789	902 to 1113	Vitrified Clay	6
4-3	MH 3H-FS to MH 4H-RE	Oily	3rd and H St. intersection	2789	1113 to 1180	Vitrified Clay	18
4-4	MH 4H-RE to MH 4H-FS	Oily	H St. from 3rd to 4th street	2789	1180 to 1513	Vitrified Clay	18
4-5	MH 4H-FS to MH 8H-1	Oily	4th and H St. intersection	2789 to 2789	1513 to 1673	Vitrified Clay	18
4-6	MH 8H-1 to MH 8H-FS	Oily	4th and H St. intersection, S side	2789	1673 to 1766	Vitrified Clay	18
4-7	MH 8H-FS to MH 8A-H-1	Oily	H St., NE of Tank 300x35	2789 to 2789	1766 to 1877	Vitrified Clay	18
4-8	MH 8A-H-1 to MH 10H-1	Oily	5th and H intersection	2789 to 2789	1877 to 2170	Vitrified Clay	18
4-9	MH 10H-1 to UK-MH-1 OW	Oily	East of Tank 100x93	2789	2170 to 2275	Vitrified Clay	18
4-10	UK-MH-1 OW to MH 4-6-1	Oily	6th and H St. intersection	2789 to 2779	2275 to 2696	Vitrified Clay	18
4-11	UK-MH-1 OW to MH (unnumbered MH)	Oily	H St., SE of Tank 300x45	2789 to 2810	2275 to 2279	Carbon Steel	18
4-12	MH to MH (unnumbered MH's)	Oily	H St., SE of Tank 300x46	2810 to 2812	2279 to 2653	Carbon Steel	18
4-13	MH (unnumbered MH) to MH 3-6-FS	Oily	Corner of 6th and H Streets	2812 to 2796	2653 to 2677	Carbon Steel	18
4-14	MH 3-6-FS to MH 6-6	Oily	West of 6th and H St. intersection	2796 to 3069	2677 to 2624	Vitrified Clay	18
4-15	MH 6-6 to MH 9-6	Oily	East of 6th and J St. intersection	3069 to 3365	2624 to 2676	Vitrified Clay	18
4-16	MH 9-6 to MH 16-6	Oily	West of 6th and J St. intersection	3365 to 3680	2676	Vitrified Clay	18
4-17	MH 16-6 to MH 21-6	Oily	6th and K St. intersection	3680 to 3986	2676	Vitrified Clay	18
4-18	MH 21-6 to MH 26-6	Oily	West of 6th and K St. intersection	3986 to 4330	2676	Vitrified Clay	18
4-19	MH 26-6 to MH 33-6-1	Oily	East of 6th and L St. intersection	4330 to 4638	2676	Vitrified Clay	18
4-20	MH 33-6-1 to MH E/33-6FS	Oily	6th St., NW corner of OPL	4638 to 4730	2676	Vitrified Clay	18
4-21	MH E/33-6FS to MH 36-6	Oily	6th St., NW corner of OPL	4730 to 4860	2676	Vitrified Clay	18
4-22	MH 36-6 to Div Box	Oily	6th St., between L and M Streets	4860 to 5060	2676	Vitrified Clay	18
4-23	MH 4-6-1 to MH 9 FS	Oily	West of 6th and H St. intersection	2779 to 3070	2696	Vitrified Clay	24
4-24	MH 1-H to MH 5H	Phenolic	H St., NE of Tank 800x141	2792	770 to 1190	Vitrified Clay	8
4-25	MH 5H to MH 5H FS	Phenolic	H St., 3rd to 4th	2792	1190 to 1550	Vitrified Clay	8
4-26	MH 5H FS to MH 6-H-1	Phenolic	H St., 4th and H intersection	2792	1550 to 1666	Vitrified Clay	8
4-27	MH 6-H-1 to MH 6H FS	Phenolic	H St., South of 4th and H intersection	2792	1666 to 1766	Vitrified Clay	8
4-28	MH 6H FS to MH 6A-H-1	Phenolic	H St., East of Tank 300x35	2792	1766 to 1891	Vitrified Clay	8
4-29	MH 6A-H-1 to 7H-FS	Phenolic	H Street, SE of Tank 300x35	2792	1891 to 1990	Vitrified Clay	8
4-30	MH 7H-FS to MH 12H	Phenolic	H St., N. of 5th and H intersection	2792	1990 to 2180	Vitrified Clay	8
4-31	MH 12H to MH 12-H FS	Phenolic	South of 5th and H St intersection	2792	2180 to 2210	Vitrified Clay	8
4-32	MH 12-H FS to MH 4-6	Phenolic	H St., East of Tank 100x92	2792	2210 to 2670	Vitrified Clay	8
4-33	MH 4-6 to MH 8-6	Phenolic	West of 6th and H St. intersection	2792 to 3065	2670	Vitrified Clay	8
4-34	MH 8-6 to MH 12-6	Phenolic	6th St., between J and H Streets	3065 to 3398	2670	Vitrified Clay	8
4-35	MH 12-6 to MH 18-6	Phenolic	West of 6th and J Street intersection	3398 to 3690	2670	Vitrified Clay	8
4-36	MH 18-6 to MH 23-6	Phenolic	East of 6th and K St. intersection	3690 to 3997	2670	Vitrified Clay	8

Table 2. P66 Oily Water Sewer - Sewer Line Segment Inspection Schedule

Segment ID	Sewer Trunk Segment (MH to MH)	Associated Sewer	Location Description	Plant Coordinates ((x) MH to MH)	Plant Coordinates ((y) MH to MH)	Sewer Segment Type	Sewer Size (in)
Phase IV - Complete by December 31, 2029							
4-37	MH 23-6 to MH 28-6	Phenolic	West of 6th and K St. intersection	3997 to 4345	2670	Vitrified Clay	8
4-38	MH 28-6 to MH 29-6	Phenolic	East of 6th and L St. intersection	4345 to 4622	2670	Vitrified Clay	8
4-39	MH 29-6 to MH 34-6	Phenolic	West of 6th and L St. intersection	4622 to 4850	2670	Vitrified Clay	8
4-40	MH 34-6 to MH 40-6-1	Phenolic	6th Street, near lift station	4850 to 5065	2670	Vitrified Clay	8

APPENDIX A

Site Characterization Standard Operating Procedures

SITE CHARACTERIZATION STANDARD OPERATING PROCEDURES

1.1 PRELIMINARY ACTIVITIES

Prior to the onset of field activities at the Site, all appropriate permit(s) from the governing agency(s) must be obtained. Advance notification will be made as required by the agency(s) prior to the start of work. All excavation or borehole locations will be marked with white paint and the local one-call underground utility locating service will be contacted to mark underground utilities at least 48 hours prior to the start of work. Excavation or borehole locations may also be checked for underground utilities by a private geophysical surveyor. Prior to drilling, borehole locations will be cleared to at least 5 feet deep. Fieldwork will be conducted under the advisement of a registered professional geologist, hydrogeologist, or engineer and in accordance with a site-specific health and safety plan prepared for the project, which will be available at the job site during field activities.

1.2 SOIL BORINGS AND SOIL SAMPLING PROCEDURES

A licensed driller will be contracted to advance the borings and collect soil samples. The specific drilling method (e.g., hollow-stem auger, direct push method, or sonic drilling), sampling method [e.g., core barrel or California-modified split spoon sampler (CMSSS)] and sampling depths will be documented on the boring log and may be specified in a work plan. Soil samples will be typically collected at the capillary fringe and at 5-foot intervals to the total depth of the boring. To determine the depth of the capillary fringe prior to drilling, the static groundwater level will be measured with a water level indicator in the monitoring well located closest to the boring location, if available.

The borehole will be advanced to just above the desired sampling depth. For CMSSSs, the sampler is placed inside the auger and driven to a depth of 18 inches past the bit of the auger. The sampler is driven into the soil with a standard 140-pound hammer repeatedly dropped from a height of 30 inches onto the sampler. The number of blows required to drive the sampler each 6-inch increment will be recorded on the boring log. For core samplers (e.g., direct push), the core is driven 4-5 feet using the rig apparatus.

Soil samples will be preserved in the metal or plastic sleeve used with the CMSSS or core sampler, in glass jars or other manner required by the local regulatory agency (e.g., Environmental Protection Agency Method 5035). Soil samples will be collected as discrete samples and placed in containers provided by the laboratory. Samples will be placed in a chilled cooler and transported to a state-certified laboratory. The samples will be transferred under chain-of-custody (COC) protocol.

1.2.1 Field Screening Procedures

Soil from the sampling interval will be placed in a plastic re-sealable bag, and the tip of a photo-ionization detector (PID) will be inserted into the plastic bag to measure organic vapor concentrations in the headspace. The PID measurement will be recorded on the boring log. The organic vapor headspace analyses will be conducted using a MiniRAE Model 3000 PID equipped with a 10.6 eV lamp (or equivalent). At a minimum, the PID will be calibrated on a daily basis in accordance with manufacturer's specifications using a hexane or isobutylene standard. The calibration gas and concentration will be recorded on a calibration log.

Sheen tests will be conducted using a portion of the soil core and distilled water. Sheen tests will be recorded as: NS – no sheen, VSS – very slight sheen, SS – slight sheen, MS – moderate sheen, and HS – heavy sheen.

The soil will be described according to the Unified Soil Classification System and the description will be recorded on the boring log.

1.2.2 Backfilling of Soil Borings

If a well is not installed, the boring will be backfilled from total depth to approximately 5 feet below ground surface (bgs) with either neat cement, bentonite grout, or bentonite chip. The boring will be backfilled from 5 feet bgs to approximately 1-foot bgs with hydrated bentonite chips. The borehole will be completed from 1-foot bgs to surface grade with material that best matches existing surface conditions and meets local agency requirements.

1.3 EXCAVATION SOIL SAMPLING PROCEDURES

During excavation activities, exposed soil from the bottom and sidewalls of the excavation will be field screened for petroleum, soil staining, and/or discoloration. Samples of the soil will be also periodically screened for the presence of volatile organic compounds using a photoionization detector (PID), with the vapor readings noted. Performance samples may be collected during the excavation to confirm the presence of contaminants and provide information regarding soil disposal classes/categories.

Confirmation soil samples will be collected from the bottom and sidewalls of the excavation when field screening indicates that contaminant concentrations are below the established Site cleanup levels. All sampling locations will be recorded with respect to lateral and vertical locations. Soil samples may be collected directly from the excavation using hand-sampling equipment such as a stainless-steel spoon, trowel, or hand auger. Samples collected in the deeper areas of an excavation will be collected directly from the excavator bucket by removing approximately 6 inches of soil from the bucket (thereby exposing fresh soil) and collecting a sample from the middle of the bucket. The sample will be placed into a laboratory-supplied glass sample container with a Teflon-lined lid. Soil samples will be collected as discrete samples and placed in containers provided by the laboratory. Samples will be placed in a chilled cooler and transported to a state-certified laboratory. The samples will be transferred under chain-of-custody (COC) protocol. Excavation soil samples will be field screened as outlined in Section 1.2.1.

1.4 MONITORING WELL CONSTRUCTION AND GROUNDWATER SAMPLING PROCEDURES

Groundwater samples may be collected from either a temporary or permanent well installed in the borehole.

1.4.1 Well Construction

A well (if constructed) will be completed using materials documented on the boring log or specified in a work plan. The well will be constructed with slotted casing across the desired groundwater sampling depth(s) and completed with blank casing to within 6 inches of surface grade. No further construction will be conducted on temporary wells.

For permanent wells, the annular space of the well will be backfilled with sand from the total depth to approximately 2 feet above the top of the screened casing. A hydrated granular bentonite seal will be placed on top of the sand filter pack. Grout may be placed on top of the bentonite seal to the desired depth. The well may be completed to surface grade with a 1-foot thick concrete pad. A well monument and cap for the well casing will be installed to protect against surface water infiltration. Site-specific well construction details including type of well, well depth, casing diameter, slot size, length of screen interval and sand size will be documented on the well construction diagram.

1.4.2 Well Development

If a permanent groundwater monitoring well is installed, the grout will be allowed to cure a minimum of 48 hours before development. A new bailer or submersible pump will be used to develop the newly installed well. The well will be developed until sufficient well casing volumes are removed so that turbidity is within allowable limits or the well goes dry. The volume of groundwater extracted will be recorded on a log.

1.4.3 Groundwater Sampling

Wells will be sampled using the low-flow sampling technique, recommended and approved by the U.S. Environmental Protection Agency. The low-flow sampling technique minimizes the impact of the purging process on groundwater chemistry and provides an accurate representation of the groundwater's condition at the time of sampling. Prior to sampling, the depth-to-water will be measured in each well, to use in calculating the groundwater elevation for the sampling event. A YSI Model 556 multi probe meter will be used in conjunction with a flow-through cell to monitor groundwater chemistry during the low-flow purging process. Purging will be considered adequate and groundwater samples will be collected when the water chemistry parameters stabilize.

The water sample will be stored in laboratory-supplied containers constructed of the correct material and with the correct volume and preservative to comply with the proposed laboratory test. Samples to be analyzed for iron, manganese, lead, and other naturally occurring trace metals may be filtered where it is not possible to develop the well to obtain a relatively clear sample (<50 Nephelometric Turbidity Units). If filtering is conducted, the dissolved metals samples will be filtered in the field using a disposable 0.45 µm in-line filter. Containers will be slowly filled with the retrieved water sample until no headspace remains and then promptly

sealed with a Teflon-lined cap, checked for the presence of bubbles, labeled, entered onto a COC record and placed in a chilled cooler. Laboratory-supplied trip blanks accompany the water samples (as required by the laboratory) as a quality assurance/quality control procedure. Equipment blanks and duplicate samples may be collected as required. The samples will be kept in chilled storage and transported under COC protocol to a client-approved, state-certified laboratory for analysis

1.4.4 Surveying

If required, wells will be surveyed by a licensed land surveyor relative to an established benchmark of known elevation above mean sea level to an accuracy of +/- 0.01 foot. The casing will be notched or marked on the north side to identify a consistent surveying and measuring point.

1.4.5 Decontamination Procedures

All sampling equipment will be decontaminated prior to and between each sampling event to reduce the potential for cross contamination.

1.4.6 Investigation Derived Waste Handling

Soil cuttings generated from the drilling or sampling will be stored on site in labeled, Department of Transportation-approved, 55-gallon drums or other appropriate storage container. The soil will be removed from the site and transported under manifest to a client- and regulatory-approved facility for recycling or disposal. Decontamination fluids and purge water from well development and sampling activities, if conducted, will be stored on site in labeled, regulatory-approved storage containers. Fluids will be subsequently transported under manifest to a client- and regulatory-approved facility for disposal.

APPENDIX B

Ferndale Refinery Geology and Hydrogeology

FERDNALE REFINERY GEOLOGY

The geologic units mapped at the Ferndale Refinery are described below in stratigraphically descending order.

Fill material (Unit I): Fill material at the site consists of silty clays and imported sand and gravel.

Native soils and thin surficial deposits (Unit II): Soil and thin surficial deposits overlie the regional stratigraphic units. The unit is divided into two lithologic subunits. Typically, the subunits are distinguishable based on color and textural differences; however, disturbances made during refinery construction often make this distinction difficult.

(Native soil) Silty/sandy clay, silty clay, and clayey silt; dark brown; some gravel; firm; decomposed roots locally; slightly moist to wet; locally very wet. (thickness: 5 - <1 foot)

(Surficial deposits) Clayey/silty sand and clayey silt; light gray to greenish gray; some gravel; slightly firm; slightly wet to wet. (thickness: 5 - <1 foot)

Bellingham Glaciomarine Drift (Diamicton) (Unit III/IV): The Bellingham glaciomarine drift represents the uppermost regionally continuous stratigraphic unit at the Ferndale Refinery. The unit acts as an aquitard impeding the vertical migration of infiltrating precipitation and released contaminants. The glaciomarine drift is made up of an upper weathered unit (Unit III) and a deeper unweathered unit (Unit IV). The shallow weathered drift consists of brown silty clay, clayey silt, and clayey sand with minor to moderate amounts of sand, gravel, and matrix-supported pebbles, cobbles, and boulders. Occasionally the angular to rounded clasts are striated. The unit is consistently firm to very hard, depending on moisture content. Some orange and gray mottles are seen locally, as are thin (< 1 mm) vertical fractures in the uppermost portions. The unit is predominantly dry to slightly moist (thickness: 16 - <1 foot).

The deeper unweathered drift consists of light to dark gray silty clay with traces of sand, gravel, and matrix-supported pebbles, cobbles, and boulders. Occasionally the angular to rounded clasts are striated. The upper portions are firm to slightly plastic, and generally wet. With depth, the unit shows an increase in sand and often a significant increase in moisture content and plasticity (i.e., the material becomes very plastic, sticky, and very wet). Shells and shell fragments are common, confirming a marine origin (thickness: >40 - <1 foot).

Mountain View Sand and Gravel (Unit V): The Mountain View sand and gravel underlies the younger Bellingham drift and overlies the Cherry Point silt. The deposit consists of well sorted silt, silty sand, and fine to medium grained sand, interlayered with poorly sorted sand and sand-gravel mixtures. The sands and gravels vary from light brown to gray, with their color influenced by the lithology of the mineral grains. The sands and gravels are loose and dry to slightly wet. The sediments are well stratified, with rounded pebbles, cross-bedding, and other features typical of fluvial deposition. The upper surface of the unit is irregular. The unit contains fine-grained channel fill deposits interspersed with sands and gravels (Easterbrook, 1963).

Bodies of silt, representing low energy areas within the fluvial outwash environment during Mountain View time, are fairly widespread over most of the refinery site (BP, 1989). The fine grained interbeds consist of tan clayey silt and lean clay. The silt bodies vary in thickness and stratigraphic position over short distances and are absent in places, indicating that the silt deposits are lensaic in nature. The silt lenses consist of thinly-bedded, micaceous silt, sandy silt, and silty very fine sand which is well sorted. They exhibit a floury texture and low shear strength when dry. The silts are dark gray where fresh, but are oxidized to orange and brown near the contact with adjacent materials (thickness: 25-100 feet).

Cherry Point Silt (Unit VI): The top of the Cherry Point Silt lies at approximately 60 feet above mean sea level (approximately 130 feet below grade). The Cherry Point Silt consists of brown to gray interbedded clay, silt, silty sand, and fine to medium grained well-sorted sand. The regional water table occurs within the unit at approximately 160 feet below ground surface. The regional water table aquifer in the Cherry Point Silt is not used as a water supply downgradient of the facility. The direction of flow in the Cherry Point Silt is toward the west, where flowing groundwater discharges to the Strait of Georgia. The maximum thickness of the Cherry Point Silt is unknown and is estimated at approximately 300 feet thick.

FERNDALE REFINERY HYDROGEOLOGY

The hydrogeology of the Ferndale Refinery site has been characterized through the installation of numerous soil borings and monitoring wells, as well as the completion of bail tests, laboratory permeability tests, and grain size distribution tests.

The Ferndale Refinery area is underlain by a regionally continuous stratigraphic unit known as glaciomarine drift, or diamicton (Easterbrook, 1976). The diamicton unit consists of moderately sorted to unsorted diamicton with lenses and discontinuous beds of moderately to well-sorted gravel, sand, silt, and clay. Bedding is massive to poorly stratified. Color is blue-gray

to olive-gray depending on oxidation state. Thickness ranges to as much as 90 meters (WA DNR, 2000). Permeability is low and infiltration of precipitation is very poor.

Geotechnical samples collected in the diamicton from soil borings drilled in the central portion of the refinery south of 6th Street were analyzed for bulk density, moisture content, vertical hydraulic conductivity, Atterberg limits, plasticity indices, and grain-size distribution. The data revealed that a fining-downward sequence is evident in the stratigraphic column. The average percentage of sand decreases with depth and the average percentage of silt and clay increases with depth. The bulk density of the samples increases with depth. The average vertical hydraulic conductivity decreases with depth from $1.26x10^{-07}$ cm/s in the upper weathered portion of the diamicton to $7.86x10^{-08}$ cm/s in the deeper portion of the unit. The average horizontal saturated hydraulic conductivity in the deeper portion of the unit is $1.70x10^{-06}$ cm/s. The fining-downward grain-size distribution, the increasing bulk density with depth, and the decreasing vertical conductivity with depth all support the conclusion that the diamicton acts as a sufficient aquitard to inhibit the downward migration of precipitation and accidentally spilled petroleum products.

The uppermost zone of saturation consists of saturated portions of native deposits and fill material located above the diamicton. The diamicton at the site is known to be firm and dry and consists of brown silty clay with minor gravel. The unit acts as an aquitard impeding the vertical migration of contaminants and occurs at approximately 6-10 feet below grade at the site.

Groundwater contained in the shallow surficial deposits is perched atop the relatively impermeable silt and clay of the diamicton (Units III and IV). The unconfined perched water is contained in the fill material, Unit IIA soil layer, and Unit IIB sand layer. Water percolates downward and becomes perched above Unit III as a result of the textural disconformity between the diamicton and the overlying surficial units. The flow direction of the perched water atop the diamicton follows the structural contours of the upper surface of the diamicton.

The perched water above the diamicton would not be classified as potable per the definition in WAC 173-340-720 (2). The perched water at the site does not serve as a current source of drinking water and is not a potential future source of drinking water because the groundwater is likely present in insufficient quantity to yield greater than 0.5 gallons per minute on a sustainable basis.

The regional water table occurs within the Cherry Point Silt (Unit VI) at approximately 160 feet below ground surface. The direction of flow in the Cherry Point Silt is toward the west-

northwest, where flowing groundwater discharges to the Strait of Georgia. The Cherry Point aquifer is not believed to be used as a water supply downgradient of the Ferndale Refinery as the flow direction is to the west-northwest toward the Strait of Georgia.