

State of Oregon
Department of Environmental Quality

Memorandum

Date: September 26, 2023 DRAFT

To: FILE

Through: Paul Seidel (Manager), Dan Hafley (Lead Worker), Mark Pugh (Peer), Mike Poulsen (Toxicologist)

From: Anna Coates, Project Manager
Northwest Region Cleanup Section

Subject: Staff Memorandum in Support of a Conditional NFA
Astoria Area-Wide Petroleum Site – Area of Concern 2 - Former Shell Oil Facility
ECSI File No. 2277

This document presents the basis for the Oregon Department of Environmental Quality's (DEQ's) recommended issuance of a Conditional No Further Action (cNFA) determination and a Certification of Completion (COC) for Port of Astoria property formerly leased by Shell Oil (Site). The Site location is shown in the attached Figure 1 and is variously referred to in DEQ documents as a portion of the Astoria Area-Wide Area of Concern 2 (AOC2) site and the Shell Bulk Oil Facility. The cNFA will be issued following the public comment period specific to the former Shell Oil Site. The COC will be issued at a later date following completion of the Scope of Work by all parties in the Order (described below) as required for the greater Astoria Area-Wide site.

As discussed in this memorandum, localized contaminant concentrations in subsurface soil could present unacceptable risk for construction workers. Otherwise, soil, soil vapor and groundwater do not present unacceptable risk for occupational workers, construction workers, or excavation workers at the Site. Potential risk to construction and excavation workers will be addressed through implementation of institutional controls in the form of a contaminated media management plan (CMMP), the need for which will be memorialized in the Port Layout Plan for Port of Astoria.

The proposed cNFA determination meets the requirements of Oregon Administrative Rules Chapter 340 Division 122, Sections 010 to 0140; and ORS 465.200 through 465.455. The proposal is based on information documented in the administrative record for this Site. Substantive documents related to site work are presented in the administrative record index at the end of this memorandum.

1. REGULATORY BACKGROUND

The greater Astoria Area-Wide (AAW) site was designated by DEQ in 2000 based on the presence of multiple facilities at and upgradient of Port of Astoria where petroleum releases had occurred, including the apparent comingling of groundwater plumes and ongoing seepage of petroleum hydrocarbon free product into the Columbia River. DEQ issued a Unilateral Order (DEQ Number ECSR-NWR-01-11 [Order]) on December 14, 2001 requiring completion of a Remedial Investigation/Feasibility Study (RI/FS). In response to the Order, Chevron Product Company (Chevron), Delphia Oil Company (Delphia), McCall Oil and Chemical Company (McCall), Ed Niemi Oil Company (Niemi Oil), Flying Dutchman and Harris Enterprises (Harris/Flying Dutchman), Port of Astoria, Century Link (formerly Qwest Communications), and Shell Oil Products (Shell) agreed to perform the requested RI/FS at five areas of concern (AOCs) within the larger AAW site (see Figure 2 for the five AOCs). In November 2003, ExxonMobil Corporation agreed to participate in the RI/FS with the other potentially responsible parties (PRPs). Qwest withdrew from participation in the area-wide RI in 2004 after completing characterization of their property.

The collective PRP group hired an environmental consultant to complete the RI, which was conducted in several phases from 2001 to 2008. The 2008 AAW *Remedial Investigation Report* (EnviroLogic Resources, Inc.; 2008) identified ten key petroleum hydrocarbon contaminants of interest: total petroleum hydrocarbon (TPH)-gasoline, TPH-diesel, TPH-heavy oil, benzene, toluene, ethylbenzene, xylenes (BTEX), 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, and naphthalene. Three groundwater plumes were identified, one in AOC1, one in AOC2, and one in AOC4 (see Figure 1). In AOC4, a light, non- aqueous phase liquid (LNAPL, floating free product) plume in groundwater discharges to Slip 2 surface water, and soil vapor intrusion impacts a former Port of Astoria office building. Discharge of petroleum hydrocarbon-impacted groundwater to surface water results in a surface water sheen. See DEQ's 2019 *Record of Decision* for a detailed discussion of the AOC4 RI/FS and the selected remedy for AOC4 (DEQ, 2019b).

2. PHYSICAL SETTING

Site location

The former Shell Oil bulk fuel facility is located at Port of Astoria, Oregon 97103. It includes the eastern portion of Tax Lot 100 in Clatsop County, Township 8 North, Range 9 West, Section 7 Willamette Base and Meridian., at latitude 46.186237 ° North, longitude -123.857447 ° West.

Site setting

The approximate 160 ft wide by 190 ft long (0.7-acre) Site is paved and includes stormwater controls. The RI report (2008) indicates that in 1927 the former Shell Oil warehouse was located at the current location of the Oregon State Police, Astoria Patrol Office constructed in the late 1980s. In 1927 the facility included two above ground fuel storage tanks (ASTs), a warehouse, a pump house, a garage, and an office building.

Bulk fuel storage and distribution occurred at the Site from 1925 to 1972. Tanks were added over the years and the buildings were modified to allow for their installation. Seven ASTs were operating onsite by 1953. Port of Astoria records show that ASTs included:

- one 420,000-gallon AST,
- one 400,000-gallon AST,
- two 230,000-gallon ASTs, and
- three 25,000-gallon ASTs.

By 1974, all above ground tanks and pipelines were decommissioned. Details regarding the contents of the various tanks are not available but are expected to have been gasoline, diesel, and oil and most certainly varied over the years of operation. A multi-story office building was constructed in the southwest corner of the Site prior to 1989.

The 2008 RI identified former ASTs, a filling dock, a pump house, and ancillary on-site piping as potential contaminant sources. Two 3-inch petroleum fuel product delivery pipelines extended from the Site to the south end of Slip 2 where they serviced a marine filling station. One 6-inch bulk fuel petroleum delivery pipeline serviced the onshore area and Pier 2. Petroleum hydrocarbon impacts to soil are likely due to historic releases from above ground fuel storage tanks, fuel pipelines and other inadvertent releases during Site operations.

Adjacent properties are the former Delphia Oil Bulk Plant to the south, Bergerson Construction Company and Portway Street to the east, Industry Street and the Port of Astoria facilities occupied by Bornstein Seafood Processing Facility to the north. A City of Astoria utility corridor and railroad tracks in use by the Astoria Trolley Line are located immediately south of the property.

The Site is zoned Marine Industrial Shorelands S-1. According to the City of Astoria Municipal Code, the purpose of the Marine Industrial Shorelands Zone is “to manage shorelands in urban and urbanizable areas especially suited for water-dependent uses and to protect these shorelands for water-dependent industrial, commercial and recreational use.” Therefore, residential land use is not a reasonably likely expected future use at the Site.

Topography, Surface Water, Geology, and Groundwater

The Site topography is generally flat. Stormwater runoff from impervious surfaces is routed to the City of Astoria wastewater treatment plant. Some stormwater runoff along the margins of pavement may enter the City of Astoria stormwater lines that discharge to permitted City outfalls along the Columbia River (see Figure 2-4 of the 2008 RI Report (EnviroLogic, 2008)).

The Site and larger AAW site are underlain by a sequence of dredge fill deposits, native alluvial deposits, and the Astoria Formation. Geologic cross-sections are included in the 2008 RI and in the 2019 AOC4 ROD. Shallow groundwater occurs between 4 and 11 ft below ground surface (bgs) at the Site, with modest seasonal fluctuations. Four monitoring wells (MW-19, MW-20, MW-21, and MW-22) were installed at the Site during the RI. Based on historic water level measurements the shallow groundwater flow direction is generally north towards the Columbia River. Groundwater elevation contour maps are presented in the 2008 RI.

3. BENEFICIAL LAND AND WATER USE DETERMINATIONS

Land Use and Zoning. The Site is zoned S2, General Development Shorelands. According to the City of Astoria, “The purpose of the S-2 Zone is to provide an area where a mixture of industrial, commercial, residential, public and recreational uses can locate”. The Port of Astoria *Waterfront Master Plan* (Port of Astoria and City of Astoria, 2022) shows the Site as support for maritime industrial use including street connections and parking.

Groundwater. Groundwater beneath the Site is not used as a potable water source. Domestic water for the Site and surrounding properties is provided by the City of Astoria municipal supply from the 3,700-acre Bear Creek watershed, located approximately twelve miles east of Astoria. Groundwater is not likely to be used as a water-supply source in the foreseeable future. Water quality parameters indicate groundwater in the area is generally of poor quality for potable use (EnviroLogic Resources, 2008). In addition, results of a groundwater well survey did not identify any potable use or industrial use groundwater supply wells within the surrounding area. Therefore, ingestion of groundwater from beneath the Site is not a complete exposure pathway or expected to be complete in the future.

Surface Water. The only apparent beneficial groundwater water use at the AAW site (in AOC4) is discharge of shallow groundwater to the Columbia River and Youngs Bay. The utility corridor along Industry Street south of the Site has been impacted by soil vapors and identified in the 2019 Hazard Notice. As described above, a municipal combined sanitary/stormwater system on the north side of Industry Street collects runoff from the road and properties along Industry Street, flows to Portway Avenue, and eventually discharges to the City of Astoria wastewater treatment plant. Therefore, this discharge does not present a risk to surface water bodies. Stormwater discharge was monitored for four quarters during the RI and contaminants were not detected above human health or ecological screening levels for Slip 2 surface water in AOC4. A combined sewer and stormwater system collects stormwater runoff from paved areas of the Site.

4. INVESTIGATION AND CLEANUP WORK

AAW RI Investigation Phases

Phase 1 and Phase 2 RI

- The AAW Phase 1 soil investigation activities conducted in 2002 included sample collection and analyses from 139 soil borings. The results of the Phase 1 RI were presented in EnviroLogic Resources’ *Technical Memorandum, Phase 1 Source/Soil Characterization* (EnviroLogic Resources 2003). Eleven Phase 1 soil borings were completed on the Site.
- A total of 94 groundwater samples were collected from 86 temporary borings collected by push-probe drilling rigs during the Phase 1 ground-water investigation, eleven of which were located on the Site.
- Fifty additional borings were completed as part of the Phase 2 soil and groundwater investigation during 2003 and 2004. The results of the Phase 2 RI were presented in

EnviroLogic Resources' *Technical Memorandum, Phase 2 Source/Soil Characterization* (EnviroLogic Resources, 2004). Three Phase 2 soil and groundwater borings were completed on the Site.

Groundwater

The AAW RI included the construction and sampling of twenty-one groundwater monitoring wells to collect water level elevations and water quality data. Four monitoring wells were installed on or adjacent to the former Site and included:

- MW-19 (upgradient)
- MW-20 (cross-gradient)
- MW-21 (downgradient)
- MW-22 (cross-gradient)

Figure 3 shows the locations of the groundwater monitoring wells. Figure 4 shows the Site in cross-section. Quarterly groundwater monitoring was conducted at the AAW site between October 2003 and September 2004. LNAPL (petroleum free product) was not identified in monitoring wells at the former Shell Site during the RI (EnviroLogic Resources, 2008).

Soil Vapor Investigations at the Shell Site

To determine the extent and magnitude of soil, soil vapor and groundwater impacts on or associated with the Site, soil vapor and potential preferential pathways along the utility corridors became the focus of investigation as the work progressed (Hart Crowser, 2012a and 2012b). Soil and soil vapor samples were collected for the evaluation of soil vapor migration and potential impacts to human health. Six soil vapor samples, SV-1 through SV-6 (Figure 3), were collected within the corridor and tested for gasoline range hydrocarbons and for volatile organic compounds (VOCs) by EPA Method TO-15.

Nature and Extent of Contamination

Surface soil (0 to 3 ft bgs). In the upper three feet of soil, gasoline, diesel and heavy oil-range hydrocarbons were detected. The maximum concentration of gasoline-range hydrocarbons detected in the upper three feet was 3.23 mg/kg in soil boring SB-905(S)-4 which had a sample interval of 0 to 4 ft bgs. The maximum concentration of diesel-range hydrocarbons was 2,440 mg/kg in SB-913(S). The maximum concentration of heavy oil-range hydrocarbons detected in the upper three feet was 6,390 mg/kg in soil boring SB-913(S). Slight (SB-905(S)-4) to strong (SB-908(S)-4) LNAPL sheen was observed in surface soil samples.

Subsurface soil (3 to 15 ft bgs). Gasoline was detected in soil on the southern portion of the Site at a maximum concentration of 2,160 mg/kg at SB-900(S). The highest diesel-range hydrocarbon detections in soil generally occur in the western portion of the Site. The highest concentration was 23,000 mg/kg in SB-904(S). Residual range hydrocarbons were detected in several borings with the highest concentration in SB-908(S) at 12,300 mg/kg. The maximum naphthalene concentration was detected in SB-904(S) at 15.1 mg/kg. Slight (SB-903(S)-10, SB-904(S)-12, SB-905(S)-12, SB-906(S)-12) to strong (SB-902(S)-8, SB-902(S)-12) LNAPL sheen was observed in sub-surface soil samples.

Groundwater. Gasoline- and diesel-range hydrocarbons and fuel-related-VOCs were detected in groundwater monitoring well samples collected from the Site. MW-20(A) and MW-21(A) contained the highest TPH-gasoline (1,590 ug/L) and TPH-diesel (4,860 ug/L) concentrations, respectively. MW-22(A) contained the highest benzene concentration of 19.4 ug/L. MW-20(A) contained the highest naphthalene concentration of 51.8 ug/L. Monitoring wells were generally screened across the water table to detect free product if present. LNAPL was not detected in Shell groundwater samples during four quarters of monitoring in 2003 to 2004 for the RI.

Interim Removal Measures

Interim removal measures at the Site included the pipeline investigation and decommissioning per a DEQ-approved work plan (Hart Crowser, 2003). The work included the investigation and decommissioning of the Shell/Niemi Oil/ExxonMobil petroleum pipelines as summarized in the *Shell/Niemi Oil/ExxonMobil Petroleum Pipeline Investigation and Decommissioning Report* (Hart Crowser, 2004b). The scope of work included a geophysical survey to locate the pipelines, test pits and push-probes for inspection of the pipelines. Exposed pipelines were inspected for leaks and access holes were cut in the pipelines. About 300 gallons of residual product and water were removed from the Shell bulk plant supply lines and transported to a licensed facility for recycling. Soil samples were collected for laboratory analyses. Pipelines were decommissioned in place with bentonite grout. Product lines supplied marine filling stations at Port of Astoria Slip 2 and a receiving station at Slip 1. The supply lines entered the Site from the north near boring SB-911 (S). Test pit EX-3 was completed to three ft bgs at the pipeline juncture into the Site. Sheen was not observed. TPH-diesel was detected at a maximum of 770 mg/kg in soil samples.

5. RISK EVALUATION

Conceptual Site Model

An evaluation of human exposure to residual chemical contamination requires an assessment of the type and extent of that exposure. This is based on current and reasonably likely future land use. DEQ publishes risk-based concentrations (RBCs) for contaminants commonly encountered, for different types of exposure scenarios. These RBCs are conservative estimates of protective levels of contaminants in soil, groundwater and air. Table 1 shows potential exposure pathways and receptors for the former Site. Based on this, applicable RBCs are identified and used for risk screening.

Potentially complete exposure pathways at the Site are summarized in Table 1 and include:

- Occupational workers,
- Construction workers,
- Excavation workers,
- Volatilization to outdoor air,
- Vapor intrusion into buildings.

Table 1. Conceptual Site Model - Identification of Applicable RBCs

Pathway	Receptor	Applicable RBC	Basis for selection/exclusion
SOIL			
Ingestion, dermal contact, and inhalation	Residential	No	See Note 1.
	Occupational	Yes	See Note 2
	Construction worker	Yes	See Note 3.
	Excavation worker	Yes	See Note 3.
Volatilization to outdoor air	Residential	No	See Note 1.
	Occupational	Yes	See Note 2.
Vapor intrusion into buildings	Residential	No	See Note 1.
	Occupational	NA	See Note 6.
Leaching to groundwater	Residential	No	See Note 1.
	Occupational	Yes	See Note 2.
GROUNDWATER			
Ingestion, dermal and inhalation from tap water	Residential	No	See Notes 1 and 4.
	Occupational	No	See Note 4.
Volatilization to outdoor air	Residential	No	See Note 1.
	Occupational	Yes	See Note 2.
Vapor intrusion into buildings	Residential	No	See Note 1.
	Occupational	Yes	See Note 2.
Groundwater in excavation	Construction and excavation worker	Yes	See Note 5.

Notes:

1. The Site is part of the Port of Astoria Facility and is zoned S2, General Development Shorelands. Residential development is not considered a reasonably likely future use due to *Port of Astoria Waterfront Master Plan, Port of Astoria and City of Astoria*, March 2022 and discussions with the Port.
2. Occupational use is considered reasonably likely.
3. Construction and excavation workers are considered reasonably likely.
4. City water is provided. Local groundwater is not currently used for drinking water (tap water) and is not likely to be used for this purpose in the future.
5. Shallow groundwater was generally encountered between 4 and 11 ft bgs at the Site. Construction and excavation work is generally to a depth of approximately 15 ft and is therefore considered reasonably likely.
6. NA = not applicable. It may be a potential exposure pathway, but as of April 2023 DEQ no longer screens vapor intrusion risk based on soil data. Use of soil vapor data is preferred.

Risk Screening of Contaminants

Based on the Site Conceptual Site Model above, relevant RBCs for evaluating Site risk are shown in Table 2. Contaminant concentrations that are compared to the RBCs applicable for the Site are shown in Tables 3, 5, and 6. The occurrence of sheen is summarized in Table 4. A discussion of hot spots is also provided below. Note that in evaluating potential risk, soil within the 0 to 3 ft bgs range was evaluated for occupational risk, while soil in the 0 to 15 ft bgs range was considered for excavation worker and construction worker exposure. DEQ evaluated vapor

intrusion risk by comparing new DEQ RBCs to soil vapor and groundwater samples. DEQ revised the approach for evaluating vapor intrusion and provided updated RBCs in June 2023. Indoor air samples were not collected at the Site.

Soil

- Maximum surface soil concentrations (0 to 3' bgs) did not exceed RBCs for occupational exposure. TPH-gasoline, BTEX, 1,2,4-TMB, 1,3,5-TMB were not detected above laboratory method reporting limits.
- Maximum surface soil (in the 0 to 3 ft bgs interval) concentrations exceeded RBCs for TPH-diesel for construction workers but not for excavation workers.
- Maximum subsurface soil (in the 3 to 15 ft bgs interval) concentrations exceed RBCs for TPH-diesel for construction workers but not for excavation workers.
- Maximum subsurface soil (in the 3 to 15 ft bgs interval) concentrations for TPH-gasoline were below applicable RBCs.
- BTEX, 1,2,4-TMB, 1,3,5-TMB were not detected above laboratory method reporting limits in subsurface soil.
- Slight to strong sheen was observed in surface and subsurface soil samples. Contact with a separate-phase petroleum as indicated by sheen is considered an unacceptable risk and potential hot spot. In addition, testing of the samples showed that concentrations exceeded RBCs for the construction worker.

Groundwater

- Groundwater concentrations exceeded for vapor intrusion into buildings for occupational users. Maximum concentrations of benzene, ethylbenzene, and naphthalene slightly exceeded RBCs. TPH-gasoline was approximately three times the RBC. TPH-diesel exceeded by the RBC by two times (see Table 6).

Soil Vapor

- All soil vapor concentrations were below DEQ's occupational RBCs for vapor intrusion.

Human Health Risk

Based on current and potential future land use and the risk-based screening, current and/or potential future risk appears to be present for:

- Exposure to surface and subsurface soil through ingestion, dermal contact and inhalation by construction workers.
- Volatilization from groundwater and exposure to gasoline and diesel-range vapors in indoor air by occupational workers.
- The Site Locality of the Facility is shown in Figures 3, 4 and 5. Future construction and excavation workers might encounter petroleum hydrocarbons in the surface and subsurface in the vicinity of borings SB-900 through SB-909.

Ecological Risk

A *Level 1 Ecological Risk Assessment* was completed for the AAW site in August 2004 (Hart Crowser, 2004). On August 20, 2004, DEQ issued its finding in agreement with the Level 1 report, that no ecologically important species and/or habitats were present in the upland portion of the AAW site (DEQ, 2004) including AOC2. DEQ did not require further ecological risk assessment for AOC2, including the subject Site.

The Site is covered with a combination of hardscape and buildings, and there is not ecological habitat present. Ecological contact with residual contamination is not expected. Figure 1 shows the location of the Shell Site and the AOC2 and AOC4 groundwater plumes in relationship to the nearest surface water at Slip 2.

Dissolved concentrations in groundwater at Shell exceeded ecological risk screening values for surface water (DEQ chronic freshwater RBCs). However, these screening values are not directly applicable for the Site because groundwater would need to flow through AOC4 in order to discharge to the nearest surface water, Slip 2 surface water in AOC4. AOC4 groundwater contains LNAPL which discharges to Slip 2 surface water. As a result, a cleanup is underway at AOC4 in accordance with the May 2022 Consent Judgment. A groundwater plume containing LNAPL was not identified at Shell. Potential risks from dissolved phase transport of chemicals in groundwater to surface water cannot be evaluated unless LNAPL at AOC4 is addressed. The groundwater plume at AOC4 is being remediated in accordance with the CJ scope of work that is currently in the design phase.

Hot Spot Determination

Per DEQ guidance, upland soil and soil vapor results from the AAW RI were screened against human health hot spot criteria based on 100 times an applicable RBC for individual carcinogenic compounds, and 10 times an RBC for individual noncarcinogenic compounds. In addition, LNAPL was identified as a hot spot based on adverse effects on the beneficial uses of groundwater for the Area-Wide site. This beneficial use of groundwater includes discharge of groundwater to surface water for areas near the river. This pathway does not apply to the Site because groundwater within the Site Locality of Facility (see Figures 3, 4, and 5) do not discharge directly to surface water because of its distance from the river. As described above, groundwater in AOC2 must flow through AOC4 before discharging to surface water.

Sheen was observed in surface and subsurface soils but not in groundwater samples. Excavation and construction worker direct contact with residual free product was determined to be possible in the future, and necessarily will be addressed through institutional controls (see below). Residual petroleum product was determined to be immobile and therefore not a hot spot from the perspective of off-Site migration and potential impacts to surface water receptors.

6. RECOMMENDATIONS

Site conditions are protective of human health and the environment provided a Contaminated Media Management Plan is developed for use by excavation and construction workers. To ensure conditions are protective the following controls and restrictions are necessary conditions for DEQ's issuance of a (conditional) NFA determination:

- A DEQ-approved Contaminated Media Management Plan (CMMP) developed to ensure that proper controls are implemented during activities where impacted soil may be contacted or generated, in particular in soil on the western and southern part of the Site.
- A Site-specific construction and excavation worker Health and Safety Plan developed and implemented prior to initiation of intrusive activities.
- The need for the CMMP and H&S Plans will be recorded in the Port Layout Plan for Port of Astoria.

At present and given the restrictions above, Site conditions are protective of public health and the environment under current and likely future (occupational) Site use. If a non-occupational Site use occurs in the future, DEQ's NFA determination for the Site will need to be reconsidered.

No further restrictions are needed for this Site unless conditions change. A Certification of Completion and No Further Action determination with conditions is recommended for the former Shell Site at Tax Lot 100 in Clatsop County, Township 8 North, Range 9 West, Section 7 Willamette Base and Meridian., at latitude 46.186237 ° North, longitude -123.857447 ° West based on the findings from review of the Administrative Record. DEQ should proceed with a public comment period to announce its proposed issuance of a Conditional No Further Action determination for the Site and eligibility for a Certification of Completion. The COC will be issued for the greater AAW project at a later date once all parties have completed their respective work. The remedy at Port of Astoria Slip 2 in AOC4 is currently in the remedial design phase of work. DEQ anticipates that completion of the remedy at AOC4 will take several years.

7. PUBLIC COMMENT PERIOD

On October 1, 2023, DEQ will publish a public notice concerning the Proposed Conditional No Further Action determination for the Site in the Oregon Secretary of States' Bulletin and in The Astorian. The notices will be added to the Administrative Record. In addition, notices will be sent by electronic mail to adjacent and nearby property owners, the City of Astoria, the Port of Astoria, and other stakeholders.

All comments received during the 30-day comments period, extending through November 1, 2023 will be considered before making a final decision regarding the proposed Conditional NFA determination.

The cNFA for the Shell property will not apply to any other properties (other tax lots) within the AAW or AOC2 site boundaries. The AAW Site is listed on the Department's Confirmed Release List and Inventory of Hazardous Substance sites. This listing will remain in place until any remaining remedial actions within the AAW site are completed.

Final decision-making will be recorded in DEQ's ECSI database (ECSI # 2277).

8. ADMINISTRATIVE RECORD

The Astorian, 2023. AB8566. DEQ Seeks Comments on Proposed Conditional No Further Action Cleanup Determination for a portion of Astoria Area-Wide Site. October 1.

DEQ, 2019a. *Hazard Notification: Astoria Area-Wide Cleanup Site in Astoria, Oregon (ECSI # 2277)*. April 11.

DEQ, 2019b. *Remedial Action Record of Decision, Astoria Area-Wide Petroleum Site Area of Concern 4, Astoria, Oregon*. June 20.

DEQ, 2013. *Re: Shell's Soil Gas Sampling Report and Request for NFA, Astoria Area-Wide Petroleum Site – AOC2 – Shell, Astoria, Oregon, DEQ ECSI File #2277, Order ECSR-NWR-01-11*. September 11.

EnviroLogic Resources, Inc., 2003a. *Technical Memorandum, Phase 2 Source/Soil-Characterization, Astoria Area-Wide Petroleum Site, Astoria, Oregon*. January 30.

EnviroLogic Resources, Inc., 2003b. *Phase 1 Groundwater Assessment, Remedial Investigation/Feasibility Study, Astoria Area-Wide Petroleum Site, Astoria, Oregon*. July 2.

EnviroLogic Resources, Inc., 2008. *Remedial Investigation Report. Prepared for the Astoria Area-Wide PRP Group*. June.

Hart Crowser, 2013. *Re: Response to Port of Astoria Comments, Soil Gas Sampling Report and Request for No Further Action, Former Shell Oil Facility, Astoria, Oregon, DEQ ECSI File No. 2277, Order ECSR-NWR-01-11*. April 17.

Hart Crowser, 2012a. *Re: Soil Gas Sampling Report and Request for No Further Action, Astoria Area-Wide Petroleum Site – Area of Concern 2, Former Shell Oil Facility, Astoria Oregon, DEQ ECSI File No. 2277, Order ECSR-NWR-01-11*. June 25.

Hart Crowser, 2012b. *Re: Soil Gas Sampling Report and Request for No Further Action, Astoria Area-Wide Petroleum Site – Area of Concern 2, Former Shell Oil Facility, Astoria Oregon, DEQ ECSI File No. 2277, Order ECSR-NWR-01-11*. July 3.

Hart Crowser, 2011. *Soil Gas Sampling Work Plan, Astoria Area-Wide Petroleum Site – Area of Concern 2, Former Shell Oil Facility, Astoria Oregon, DEQ ECSI File No. 2277, Order ECSR-NWR-01-11*. August 9.

Hart Crowser, 2004a. *RI/FS Technical Memorandum, Level 1 Ecological Risk Assessment, Remedial Investigation/Feasibility Study, Astoria Area-Wide Petroleum Site, Astoria, Oregon*. August 12.

Hart Crowser, 2004b. *Historical Shell/Niemi/Mobil Petroleum Pipeline Investigation and Decommissioning Report, Astoria Area-Wide Petroleum Site, Astoria, Oregon, Prepared for Shell Oil Company and ExxonMobil Corporation.* July 30.

Hart Crowser, 2003. *Historical Shell/Niemi/Mobil Petroleum Pipeline Investigation and Decommissioning Work Plan, Astoria Area-Wide Petroleum Site, Astoria, Oregon, Prepared for Shell Oil Company and ExxonMobil Corporation.* December 18.

Landye Bennett Blumstein LLP, 2013. *Re: Comments on Shell's Soil Gas Sampling Report and Request for No Further Action for Area of Concern 2 of the Astoria Area-Wide Cleanup Site.* January 2.

Oregon Secretary of State's Bulletin, 2023. DEQ Seeks Comments on Proposed Conditional No Further Action Cleanup Determination for a portion of Astoria Area-Wide Site. October 1.

Port of Astoria and City of Astoria, 2022. *Waterfront Master Plan*, Walker Macy Planning and Urban Design. March.

9. ATTACHMENTS

Tables

Table 1 - Conceptual Site Model – Identification of Applicable RBCs

Table 2 - Human Health Risk-Based Concentrations

Table 3 – Comparison of Maximum Soil Concentrations with Human Health RBCs

Table 4 – Sheen Observed in Soil Borings

Table 5 – Soil Vapor Concentrations Compared with Human Health RBCs

Table 6 – Maximum Groundwater Concentrations Compared with Human Health RBCs

Table 7 – Selected Human Health Risk-Based Concentrations (RBCs)

Table 8 – Comparison of Ecological RBCs with Groundwater Concentrations

Figures

Figure 1 - Site Location and Vicinity Map

Figure 2 – Five Areas of Concern

Figure 3 – Locality of Facility Map

Figure 4 – Geologic Cross-Section A-A'

Figure 5 - Geologic Cross-Section B-B'

Table 2. Human Health Risk-Based Concentrations

Chemical	Risk-Based Concentrations							
	Soil Ingestion, Dermal Contact, and Inhalation, Occupational Worker (0 to 3 ft bgs) RBCss-oc	Soil Ingestion, Dermal Contact, and Inhalation, Construction Worker (0 to 15 ft bgs) RBCss-cw	Soil Ingestion, Dermal Contact, and Inhalation, Excavation Worker (0 to 15 ft bgs) RBCss-ew	Volatilization to Outdoor Air, Occupational RBCso-oc	Direct Excavation and Construction Worker RBCwe	Vapor Intrusion into Buildings, Occupational RBCwi-oc	Vapor Intrusion into Buildings, Occupational RBCsv-oc	Inhalation, Occupational RBCair-oc
Units:	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(µg/L)	(µg/L)	(µg/m ³)	(µg/m ³)
Benzene	37	380	11,000	50	1,800	12	52	1.6
Benzo[a]pyrene (and BaP Eq)	2.1	17 >Csat	490>Csat	NV	>S	NV	NV	0.0088
Benzo[b]fluoranthene	21	170 >Csat	4900>Csat	NV	>S	NV	NV	0.20
Dibenz[a,h]anthracene	2.1	17 >Csat	490>Csat	NV	>S	NV	NV	>Pv
Ethylbenzene	150	1,700 >Csat	49,000>Csat	160	4,500	31	160	4.9
Naphthalene	23	580	16,000>Csat	83	500	50	12	0.36
Toluene	88,000	28,000 >Csat	770,000>Csat	>Csat	220,000	150,000	730,000	22,000
1,2,4-Trimethylbenzene	6,900	2,900 >Csat	81,000>Csat	>Csat	6,300	2,400	8,800	260
1,3,5-Trimethylbenzene	6,900	2,900 >Csat	81,000>Csat	>Csat	7,500	1,700	8,800	260
Xylenes	25,000	20,000 >Csat	560,000>Csat	>Csat	23,000	3,300	15,000	440
TPH-gasoline	20,000	9,700	>Max	69,000	14,000	520	40,000	1,200
TPH-diesel	14,000	4,600	>Max	>Max	>S	1,700	14,000	430

Notes:

- >Csat
- >MAX
- >S
- >Pv
- BaP Eq
- bgs
- ft
- mg/kg
- µg/L
- µg/m³
- NV
- TPH

Risk-Based Concentrations (RBCs) values Oregon Department of Environmental Quality Risk-Based Concentrations for Individual Chemicals, April 2023.

Table 3. Comparison of Maximum Soil Concentrations with Human Health RBCs

	Units	Surface Soil				Sub-Surface Soil				Risk-Based Concentration			
		Sample ID	Mar-03	Sample Depth (ft bgs)	Maximum Detected Value (0 to 3 ft bgs)	Sample ID	Date	Sample Depth (ft bgs)	Maximum Detected Value (0 to 15 ft bgs)	Soil Ingestion, Dermal Contact, and Inhalation, Occupational Worker (0 to 3 ft bgs) RBCss-oc	Soil Ingestion, Dermal Contact, and Inhalation, Construction Worker (0 to 15 ft bgs) RBCss-cw	Soil Ingestion, Dermal Contact, and Inhalation, Excavation Worker (0 to 15 ft bgs) RBCss-ew	Volatilization to Outdoor Air, Occupational RBCso-oc
Contaminants in Soil Borings										(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Benzene	mg/kg	SB-904(S)-4	8/26/2002	0-4	0.05U	SB-900(S)-12	08/26/2002	8 to 12	5.00U	37	380	11000>Csat	50
Ethylbenzene	mg/kg	SB-908(S)-4	8/27/2002	0-4	0.147	SB-900(S)-12	08/26/2002	8 to 12	8.56	150	1,700	49,000	160
Naphthalene	mg/kg	SB-912(S)-2	9/3/2003	1.5-3	0.200U	SB-904(S)-12	08/26/2002	8 to 12	4.06	23	580	16,000	83
Toluene	mg/kg	SB-904(S)-4	8/26/2002	0-4	0.05U	SB-902(S)-12	08/26/2002	8 to 12	0.000512J	88,000 >Csat	28,000	770,000	>Csat
1,2,4-Trimethylbenzene	mg/kg	SB-908(S)-4	8/27/2002	0-4	1.10	SB-906(S)-12	08/27/2002	8 to 12	14.0	6,900>Csat	2,900	81,000	>Csat
1,3,5-Trimethylbenzene	mg/kg	SB-905(S)-4	8/26/2002	0-4	0.456	SB-906(S)-12	08/27/2002	8 to 12	3.91	6,900>Csat	2,900	81,000	>Csat
Xylene	mg/kg	SB-908(S)-4	8/27/2002	0-4	0.385	SB-900(S)-12	08/26/2002	8 to 12	16.4	25,000	20,000	560,000	>Csat
TPH-gasoline	mg/kg	SB-905(S)-4	8/26/2002	0-4	3.23	SB-900(S)-12	08/26/2002	8 to 12	2,160	20,000	9,700	>Max	69,000
TPH-diesel	mg/kg	SB-908(S)-4	8/27/2002	0-4	7,550	SB-904(S)-12	08/26/2002	8 to 12	23,100	14,000	4,600	>Max	>Max
		Surface Soil				Sub-Surface Soil							

Notes:

Data from Tables A-1 and A-3 of the Human Health Risk Assessment (Maul Foster & Alongi, Inc. 2008); Appendix G of the *Remedial Investigation Report* [EnviroLogic Resources, Inc. 2008]].

- ft
- feet
- bgs
- below ground surface
- mg/kg
- milligrams of constituent per kilogram of soil
- NV
- No value reported
- >MAX
- The constituent RBC for this pathway is greater than 100,000 mg/kg.
- >Csat
- This RBC exceeds the limit of the three-phase equilibrium partitioning
- TPH
- Total petroleum hydrocarbons

(yellow highlighting) indicates that a measured concentration exceeds one or more applicable RBC.

(orange highlighting) indicates RBC value is exceeded by one or more measured concentrations.

Risk-Based Concentrations (RBCs) values from Oregon Department of Environmental Quality Risk-Based Concentrations for Individual Chemicals, May 2018, updated June 2023; and RBCs for TPH, Nov. 2011.

Table 4. Sheen Observed in Soil Borings

<u>Sample Identification</u>	<u>Sampling Date</u>	<u>Depth in feet</u>	<u>Field PID Reading</u>	<u>Sheen Observed</u>
SB-902(S)-8	8/26/2002	4 to 8	5U	Strong
SB-902(S)-12	8/26/2002	8 to 12	28.7	Strong
SB-903(S)-10	8/26/2002	8 to 10	7	Slight
SB-904(S)-12	8/26/2002	8 to 12	15	Slight
SB-905(S)-4	8/26/2002	0 to 4	5	Slight
SB-905(S)-12	8/26/2002	8 to 12	15	Slight
SB-906(S)-12	8/26/2002	8 to 12	11.7	Slight
SB-908(S)-4	8/26/2002	0 to 4	11	Strong
SB-913(S)-2 (MW-20A)	9/3/2003	1.5 to 3	5U	Slight
SB-913(S)-7 (MW-20A)	9/3/2003	7 to 8.5	8	Slight
<u>Notes</u>				
surface soil sample				
subsurface soil sample				

Table 5. Soil Vapor Concentrations Compared with Human Health RBCs

	Soil Vapor Concentrations by Sample Location						
	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	Vapor Intrusion into Buildings, Occupational RBCsv-oc
	9/13/2011	9/13/2011	9/13/2011	9/13/2011	9/13/2011	2/21/2012	($\mu\text{g}/\text{m}^3$)
Benzene	3.5	8.4	3.1U	3.3U	3.0U	3.0U	52
Ethylbenzene	3.1U	4.3	3.1U	3.3U	3U	3U	160
Naphthalene	16U	16U	16U	17U	16U	16U	12
Toluene	14.0	32.0	7.4	6.9	7.0	3.0U	730,000
1,2,4-Trimethylbenzene	3.8U	4.2	4.1	4.0U	5.1	3.7U	8,800
1,3,5-Trimethylbenzene	3.8U	3.7U	3.8U	4.0U	3.7U	3.7U	8,800
Xylene	9.2	18	8.5	6.6	7.8	3.0U	15,000
C ₅ -C ₈ Aliphatic Hydrocarbons	55	180	25	34	71	24	58,000
C ₉ -C ₁₂ Aliphatic Hydrocarbons	19U	18U	19U	20U	18U	18U	15,000
C ₉ -C ₁₀ Aromatic Hydrocarbons	20	50	41	31	98	33	8,800
TPH-gasoline	NT	NT	NT	NT	NT	NT	40,000
TPH-diesel	NT	NT	NT	NT	NT	NT	14,000

Notes:

Data from Table A-10 of the Human Health Risk Assessment (Maul Foster & Alongi, Inc. 2008) and

Appendix G of the *Remedial Investigation Report* [EnviroLogic Resources, Inc. 2008]).

Gasoline concentrations converted from ppmv using $\text{mg}/\text{m}^3 = (99.7 \text{ g}/\text{mol})(\text{ppmv}) / 24.45 \text{ L}/\text{mol}$

The locations of soil vapor samples are shown on Figure 6-117 of the *Remedial Investigation Report* (EnviroLogic Resources, Inc. 2008).

$\mu\text{g}/\text{m}^3$ micrograms per cubic meter

NV No value reported or established

NT Not tested for parameter

NITI No inhalation toxicity information available

(yellow highlighting) indicates that a measured concentration exceeds one or more applicable RBC.

(orange highlighting) indicates RBC value is exceeded by one or more measured concentrations.

Risk-Based Concentrations (RBCs) values from *Oregon Department of Environmental Quality Risk-Based Concentrations for Individual Chemicals*, rev. 9/15/2009, 05/2018.

Table 6. Maximum Groundwater Concentrations Compared with Human Health RBCs

Constituents	Monitoring Well	Sample Date	Maximum Detected Concentration	Units	Groundwater RBC		
					Direct Excavation and Construction Worker RBCwe	Volatilization to Outdoor Air, Occupational RBCwo-oc	Vapor Intrusion into Buildings, Occupational RBCwi-oc
Benzene	MW-22(A)	10/20/03	19.4	µg/L	1,800	14,000	12
Ethylbenzene	MW-22(A)	10/20/03	52.9	µg/L	4,500	43,000	31
Naphthalene	MW-20(A)	12/30/09	51.8	µg/L	500	16,000	50
Toluene	MW-22(A)	10/20/03	2.96	µg/L	220,000	>S	150,000
1,2,4-Trimethylbenzene	MW-20(A)	12/30/09	165	µg/L	6,300	>S	2,400
1,3,5-Trimethylbenzene	MW-20(A)	12/30/09	32.8	µg/L	7,500	>S	1,700
Xylenes	MW-20(A)	10/20/03	121	µg/L	23,000	>S	3,300
TPH-gasoline	MW-20(A)	10/20/03	1,590	µg/L	14,000	>S	520
TPH-diesel	MW-21(A)	04/16/04	4,860	µg/L	>S	>S	1,700

Notes:

Data from Tables A-6, A-7, and A-8 of the Human Health Risk Assessment (Maul Foster & Alongi, Inc. 2008); Appendix G of the Remedial Investigation Report [EnviroLogic Resources, Inc. 2008]].

Data from the most recent sampling event reported in the remedial investigation is included in this table.

µg/L micrograms of constituent per liter of water
>S This groundwater RBC exceeds the solubility limit.
TPH Total petroleum hydrocarbons

(yellow highlighting) indicates that a measured concentration exceeds one or more applicable RBC.

(orange highlighting) indicates RBC value is exceeded by one or more measured concentrations.

Risk-Based Concentrations (RBCs) values from Oregon Department of Environmental Quality Risk-Based Concentrations for Individual Chemicals, rev. 9/15/2009, 05/2018.

Table 7. Selected Human Health Risk-Based Concentrations (RBCs)

Chemical of Concern	RBC for Soil 0-3 ft (mg/kg)		RBC for Soil 0-15 ft (mg/kg)		RBC for Groundwater Upland (µg/L)		RBC for Subslab Soil Vapor (µg/m ³)		RBC for Indoor Air (µg/m ³)	
Benzene	37	ss-oc	380	ss-cw	12	wi-oc	52	sv-oc	1.6	air-oc
Benzo[a]pyrene	2.1	ss-oc	17 >Csat	ss-cw	NV	wi-oc	NV	sv-oc	0.0088	air-oc
Benzo[b]fluoranthene	21	ss-oc	170 >Csat	ss-cw	NV	wi-oc	NV	sv-oc	0.20	air-oc
Dibenz[a,h]anthracene	2.1	ss-oc	17 >Csat	ss-cw	NV	wi-oc	NV	sv-oc	>Pv	air-oc
Ethylbenzene	150	ss-oc	1,700 >Csat	ss-cw	31	wi-oc	160	sv-oc	4.9	air-oc
Naphthalene	23	ss-oc	580	ss-cw	50	wi-oc	12	sv-oc	0.36	air-oc
Toluene	88,000	ss-oc	28,000 >Csat	ss-cw	150,000	wi-oc	730,000	sv-oc	22,000	air-oc
1,2,4-Trimethylbenzene	6,900	ss-oc	2,900 >Csat	ss-cw	2,400	wi-oc	8,800	sv-oc	260	air-oc
1,3,5-Trimethylbenzene	6,900	ss-oc	2,900 >Csat	ss-cw	1,700	wi-oc	8,800	sv-oc	260	air-oc
Xylene	25,000	ss-oc	20,000 >Csat	ss-cw	3,300	wi-oc	15,000	sv-oc	440	air-oc
TPH-gasoline	20,000	ss-oc	9,700	ss-cw	520	wi-oc	40,000	sv-oc	1200	air-oc
TPH-diesel	14,000	ss-oc	4,600	ss-cw	1,700	wi-oc	14,000	sv-oc	430	air-oc

Notes

Screening values taken from Table 2.

ss = RBC_{ss}, soil contact, occupational (oc), construction worker (cw), or excavation worker (ew)

wi = RBC_{wi}, water to indoor air, occupational (oc)

we = RBC_{we}, groundwater in excavation

sv = RBC_{sv}, soil vapor to indoor air, occupational (oc)

air = RBC_{air}, occupational (oc)

>C_{sat} = greater than soil saturation limit

>P_v = Greater than vapor pressure

TPH = Total petroleum hydrocarbons

NV = not volatile

Table 8. Comparison of Ecological RBCs with Groundwater Concentrations

Constituents	Monitoring Well	Sample Date	Maximum Detected Concentration	Units	DEQ Freshwater Chronic RBC
Benzene	MW-22(A)	10/20/03	19.4	µg/L	160
Ethylbenzene	MW-22(A)	10/20/03	52.9	µg/L	61
Naphthalene	MW-20(A)	12/30/09	51.8	µg/L	21
Toluene	MW-22(A)	10/20/03	2.96	µg/L	62
1,2,4-Trimethylbenzene	MW-20(A)	12/30/09	165	µg/L	15
1,3,5-Trimethylbenzene	MW-20(A)	12/30/09	32.8	µg/L	26
Xylenes	MW-20(A)	10/20/03	121	µg/L	27
TPH-gasoline	MW-20(A)	10/20/03	1,590	µg/L	440
TPH-diesel	MW-21(A)	04/16/04	4,860	µg/L	640

Notes:

Data from Tables A-6, A-7, and A-8 of the Human Health Risk Assessment (Maul Foster & Alongi, Inc. 2008); Appendix G of the Remedial Investigation Report [EnviroLogic Resources, Inc. 2008]).

Data from the most recent sampling event reported in the remedial investigation is included in this table.

µg/L micrograms of constituent per liter of water

>S This groundwater RBC exceeds the solubility limit.

TPH Total petroleum hydrocarbons

(yellow highlighting) indicates that a measured concentration exceeds one or more applicable RBC.

(orange highlighting) indicates RBC value is exceeded by one or more measured concentrations.

Risk-Based Concentrations (RBCs) values from Oregon Department of Environmental Quality, Conducting Ecological Risk Assessment, September 14, 2020, Table 2.

Key Plan

----- Areas of Concern
(color coded for clarity)

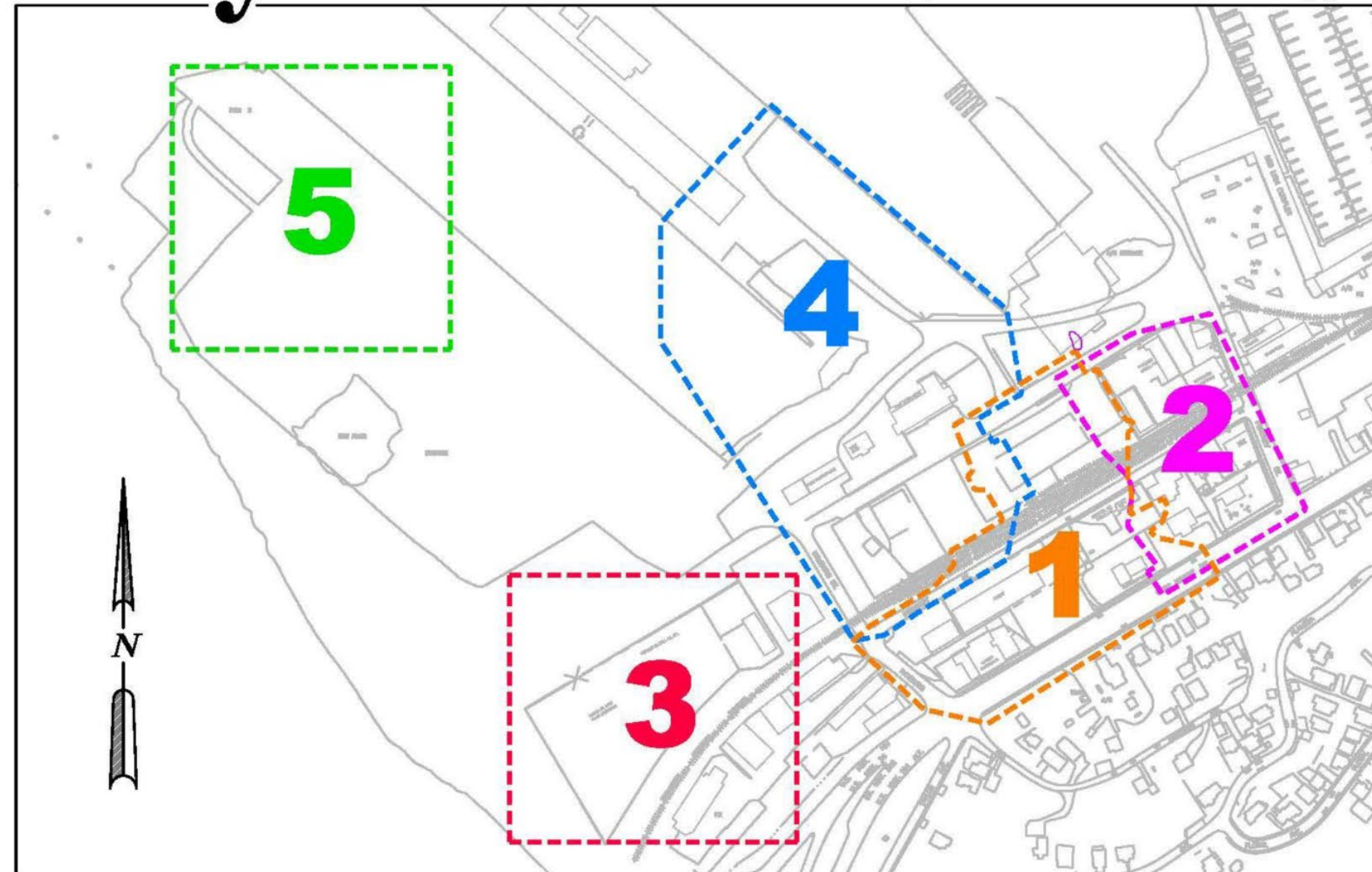


FIGURE 2

AREAS OF CONCERN
Remedial Investigation/Feasibility Study
Astoria Area-Wide Petroleum Site
Astoria, Oregon



LEGEND

--- PROPERTY BOUNDARY

MW-16(A)/SB-312(D) ● MONITORING WELL LOCATION

SV-1 ▲ SOIL GAS SAMPLE LOCATION

SB-901(S) ■ SOIL BORING/PUSH PROBE EXPLORATION LOCATION

TP-901(S) ■ TEST PIT LOCATION

■ INDICATES AT LEAST ONE SOIL CONCENTRATION EXCEEDS APPLICABLE DEQ RBCs

■ INDICATES ALL SOIL CONCENTRATIONS WERE BELOW APPLICABLE DEQ RBCs

■ INDICATES SOIL SAMPLES WERE NOT COLLECTED FROM THIS LOCATION

--- APPROXIMATE EXTENT OF SOIL CONCENTRATIONS ABOVE APPLICABLE DEQ RBCs

--- APPROXIMATE GROUNDWATER DEPTH DURING 9/16/2004 MONITORING EVENT

□ CROSS SECTION

NOTES: DEQ = DEPARTMENT OF ENVIRONMENTAL QUALITY. RBC = RISK BASED CLEANUP LEVELS.

0 20 40 ft
1" = 40 ft
Coordinate System: OR83-NF

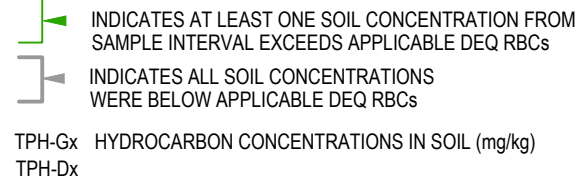
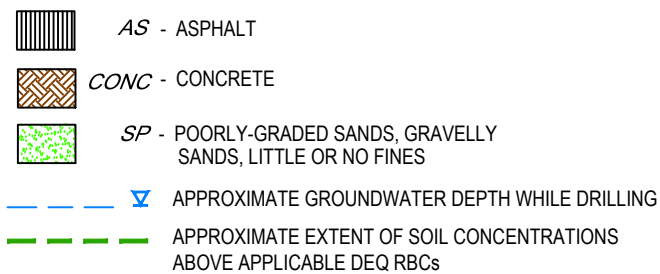
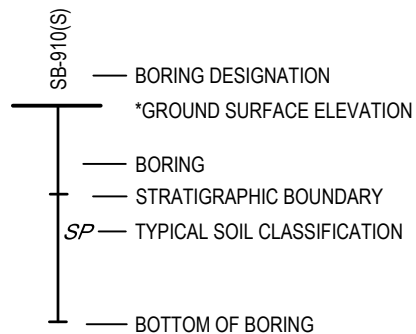
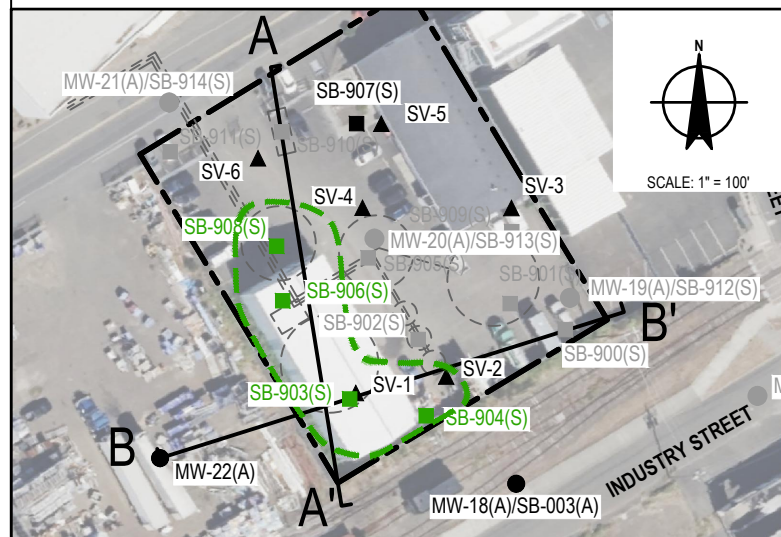
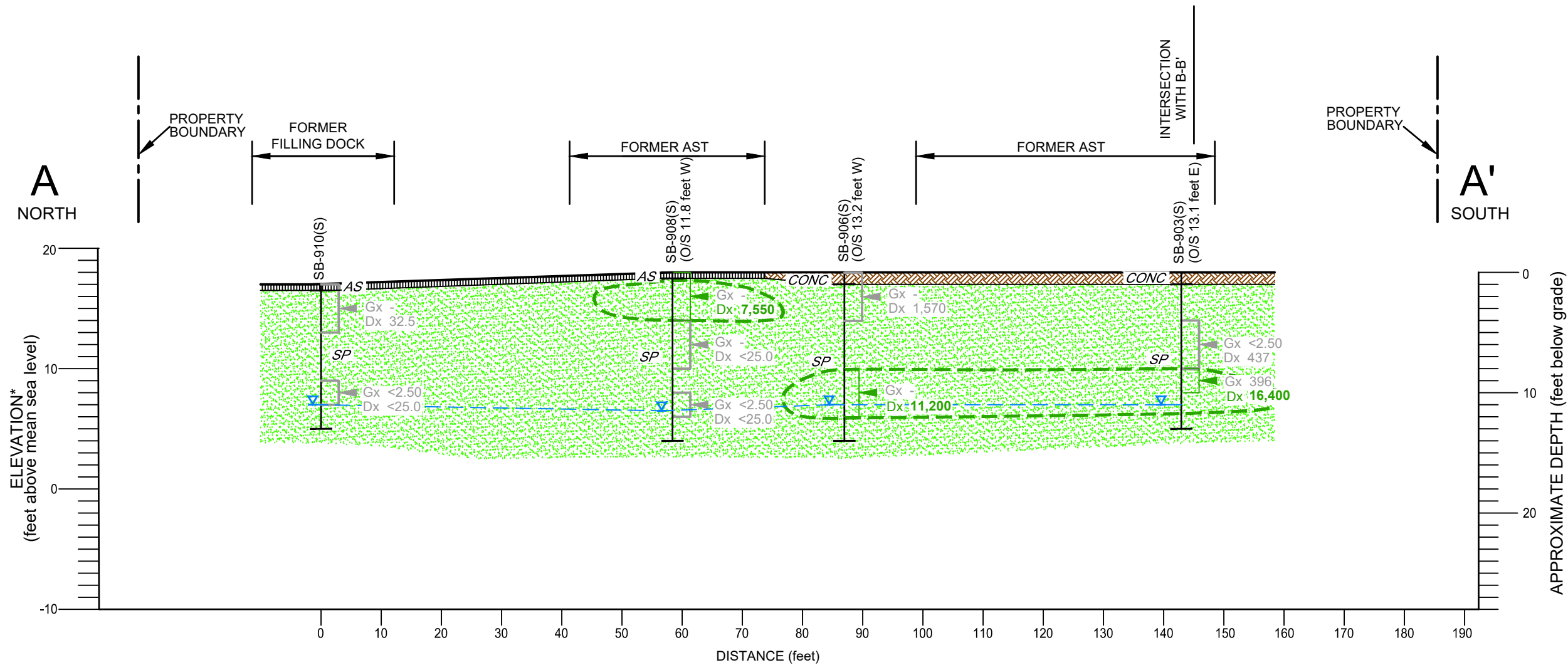
GHD

FORMER SHELL OIL BULK PLANT - AOC 2
415 GATEWAY AVENUE
ASTORIA, OREGON

LOCALITY OF FACILITY MAP

Project No. 11218586
Date September 2023

FIGURE 3



NOTES:

- mg/kg = MILLIGRAMS PER KILOGRAM.
- BOLD = EXCEEDS APPLICABLE DEQ RBCs
- DEQ = DEPARTMENT OF ENVIRONMENTAL QUALITY.
- RBC = RISK BASED CLEANUP LEVELS.
- * = APPROXIMATE GROUND SURFACE ELEVATION.
- O/S = OFF-SET.



FORMER SHELL OIL BULK PLANT - AOC 2
415 GATEWAY AVENUE
ASTORIA, OREGON

Project No. 11218586
Date September 2023

GEOLOGIC CROSS SECTION A-A'

FIGURE 4

