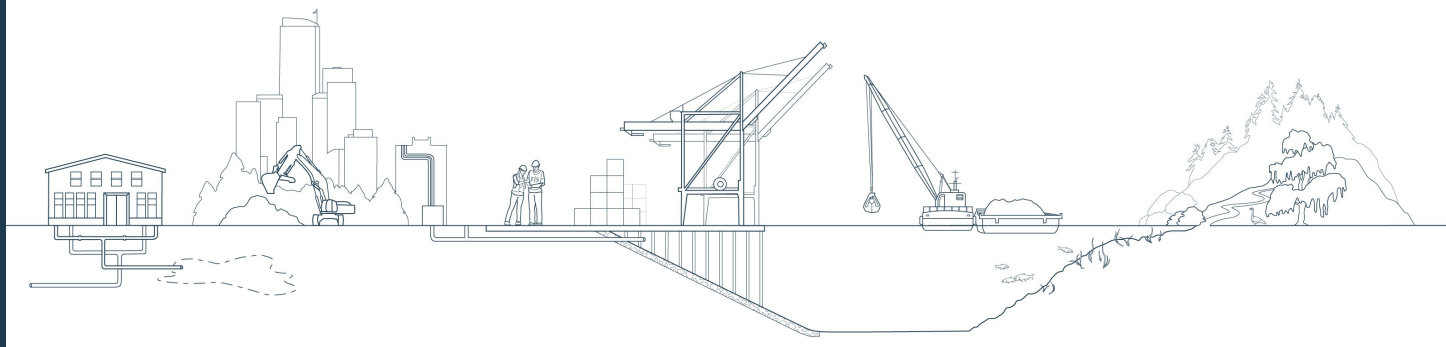
2022 Annual Progress Report for the K Ply Site

K Ply Site

Prepared for
Port of Port Angeles

January 2023



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2022 Annual Progress Report for the K Ply Site

This document was prepared for
the Port of Port Angeles
under the supervision of:

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Date: 1/27/2023

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List of Abbreviations

Abbreviation	Definition
AO	Agreed Order
CCR	Construction Completion Report
COC	Contaminant of concern
CPOC	Conditional point of compliance
CUL	Cleanup level
DO	Dissolved oxygen
DRO	Diesel-range organics
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
EIM	Environmental Information Management
Fremont	Fremont Analytical, Inc.
FS	Feasibility Study
GRO	Gasoline-range organics
IG	Infiltration gallery
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LNAPL	Light non-aqueous phase liquid
µg/L	Micrograms per liter
MS	Matrix spike
MSD	Matrix spike duplicate
ORC	Oxygen-releasing compound
ORO	Oil-range organics
ORP	Oxidation–reduction potential
Port	Port of Port Angeles
QC	Quality control

Abbreviation	Definition
RI	Remedial Investigation
RPD	Relative percent difference
SAP/QAPP	Sampling and Analysis Plan/Quality Assurance Project Plan
SDG	Sample delivery group
Site	K Ply Site
TPH	Total petroleum hydrocarbons

1.0 Introduction

This Annual Progress Report has been prepared by Floyd|Snider on behalf of the Port of Port Angeles (Port) to meet the reporting requirements of the 2015 Agreed Order (AO) No. DE 11302 with the Washington State Department of Ecology (Ecology) for the K Ply Site (Site). The Site is located at 439 Marine Drive in Port Angeles, Washington.

The objective of this report is to describe work performed for the monitoring period of December 2021 to December 2022, consistent with the requirements of Section VII, subsection C of the AO.

1.1 SITE BACKGROUND

The Site is located directly west of downtown Port Angeles and historically operated primarily as a plywood manufacturer. Environmental contamination under the former mill building was first documented in the late 1980s with partial cleanup actions undertaken by ITT Rayonier, one of the prior mill owners. The mill was demolished by the Port in 2013, which allowed for a comprehensive Remedial Investigation (RI)/Feasibility Study (FS; Floyd|Snider 2015a) and cleanup to be completed. The RI/FS was completed in 2014 and documented a broad area of both gasoline- and hydraulic oil-contaminated soil and groundwater under the former mill. The selected remedy was implemented between August 2015 and May 2016 and included excavation followed by bioremediation of contaminated soil and groundwater. This remedial action removed the majority of soil contamination and greatly reduced the source mass of contamination that was causing elevated contaminant concentrations in groundwater. The two primary cleanup areas included the following:

- **The Gasoline Area (Excavation Areas 5 and 6).** This area extended continuously from the northern to southern boundary of the Site (Figure 1.1). Gasoline was present in soil and groundwater at concentrations greater than Site cleanup levels (CULs) throughout this area. Remediation consisted of excavation of both vadose and smear zone soils to CULs in Area 6 and excavation of vadose zone soils to CULs and smear zone soils to remediation levels in Area 5, followed by application of bio-amendments during backfilling.
- **The Hydraulic Oil Area (Excavation Area 6).** This area is located in the vicinity of the former hydraulic presses. Hydraulic oil was present as a light non-aqueous phase liquid (LNAPL) pooled on the groundwater surface and also present in soil and groundwater downgradient of the LNAPL zone. Remediation consisted of excavation of both vadose and smear zone soils followed by application of bio-amendments during backfilling. A portion of the soil in the Hydraulic Oil Area was commingled with contamination from the Gasoline Area.

Per the remedial design, smear zone soils with gasoline concentrations in soil greater than the remediation level were left in place in Area 5. The remedial action also included groundwater

treatment to stimulate biodegradation of residual petroleum contamination in groundwater following excavation activities.

Groundwater at the Site was treated via application of bio-amendments in two forms:

- **Cedar Street Plume Bio-Injections**: The RI defined a plume of gasoline and benzene in groundwater emanating from the Gasoline Area and extending under Cedar Street toward the north. This area of dissolved-phase groundwater contamination was treated with an oxygen-releasing compound (ORC) that was injected during the construction phase of the project throughout an approximately 1-acre area between wells PP-15R2 and PP-37R (refer to Figure 3.3 in the Construction Completion Report [CCR]; Floyd|Snider 2016). The treated area roughly corresponded to benzene concentrations in the plume greater than 500 micrograms per liter (µg/L). In 2018, after 2 years of post-remediation groundwater monitoring that indicated the aquifer geochemical conditions were highly reducing, a limited area of the benzene plume around wells PP-14R and PP-37(R) was additionally treated with injections of activated carbon amended with magnesium sulfate to promote anaerobic degradation of benzene (Figure 1.1).
- **Groundwater Infiltration Galleries:** Infiltration galleries (IGs) were installed in Areas 5 and 6 prior to backfilling in 2016. These IGs were designed to allow for future application of an ORC or bacteriological nutrients if groundwater monitoring indicates that the groundwater CULs are not being attained at the conditional point of compliance (CPOC). Between 2017 and 2019, targeted treatment with sulfate-rich amendments were applied to the IGs and ground surface of Areas 5 and 6. In 2018, the IGs were modified by extending IGs 3 and 5 to provide more treatment coverage to the west and bifurcating IGs 1 through 4 to target treatment applications along the west side of the excavation areas. Figure 1.1 shows the current infiltration gallery alignment.

The bio-injection treatment of activated carbon and magnesium sulfate at PP-14R seems to have had the most significant improvement of any of the bio-amendment applications. Gasoline and benzene concentrations at PP-14R have declined by more than 90% to less than CULs.

1.2 AGREED ORDER ACTIVITIES COMPLETED

Activities completed during the 2022 monitoring period presented in this Annual Progress Report include the 16th and 17th rounds of post-remediation groundwater monitoring, which represent 6 years of post-remediation groundwater monitoring data. Groundwater samples were collected in May 2022 and November 2022 from 14 wells in the long-term monitoring network in accordance with the Ecology-approved Confirmational Monitoring Plan (Appendix G of the Engineering Design Report [EDR]; Floyd|Snider 2015b).

2.0 Groundwater Compliance Monitoring

Groundwater monitoring is conducted per the AO to ensure that residual soil contamination does not pose a risk to the surface water in Port Angeles Harbor via leaching of contaminants to groundwater and migration of contaminated groundwater to surface water. This section presents the groundwater monitoring results from the May 2022 and the November 2022 monitoring events. Except where deviations are noted, the field methods used were conducted in accordance with the Ecology-approved Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP; Appendix G of the EDR; Floyd|Snider 2015b). The groundwater data from these monitoring events were loaded to Ecology's Environmental Information Management (EIM) database in June 2022 and January 2023. Notification of acceptance of the data into the EIM database was received for the May data in December 2022 but has not yet been received for the November data.

The following sections present the results of monitoring for Site groundwater contaminants of concern (COCs) compared to CULs. The Site groundwater COCs include gasoline-range organics (GRO), diesel-range organics (DRO), oil-range organics (ORO), and benzene.

2.1 SEMIANNUAL GROUNDWATER COMPLIANCE MONITORING RESULTS

The list of long-term monitoring wells includes 4 CPOC wells (PP-17, PP-18R2, PP-19, and PP-34) and 10 performance monitoring wells (PP-13R, PP-14R, PP-15R2, PP-27, PP-29, PP-30, PP-32, PP-33, PP-36, and PP-37R). Monitoring well locations are shown in Figure 1.1. Groundwater samples were collected using standard low-flow sampling methods. Purge water was collected and placed in a 55-gallon drum stored on-site for profiling and off-site disposal by Clean Harbors as industrial wastewater. All compliance monitoring samples were submitted to Fremont Analytical, Inc. (Fremont) of Seattle, Washington, under chain-of-custody procedures for analysis of GRO, DRO, ORO, benzene, toluene, ethylbenzene, and xylenes.

Water quality parameters, including specific conductivity, pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), temperature, and turbidity, were field monitored during sampling of all wells using a YSI Pro DSS water quality meter and LaMotte 2020we/t turbidimeter. Field parameters are presented in Table 2.1. In general, groundwater at the Site has anaerobic/reducing geochemical qualities, such as low DO and negative ORP. There are some seasonal variations in these measurements that are likely influenced by tides and stormwater infiltration.

2.1.1 Data Quality

As described in the SAP/QAPP (Appendix G of the EDR; Floyd|Snider 2015b), a Compliance Screening (Stage 2A) data quality review was performed on total petroleum hydrocarbons (TPH) and select volatile organic compound data resulting from laboratory analysis. The analytical data were reviewed and validated using guidance and quality control (QC) criteria documented in the RI/FS SAP/QAPP (Appendix B of Floyd|Snider 2013), *Test Methods for Evaluating Solid Waste:*

Physical/Chemical Methods (USEPA 1986), and the *National Functional Guidelines for Organic Superfund Methods Data Review* (USEPA 2020).

A total of 15 groundwater samples, including one field duplicate sample, and one trip blank were submitted in one sample delivery group (SDG) for each event, including SDG 2205121 (May 2022) and SDG 2211293 (November 2022), to Fremont for chemical analysis by NWTPH-Gx, NWTPH-Dx, and USEPA 8260D. For both SDGs, all analytical holding times were met, and there were no detections in the method blanks. The matrix spike (MS) recoveries, matrix spike duplicate (MSD) recoveries, laboratory control sample (LCS) recoveries, laboratory control sample duplicate (LCSD) recoveries, sample/sample duplicate relative percent differences (RPDs), LCS/LCSD RPDs, and MS/MSD RPDs all met project requirements.

For SDG 2211293, the laboratory noted that select NWTPH-Dx results may potentially be biased high due to chromatographic interference. These results were qualified J to indicate they are estimated.

Based on the data quality review, all data are determined to be of acceptable quality for use as reported for qualified.

2.1.2 Groundwater Analytical Results

Analytical results for the 2022 post-remediation groundwater compliance monitoring are presented in Table 2.2 and on Figures 2.1 through 2.6. The 2022 groundwater results are discussed separately by contaminant group: GRO, DRO, ORO, and benzene. For reference, the cumulative post-remediation groundwater monitoring results from 2016 to 2022 are presented in Tables A.1 and A.2 (Appendix A).

2.1.2.1 Gasoline-Range Organics

GRO concentrations in groundwater at the CPOC have generally decreased or remained stable since the previous sampling events. For both 2022 monitoring events, GRO concentrations in and around the CPOC were less than the CUL of 800 µg/L, with concentrations ranging from nondetect (at a reporting limit of 50 µg/L) to 336 µg/L, at all four CPOC wells (PP-17, PP-18R2, PP-19, and PP-34) and PP-37R immediately upgradient of the CPOC. GRO concentrations in groundwater performance wells PP-15R2, PP-27, and PP-36 remain stable at concentrations greater than the CUL. These performance wells are located in Area 5, where residually contaminated soil with concentrations greater than CULs (but less than remediation levels) was left in place in the vadose zone; however, the GRO CUL is being achieved at the other performance wells and at the CPOC, indicating that attenuation is occurring as anticipated.

The most recent GRO concentrations in groundwater at Site wells from May and November 2022 are presented in Figures 2.1a and 2.1b, respectively. Figure 2.2 graphically presents all post-remediation GRO concentrations in CPOC wells since 2016.

2.1.2.2 Diesel-Range Organics

DRO concentrations in groundwater have remained relatively stable with seasonal variability observed since remediation was completed in 2016. DRO concentrations measured in groundwater from CPOC well PP-19 on the northwestern extent of the CPOC have consistently been less than the Site CUL of 500 µg/L. Groundwater samples from the other three CPOC wells (PP-17, PP-18R2, and PP-34) consistently demonstrate exceedances of DRO at concentrations ranging from 591 µg/L to 2,420 µg/L, or about 1.2 to 4.8 times the Site CUL. As discussed in the 2021 Annual Progress Report, the historical quantification of petroleum concentrations by analytical method NWTPH-Dx are more consistent with DRO (as weathered diesel) that has heavier carbon chains that overlap with ORO (Floyd|Snider 2022). Prior to October 2021, the laboratory reported weathered diesel concentrations as ORO. In October 2021, the laboratory shifted the reporting of DRO and ORO concentrations based on carbon chains to quantification based on the chromatographic pattern and the conceptual site model of residual diesel fuel in soil. Therefore, it is presumed that ORO concentrations reported in 2016 through April 2021 (Table A.1) are more consistent with a weathered diesel product rather than heavy oil (ORO).

The shift in laboratory quantification makes it difficult to discern post-remediation trends of DRO; however, the addition of silica gel cleanup on petroleum concentrations by analytical method NWTPH-Dx have shown a positive outcome for DRO concentrations at the CPOC. Silica gel cleanup was performed on the CPOC samples collected in May 2022 and resulted in decreased concentrations of DRO at PP-18R2 from 591 µg/L to 307 µg/L, less than the CUL; and at PP-17 and PP-34, silica gel cleanup reduced DRO concentrations from 1,010 µg/L to 651 µg/L and from 1,890 µg/L to 969 µg/L, respectively.

In November, silica gel cleanup on the CPOC well samples resulted in DRO concentrations less than the CUL at all four CPOC wells. At all Site wells, samples collected in 2022 and analyzed for DRO with silica gel cleanup resulted in decreased concentrations of approximately 20% to 60% and up to 90% in some samples (refer to Table 2.2).

Historically, DRO concentrations have been reported mostly without silica gel cleanup, so it is difficult to discern post-remediation trends in residual diesel fuel concentrations relative to other organic compounds that elute in the diesel range, such as fuel metabolites and naturally occurring organics in the aquifer. However, the DRO concentrations (when compared to historical ORO and DRO concentrations) have remained stable with seasonal fluctuations, and relative reduction in concentrations in samples analyzed with silica gel cleanup between 2016/2017 and 2022 indicates a potential modest decreasing trend in residual diesel fuel contamination in groundwater.

The most recent DRO concentrations in groundwater at Site wells from May and November 2022 are presented in Figures 2.3a and 2.3b, respectively. Figure 2.4 graphically presents all post-remediation DRO concentrations in CPOC wells since 2016 (quantified by the laboratory as ORO between 2016 and April 2021 and quantified as DRO beginning in October 2021).

2.1.2.3 Oil-Range Organics

ORO concentrations resulting from hydraulic oil in groundwater comply with the Site CUL of 500 µg/L at the CPOC and all upgradient performance monitoring wells. In both May and November 2022, ORO was not detected in any monitoring well. This is consistent with the RI findings that ORO was not detected in most groundwater samples from the southern portion of the former mill building (Area 5) or in the northern portion of the former Mill Building and bulkhead (Area 6; Floyd|Snider 2015a). Because ORO was not detected in any monitoring wells in 2022, there is no figure depicting ORO results in groundwater.

2.1.2.4 Benzene

The 2022 benzene concentrations measured in the CPOC well network are all less than the site-specific CUL of 51 µg/L. Benzene concentrations in groundwater across the Site have steadily decreased since 2016 and have begun to stabilize with some seasonal fluctuation; however, benzene concentrations in all four CPOC wells (PP-17, PP-18R2, PP-19, and PP-34) have been less than the Site CUL of 51 µg/L during the past 2 years of monitoring.

The only benzene exceedances in groundwater were measured at upgradient performance monitoring wells PP-15R2 and PP-27, which are expected to continue to exceed the CUL due residual source mass in soil in Area 5 that is contributing to elevated groundwater concentrations. However, similar to GRO, the benzene concentrations are less than the CUL at other performance wells and at the CPOC, indicating that the benzene exceedances in groundwater are successfully attenuating before reaching the CPOC.

The most recent benzene concentrations in groundwater at Site wells from May and November 2022 are presented on Figures 2.5a and 2.5b, respectively. Figure 2.6 graphically presents all post-remediation benzene concentrations in CPOC wells since 2016.

3.0 Groundwater Monitoring Conclusions and Recommendations

The groundwater monitoring results presented in this report confirm the overall effectiveness of remediation in reducing groundwater contamination to generally stable or decreasing concentrations. The results support the following summary conclusions:

- Post-remediation groundwater COC concentrations are gradually declining or stabilized across the Site with seasonal variability accounting for minor increased concentrations.
- Data indicate that GRO and benzene concentrations in groundwater continue to decline, with 2021 and 2022 concentrations less than the Site CULs at the CPOC.
- Hydraulic oil as ORO is nondetect and remains in compliance with CULs at the CPOC.
- Weathered diesel as DRO concentrations (and historically quantified with overlap between DRO and ORO) in groundwater have remained stable generally with exceedances of 1.2 to 4.8 times the CUL at the CPOC. Additional analysis with silica gel cleanup suggests that reported DRO concentrations represent a mixture of residual petroleum hydrocarbons, fuel metabolites, and naturally occurring polar organics. DRO results after silica gel cleanup ranged from 1.3 to 1.9 times the CUL at the CPOC in May 2022 and did not exceed the CUL at the CPOC during the most recent November 2022 monitoring event.
- It is recommended that groundwater monitoring continue on a semiannual basis for groundwater COCs. In addition, groundwater samples with detectable concentrations of DRO will continue to be analyzed with and without silica gel cleanup during the 2023 monitoring events. These results will be used to continue assessing the contributions from polar metabolites and natural organic matter in the measured DRO concentrations and overall trends for diesel fuel contamination in groundwater.

The AO prescribes a restoration time frame for groundwater at the CPOC of 10 years. The current data, representing 6 years since completion of remedial actions, is in alignment with this time frame expectation for the majority of COCs. DRO concentrations since completion of remedial actions have remained relatively stable, with exceedances ranging generally between 1 and 5 times the CUL at the CPOC. The addition of silica gel cleanup of groundwater samples analyzed in 2022 support the evaluation that natural degradation of weathered diesel contamination is occurring despite stable overall DRO results across the Site. DRO results with silica gel cleanup suggest that the diesel fuel fraction of the reported DRO, without contributions from fuel metabolites or naturally occurring organics, was less than 500 µg/L at the CPOC during the most recent monitoring event. The monitoring results collected in 2023 will be used to assess any changes in site conditions and whether a contingency treatment may be necessary to meet the CUL for DRO at the CPOC by 2026.

3.1 OTHER AGREED ORDER REPORTING REQUIREMENTS

Information on other AO reporting requirements include the following:

- Summary of deviations from the approved work plan: None
- Summary of contacts with representatives of the local community, public interest groups, press, and federal, state, or tribal governments related to the Site cleanup: None
- Changes in key personnel: None

3.2 UPCOMING WORK

Work activities planned during the next work period, ending in December 2023, include the following:

- Groundwater monitoring, which will continue on a semiannual schedule in spring (April or May) and fall (October or November) 2023
- Coordination with Ecology to support the first 5-year review anticipated to occur in 2023

4.0 References

Floyd|Snider. 2013. *K Ply Site Remedial Investigation/Feasibility Study Work Plan*. Prepared for the Port of Port Angeles. September.

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U.S. Environmental Protection Agency (USEPA). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* Prepared by the Office of Solid Waste and Emergency Response. EPA-530/SW-846.

_____. 2020. *National Functional Guidelines for Organic Superfund Methods Data Review*. Prepared by the Office of Superfund Remediation and Technology Innovation. EPA-540-R-20-005/OLEM 9240.0-51. November.

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Tables

Table 2.1
2022 Groundwater Field Parameters

Field Parameter [1]			Groundwater Elevation	Specific Conductivity	pH	Dissolved Oxygen	ORP	Temperature	Turbidity
Units			Feet NAVD 88	µS/cm	--	mg/L	mV	°C	NTU
Location	Measured Date	Screened Interval (feet bgs)							
PP-13R	5/4/2022	5–15	4.56	534	10.37	7.34 [2]	-85.1	10.7	1.7
	11/10/2022		5.83	425	11.30	2.02	-150.9	14.5	1.0
PP-14R	5/4/2022	5–15	5.45	498	8.78	7.02	-125.6	10.2	0.50
	11/10/2022		6.36	247	9.42	1.93	-80.6	13.5	0.39
PP-15R2	5/4/2022	5–15	3.70	818	7.26	0.53	-6.5	11.0	1.4
	11/11/2022		5.74	1,040	7.60	1.82	-120.9	14.7	1.2
PP-17	5/4/2022	5–15	5.04	894	11.27	0.66	96.0	11.0	1.8
	11/10/2022		5.57	880	10.56	6.23 [2]	-164.9	14.9	2.8
PP-18R2	5/4/2022	10-20	4.04	1,610	6.88	2.27	127.5	10.8	0.48
	11/10/2022		5.66	5,350	7.29	5.79 [2]	-143.2	13.5	0.60
PP-19	5/4/2022	5–15	4.49	9,560	7.00	8.60	107.1	11.7	0.53
	11/10/2022		5.43	17,800	7.13	2.64	22.2	15.4	0.53
PP-27	5/4/2022	5–15	4.15	910	12.06	0.58	91.9	10.8	3.2
	11/11/2022		6.01	727	10.33	6.66 [2]	-193.8	14.4	3.9
PP-29	5/4/2022	5–15	3.58	750	7.33	0.84	46.1	11.4	1.5
	11/11/2022		5.41	1,660	7.39	7.59 [2]	-42.1	14.6	1.1
PP-30	5/4/2022	5–15	5.38	687	11.55	7.00	-209.6	10.6	2.1
	11/10/2022		6.30	1,350	12.04	1.91	-153.9	14.9	1.2
PP-32	5/4/2022	8–18	3.42	1,280	7.26	7.53	-37.2	12.8	1.3
	11/10/2022		3.40	1,690	7.77	6.39 [2]	-142.7	15.4	1.1
PP-33	5/4/2022	5–15	4.57	1,270	7.14	7.08	-7.9	10.7	0.71
	11/11/2022		6.37	800	7.05	2.10	-86.5	12.2	7.8
PP-34	5/4/2022	5–15	4.52	1,770	12.62	0.75	141.1	10.9	1.9
	11/10/2022		5.79	2,150	12.16	5.66 [2]	-656.9	14.9	0.59
PP-36	5/4/2022	5–15	5.56	339	9.32	6.78	-164.4	11.1	0.86
	11/10/2022		6.20	708	7.49	5.73 [2]	-209.1	13.2	0.54
PP-37R	5/4/2022	10–20	4.90	968	6.97	0.74	136.9	10.5	1.5
	11/10/2022		5.20	1,320	7.35	1.80	-121.9	14.5	1.8

Notes:

1 Field parameters collected with YSI Pro DSS water quality meter and LaMotte 2020we turbidity meter.

2 Dissolved oxygen probe calibrated but likely reading artificially high values.

Abbreviations:

bgs Below ground surface
°C Degrees Celsius
µS/cm Microsiemens per centimeter
mg/L Milligrams per liter
mV Millivolts
NAVD 88 North American Vertical Datum of 1988
NTU Nephelometric turbidity units
ORP Oxidation–reduction potential

Table 2.2
2022 Groundwater Analytical Results

Analyte		Gasoline-Range Organics	Diesel-Range Organics		Oil-Range Organics		Benzene	Ethylbenzene	Toluene	Xylene (total)
Analysis Method		NWTPH-Gx	NWTPH-Dx	NWTPH-Dx with SGC	NWTPH-Dx	NWTPH-Dx with SGC	USEPA 8260D			
Criteria		800	500	500	500	500	51	--	--	--
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Sample Location	Sample Date									
Conditional Point of Compliance Monitoring Wells										
PP-17	5/4/2022 (1)	291	**1,010** (2)	**651** (2)	91.8 U	91.8 U	28.6	1.41	0.750 U	2.40
	11/10/2022	317	**1,190** (3)	194 J (3,4)	94.2 U	94.2 U	35.7	3.56	1.31	5.52
PP-18R2	5/4/2022	336 (5)	**591** (6)	307 (6)	93.9 U	93.9 U	0.485	1.27	0.750 U	1.00 U
	11/10/2022	217	**910** (3)	172 J (4)	94.7 U	94.7 U	1.47	1.02	1.00 U	1.00 U
PP-19	5/4/2022	50.0 U	156 (2)	94.9 U	94.9 U	94.9 U	0.440 U	0.400 U	0.750 U	1.00 U
	11/10/2022	50.0 U	166 (3)	--	94.1 U	--	0.440 U	0.400 U	1.00 U	1.00 U
PP-34	5/4/2022	174	**1,890** (2)	**969** (2)	93.7 U	93.7 U	1.37	5.23	0.750 U	3.30
	11/10/2022	140	**2,420** (3)	260 J (4)	94.3 U	94.3 U	1.94	7.56	1.00 U	4.96
Other Site Monitoring Wells										
PP-13R	5/4/2022	50.0 U	**845** (2)	414 (2)	93.3 U	93.3 U	2.81	0.400 U	0.750 U	1.00 U
	11/11/2022	50.0 U	**873** (3)	123 (3)	98.1 U	98.1 U	2.81	0.400 U	1.00 U	1.00 U
PP-14R	5/4/2022	82.1 (5)	**752 J** (2)	200 (2)	95.4 UJ	95.4 U	9.91	0.400 U	0.750 U	1.00 U
	11/10/2022	127	353 (3,4)	--	94.3 U	--	3.18	0.400 U	1.00 U	1.00 U
PP-15R2	5/4/2022	**8,870**	**7,330** (6)	**2,930** (6)	96.0 U	96.0 U	**359**	482	23.5	130
	11/11/2022	**8,140**	**3,110 J** (3,4)	**1,200 J** (7)	95.4 U	95.4 U	**502**	183	26.1	71.4
PP-27	5/4/2022	**1,810**	**1,710** (6)	**1,170** (6)	93.1 U	93.1 U	**58.1**	56.1	4.15	28.0
	11/11/2022	**1,800**	**1,780 J** (3,4)	**547 J** (7)	94.6 U	94.6 U	**54.0**	54.9	4.91	27.3
PP-29	5/4/2022	115	**1,790** (2)	**790** (2)	93.4 U	93.4 U	7.88	0.753	0.750 U	1.00 U
	11/11/2022 (1)	55.7	**1,130** (3)	112 (3)	96.7 U	96.7 U	1.48	0.529	1.00 U	1.00 U
PP-30	5/4/2022	365	**704** (6)	**755** (6)	94.7 U	94.7 U	17.9	3.83	0.750 U	2.80
	11/10/2022	353	**2,030 J** (3,4)	261 J (3,4)	98.6 U	98.6 U	18.5	4.39	1.00 U	7.00
PP-32	5/4/2022	50.0 U	187 (2)	92.0 U	92.0 U	92.0 U	1.20	0.400 U	0.750 U	1.00 U
	11/10/2022	50.0 U	355 (3)	--	95.8 U	--	8.16	0.400 U	1.00 U	1.00 U
PP-33	5/4/2022	243 (5)	**1,380** (2)	**800** (2)	96.9 U	96.9 U	31.5	1.82	1.37	1.00 U
	11/11/2022	50.0 U	**801** (3)	94.0 U	94.0 U	94.0 U	5.23	0.400 U	1.00 U	1.00 U
PP-36	5/4/2022	**2,710 J** (5)	**822** (6)	**861** (6)	93.9 U	93.9 U	31.0	19.4	0.750 U	2.80
	11/10/2022	**1,810**	**944 J** (3,4)	490 J (7)	93.8 U	93.8 U	29.6	20.9	1.00 U	3.39
PP-37R	5/4/2022	50.0 U	349 (2)	288 (2)	94.3 U	94.3 U	0.492	0.400 U	0.750 U	1.00 U
	11/10/2022	50.0 U	473 J (3,4)	--	98.8 U	--	1.16	0.400 U	1.00 U	1.00 U

Notes:

-- Not available or not analyzed for.

RED/BOLD Detected concentration that exceeds criteria.

1 A field duplicate was collected. The greatest value is reported.

2 Chromatogram indicates unresolved compounds in the diesel range.

3 Chromatographic pattern indicates an unresolved complex mixture, which may be weathered or organic material.

4 Detection is biased high by overlap with gasoline-range material.

5 Chromatogram indicates the presence of unresolved compounds in the gasoline range.

6 Chromatogram indicates a continuation of gasoline in the early- to mid-boiling range, as well as an unresolved complex mixture in the mid- to late-boiling range.

7 Detection is due to overlap with gasoline-range material.

Abbreviations:

µg/L Micrograms per liter

SGC Silica-gel cleanup

TPH Total petroleum hydrocarbons

Qualifiers:

J Concentration is estimated but acceptable for most uses.

U Analyte is not detected at the associated reporting limit.

UJ Analyte is not detected at the associated reporting limit, which is considered an estimate.

2022 Annual Progress Report for the K Ply Site

K Ply Site

Figures

PORT OFFICE

RIPRAP SLOPE

PP-19

PP-20

PP-18R2

PP-34

PP-18R

IG-5

PP-17

WASH-DOWN FACILITY

PP-37R

IG-4

Area 6

Hydraulic Oil Area

PP-32

PP-13R

PP-31

PP-30

PZ-12

PZ-15S

PZ-15D

PP-14R

IG-3

PP-33

N Cedar St

PP-35

PP-4R

PP-29

PP-15R2

Area 5

Gasoline Area

IG-2

PP-28

PP-27

PP-36

IG-1

ALLEY

Legend

- Piezometer
- Well
- Decommissioned Well or Piezometer
- 2015 Oxygen-Releasing Compound Injection Points
- 2017 Carbon-Injection Location
- Infiltration Gallery and ID Number
- 2" PVC Capped Below Grade
- 2015 Excavation Area Toe of Slope
- 2015 Excavation Area Top of Slope
- Conditional Point of Compliance Monitoring Wells
- Temporary Fence
- Existing Structure
- Intertidal Area
- Concrete Wash Pad

0 30 60 120

Scale in Feet

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Figure 1.1
Site Features

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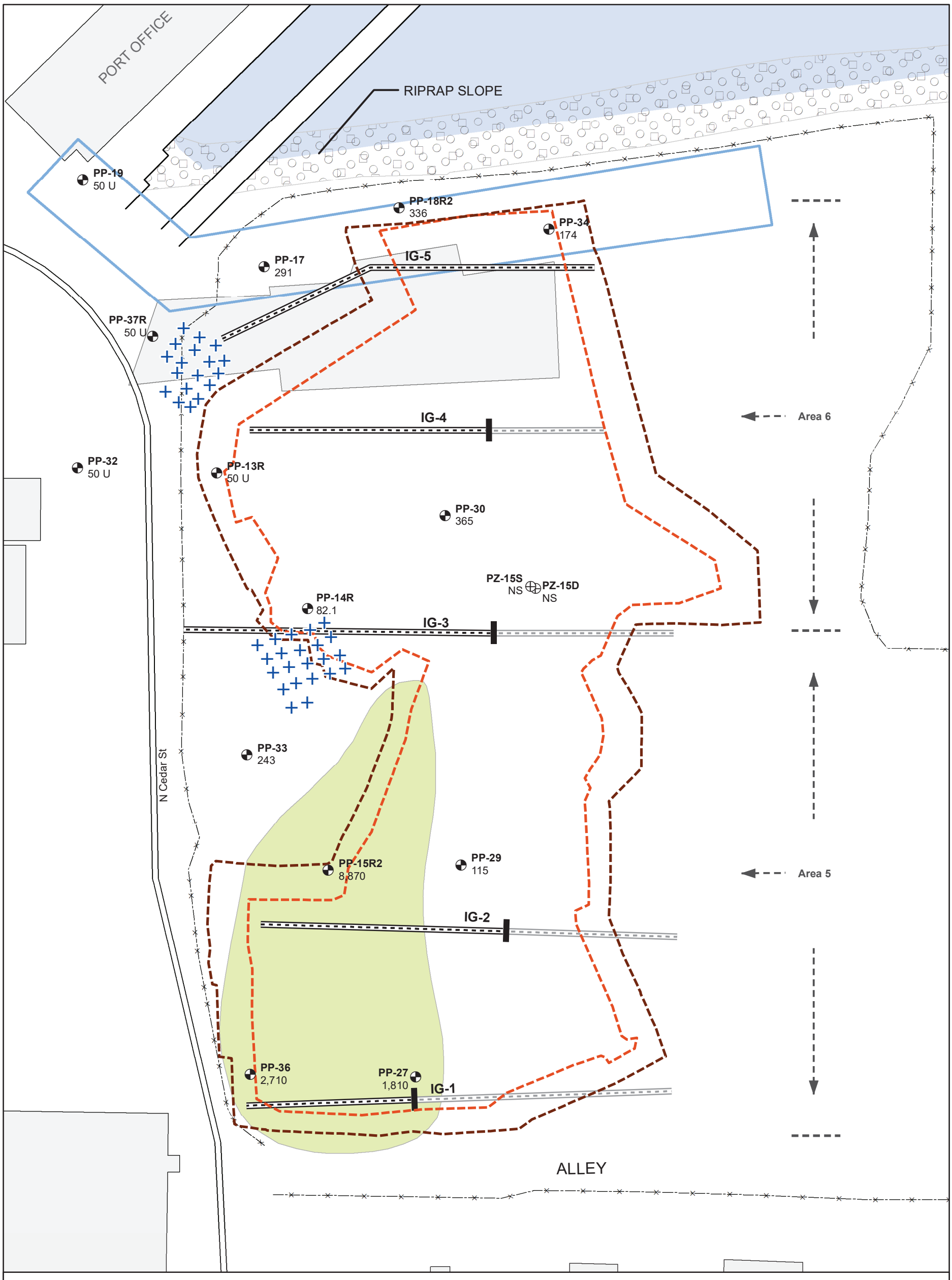
1/17/2023



Legend

- Piezometer
- Well
- Carbon-Injection Location
- Infiltration Gallery and ID Number
- 2" PVC Capped Below Grade

Extent of GRO in Groundwater (µg/L)

- >800

- 2015 Excavation Area Toe of Slope
- 2015 Excavation Area Top of Slope
- Conditional Point of Compliance Monitoring Wells
- Temporary Fence
- Existing Structure
- Intertidal Area

Notes:
- All results reported in µg/L.
- Cleanup level is 800 µg/L.
- If duplicate collected, greater concentration reported.
- Results rounded to three significant figures.

Abbreviations:
GRO = Gasoline-range organics
µg/L = Micrograms per liter
NS = Not sampled

Qualifier:
U = Analyte is not detected at the associated reporting limit.

0 30 60 120
Scale in Feet

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Figure 2.1a
May 2022 GRO
Concentrations in Groundwater

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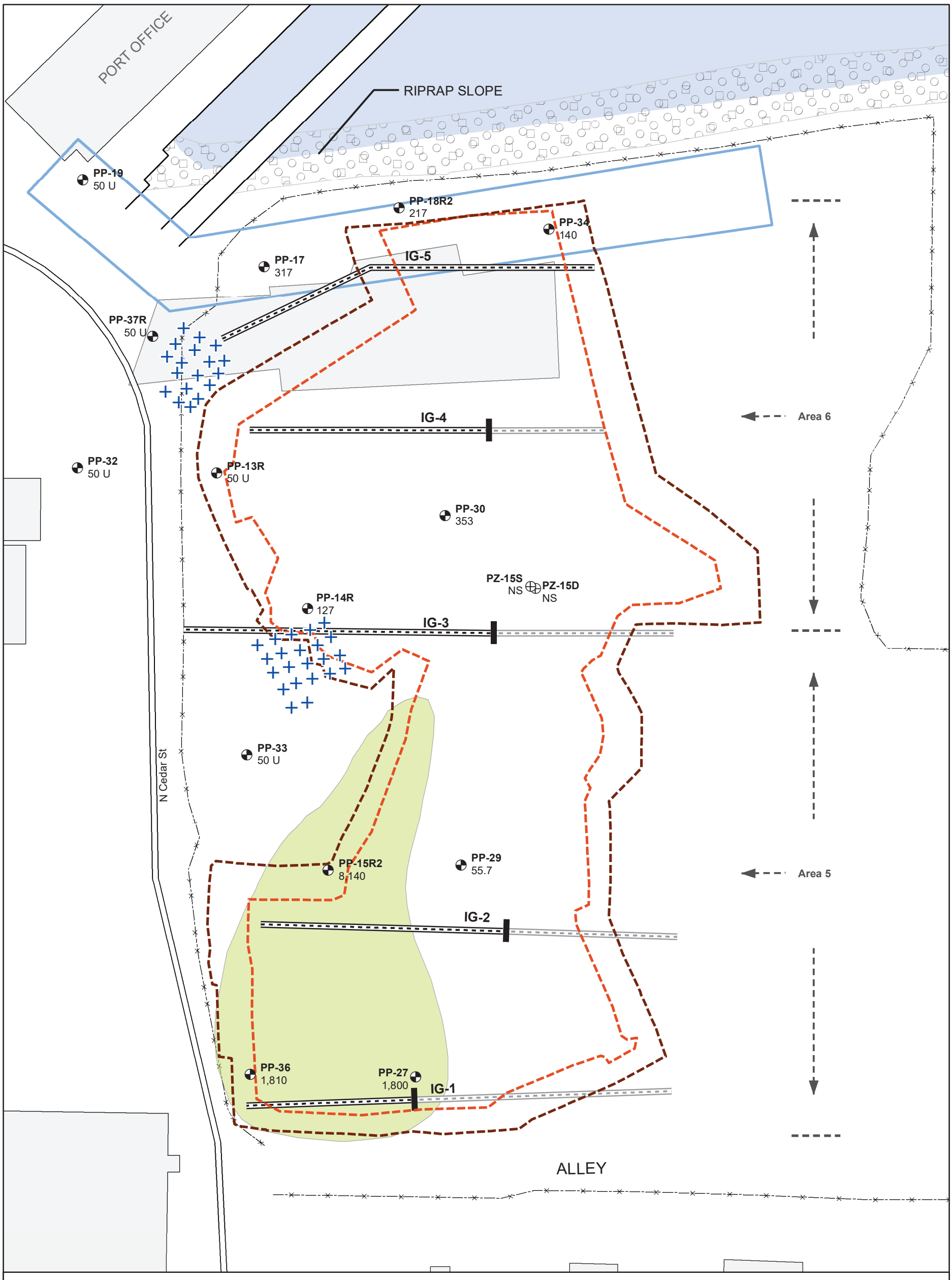
1/13/2023



Legend

- Piezometer
- Well
- Carbon-Injection Location
- Infiltration Gallery and ID Number
- 2" PVC Capped Below Grade

Extent of GRO in Groundwater (µg/L)

- >800
- 2015 Excavation Area Toe of Slope
- 2015 Excavation Area Top of Slope
- Conditional Point of Compliance Monitoring Wells
- Temporary Fence
- Existing Structure
- Intertidal Area

Notes:
- All results reported in µg/L.
- Cleanup level is 800 µg/L.
- If duplicate collected, greater concentration reported.
- Results rounded to three significant figures.

Abbreviations:
GRO = Gasoline-range organics
µg/L = Micrograms per liter
NS = Not sampled

Qualifier:
U = Analyte is not detected at the associated reporting limit.

0 30 60 120
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Figure 2.1b
November 2022 GRO
Concentrations in Groundwater

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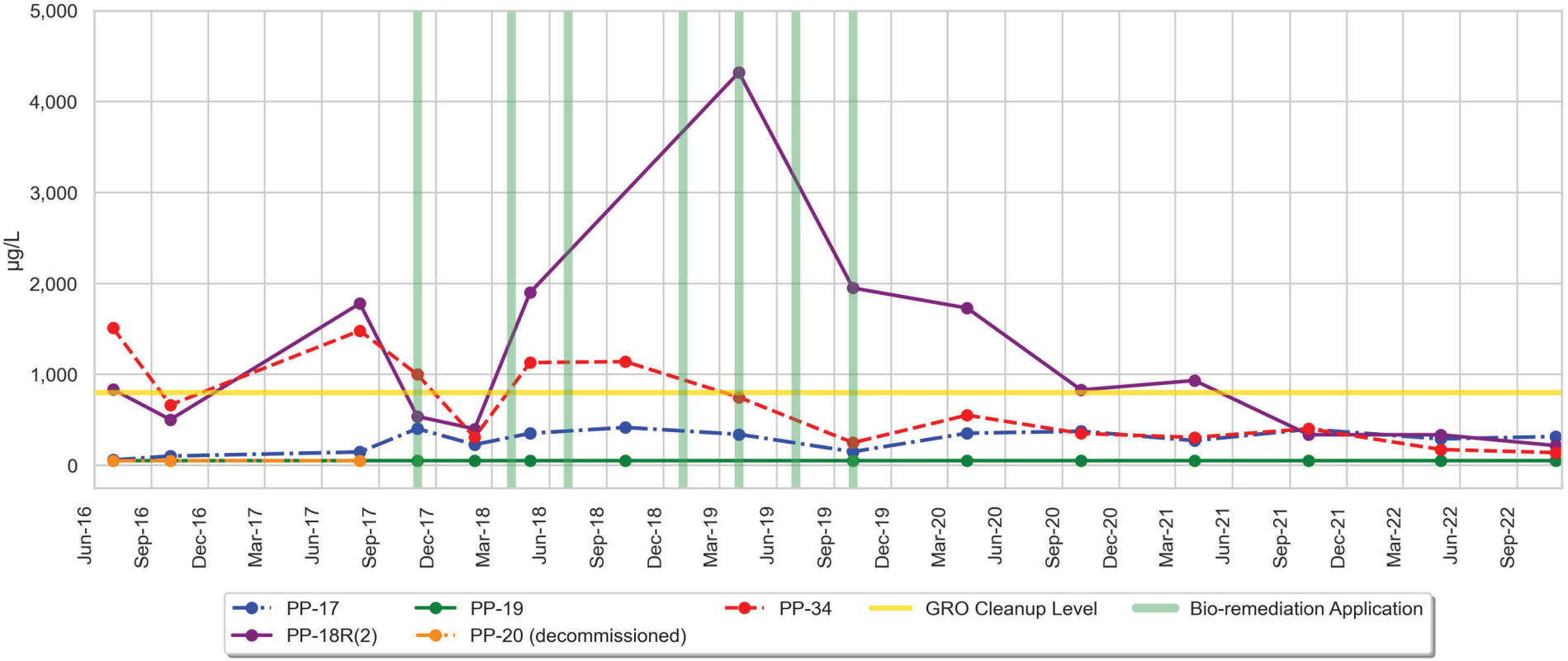
1/13/2023



Abbreviations: CPOC = Conditional point of compliance, GRO = Gasoline-range organics, µg/L = Microgram per liter

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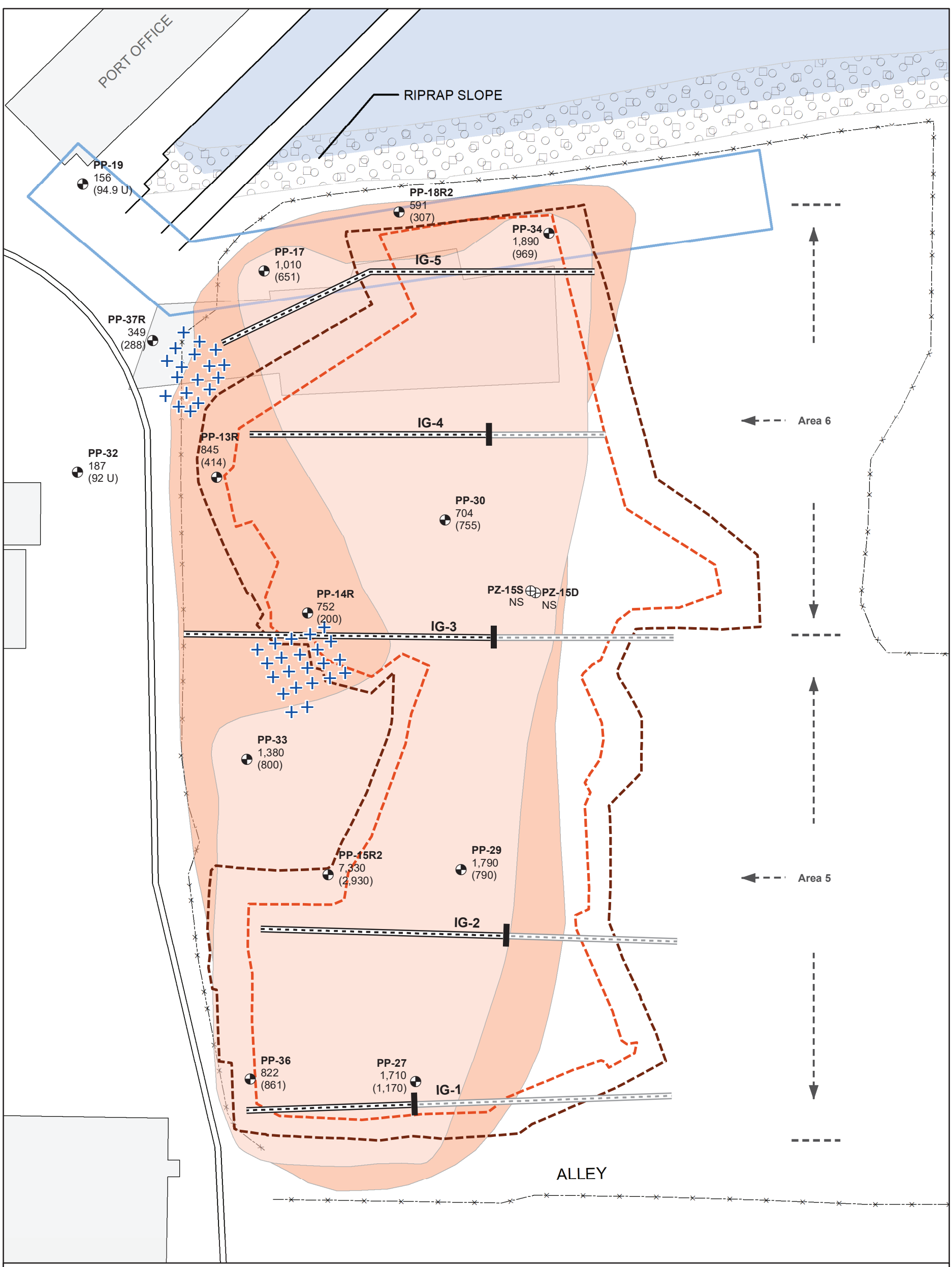
Figure 2.2
Post-Remediation CPOC GRO Concentrations in Groundwater

1/17/2023



Legend

- Piezometer
- Well
- Carbon-Injection Location
- Infiltration Gallery and ID Number
- 2" PVC Capped Below Grade

Extent of DRO in Groundwater (µg/L)

- >500
- >500 with SGC

- 2015 Excavation Area Toe of Slope
- 2015 Excavation Area Top of Slope
- Conditional Point of Compliance Monitoring Wells
- Temporary Fence
- Existing Structure
- Intertidal Area

Location Label

PP-36 ← Location
822 ← DRO Result
(861) ← DRO Result with SGC

Notes:
- All results reported in µg/L.
- Cleanup level is 500 µg/L.
- If duplicate collected, greater concentration reported.
- Results rounded to three significant figures.

Abbreviations:
DRO = Diesel-range organics
µg/L = Micrograms per liter
NS = Not sampled
SGC = Silica gel cleanup

Qualifiers:
U = Analyte is not detected at the associated reporting limit.

0 30 60 120
Scale in Feet

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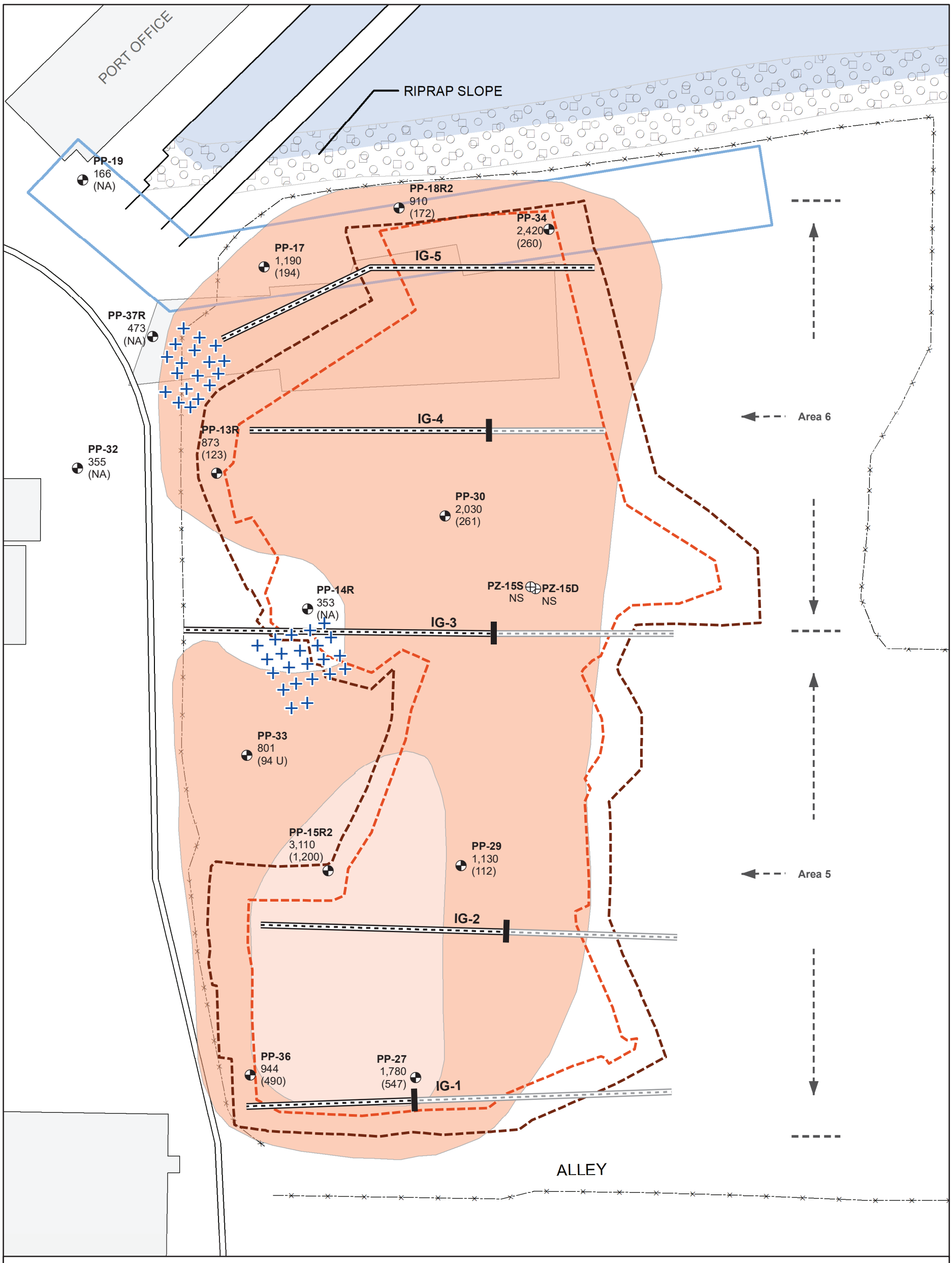
Figure 2.3a
May 2022 DRO
Concentrations in Groundwater

I:\GIS\Projects\PPA_KPLY\MXD\Annual Report\2022\Figure 2.3a May 2022 DRO Concentrations in Groundwater.mxd
1/23/2023



Legend

- Piezometer
- Well
- Carbon-Injection Location
- Infiltration Gallery and ID Number
- 2" PVC Capped Below Grade

Extent of DRO in Groundwater (µg/L)

- >500
- >500 with SGC

- 2015 Excavation Area Toe of Slope
- 2015 Excavation Area Top of Slope
- Conditional Point of Compliance Monitoring Wells
- Temporary Fence
- Existing Structure
- Intertidal Area

Location Label

PP-36 ← Location
822 ← DRO Result
(861) ← DRO Result with SGC

Notes:
- All results reported in µg/L.
- Cleanup level is 500 µg/L.
- If duplicate collected, greater concentration reported.
- Results rounded to three significant figures.

Abbreviations:
DRO = Diesel-range organics
µg/L = Micrograms per liter
NA = Not analyzed
NS = Not sampled
SGC = Silica gel cleanup

Qualifiers:
U = Analyte is not detected at the associated reporting limit.

0 30 60 120
Scale in Feet

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Figure 2.3b
November 2022 DRO
Concentrations in Groundwater

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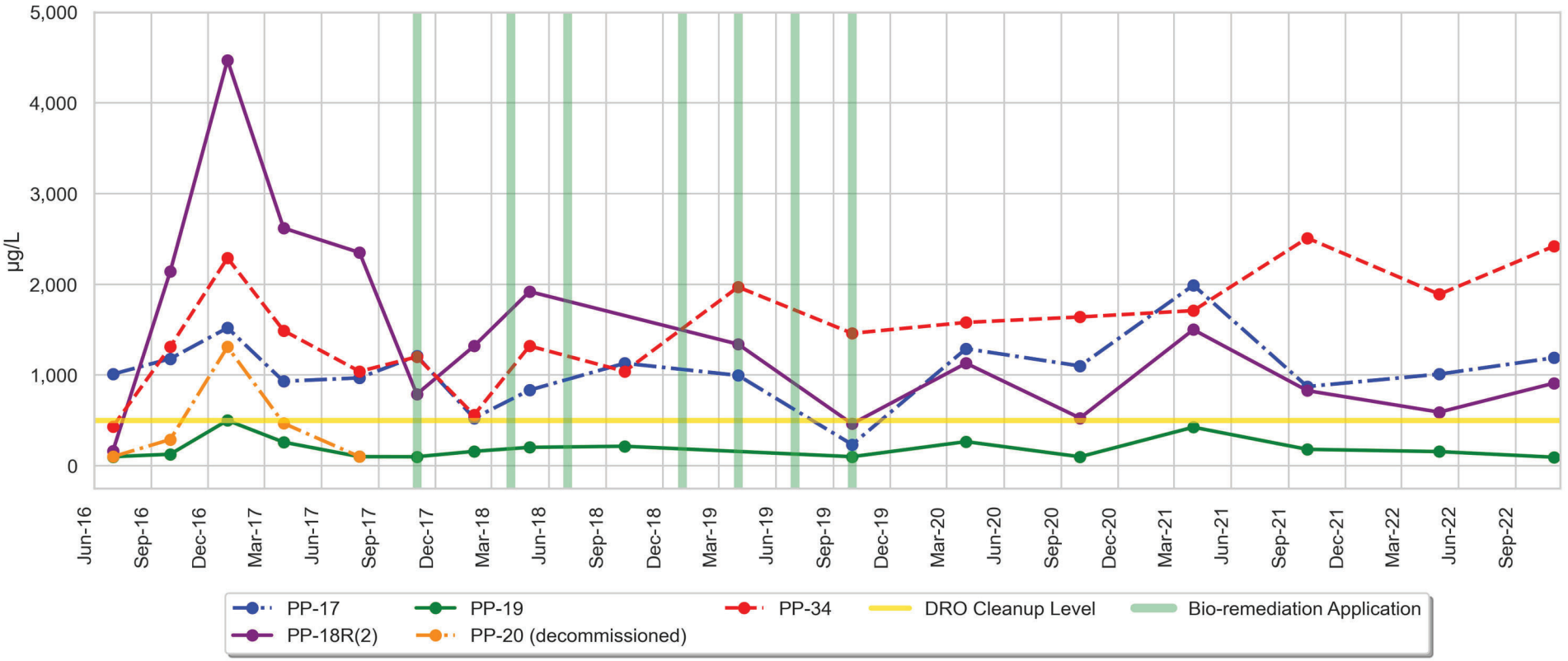
1/23/2023



Note: The results displayed depict groundwater concentrations of ORO quantified as weathered diesel between July 2016 and April 2021, and DRO quantified as weathered diesel from October 2021 onward.

Abbreviations: CPOC = Conditional point of compliance, DRO = Diesel-range organics, µg/L = Microgram per liter, ORO = Oil-range organics

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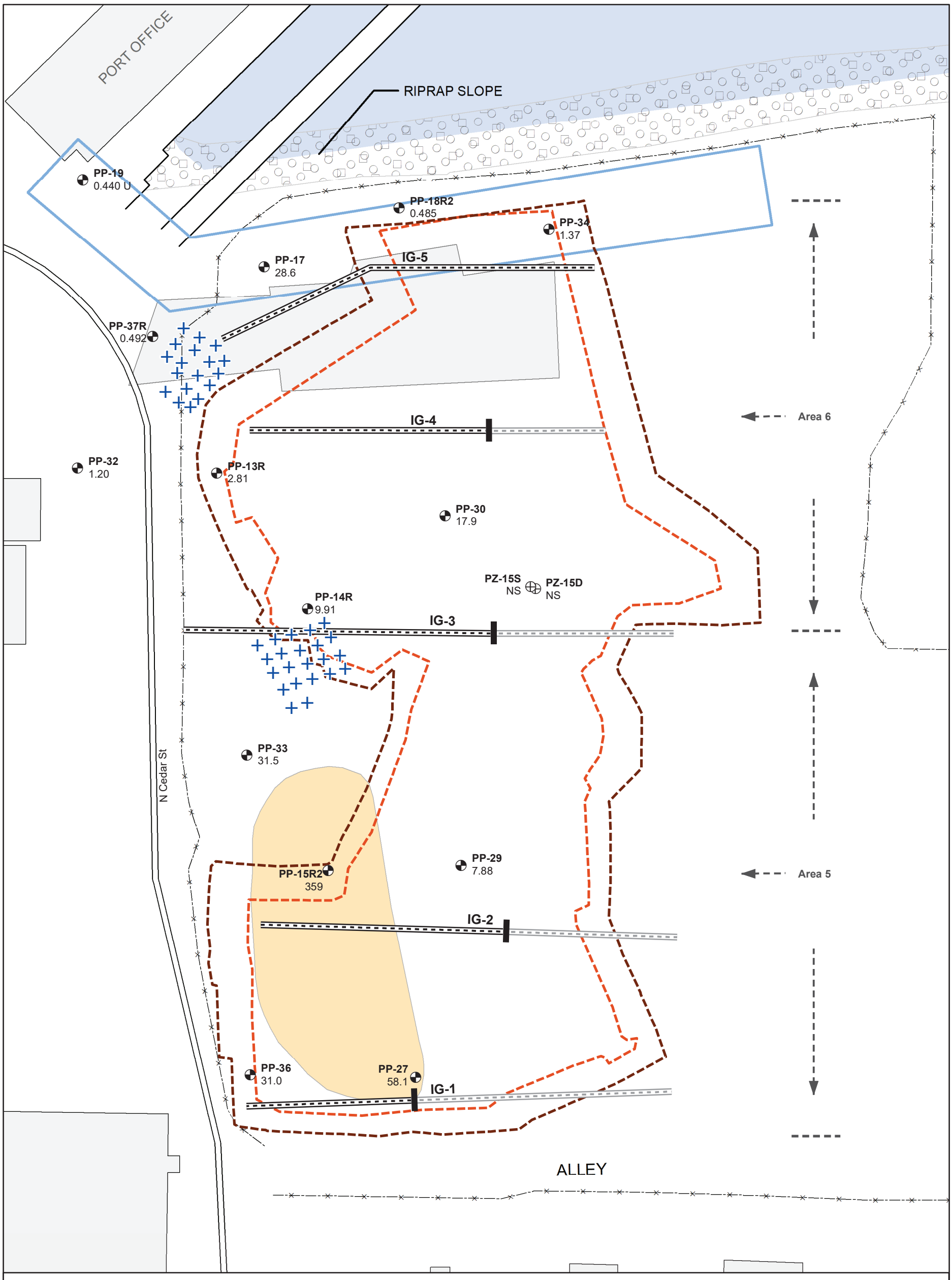
Figure 2.4
Post-Remediation CPOC DRO Concentrations in Groundwater

1/17/2023



Legend

- Piezometer
- Well
- Carbon-Injection Location
- Infiltration Gallery and ID Number
- 2" PVC Capped Below Grade

Extent of Benzene in Groundwater (µg/L)

- >51

- 2015 Excavation Area Toe of Slope
- 2015 Excavation Area Top of Slope
- Conditional Point of Compliance Monitoring Wells
- Temporary Fence
- Existing Structure
- Intertidal Area

Notes:
- All results reported in µg/L.
- Cleanup level is 51 µg/L.
- If duplicate collected, greater concentration reported.
- Results rounded to three significant figures.

Abbreviations:
µg/L = Micrograms per liter
NS = Not sampled

Qualifier:
U = Analyte is not detected at the associated reporting limit.

0 30 60 120
Scale in Feet

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Figure 2.5a
May 2022 Benzene
Concentrations in Groundwater

I:\GIS\Projects\PPA_KPLY\MXD\Annual Report\2022\Figure 2.5a May 2022 Benzene Concentrations in Groundwater.mxd
1/13/2023

PORT OFFICE

RIPRAP SLOPE

PP-19
0.440 U

PP-18R2
1.47

PP-34
1.94

PP-17
35.7

IG-5

PP-37R
1.16

IG-4

Area 6

PP-32
8.16

PP-13R
2.81

PP-30
18.5

PZ-15S
NS

PZ-15D
NS

PP-14R
3.18

IG-3

N Cedar St

PP-33
5.23

PP-29
1.48

PP-15R2
502

Area 5

IG-2

PP-36
29.6

PP-27
54.0

IG-1

ALLEY

Legend

- Piezometer
- Well
- Carbon-Injection Location
- Infiltration Gallery and ID Number
- 2" PVC Capped Below Grade

Extent of Benzene in Groundwater (µg/L)

- >51

- 2015 Excavation Area Toe of Slope
- 2015 Excavation Area Top of Slope
- Conditional Point of Compliance Monitoring Wells
- Temporary Fence
- Existing Structure
- Intertidal Area

Notes:
- All results reported in µg/L.
- Cleanup level is 51 µg/L.
- If duplicate collected, greater concentration reported.
- Results rounded to three significant figures.

Abbreviations:
µg/L = Micrograms per liter
NS = Not sampled

Qualifier:
U = Analyte is not detected at the associated reporting limit.

0 30 60 120
Scale in Feet

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Figure 2.5b
November 2022 Benzene Concentrations in Groundwater

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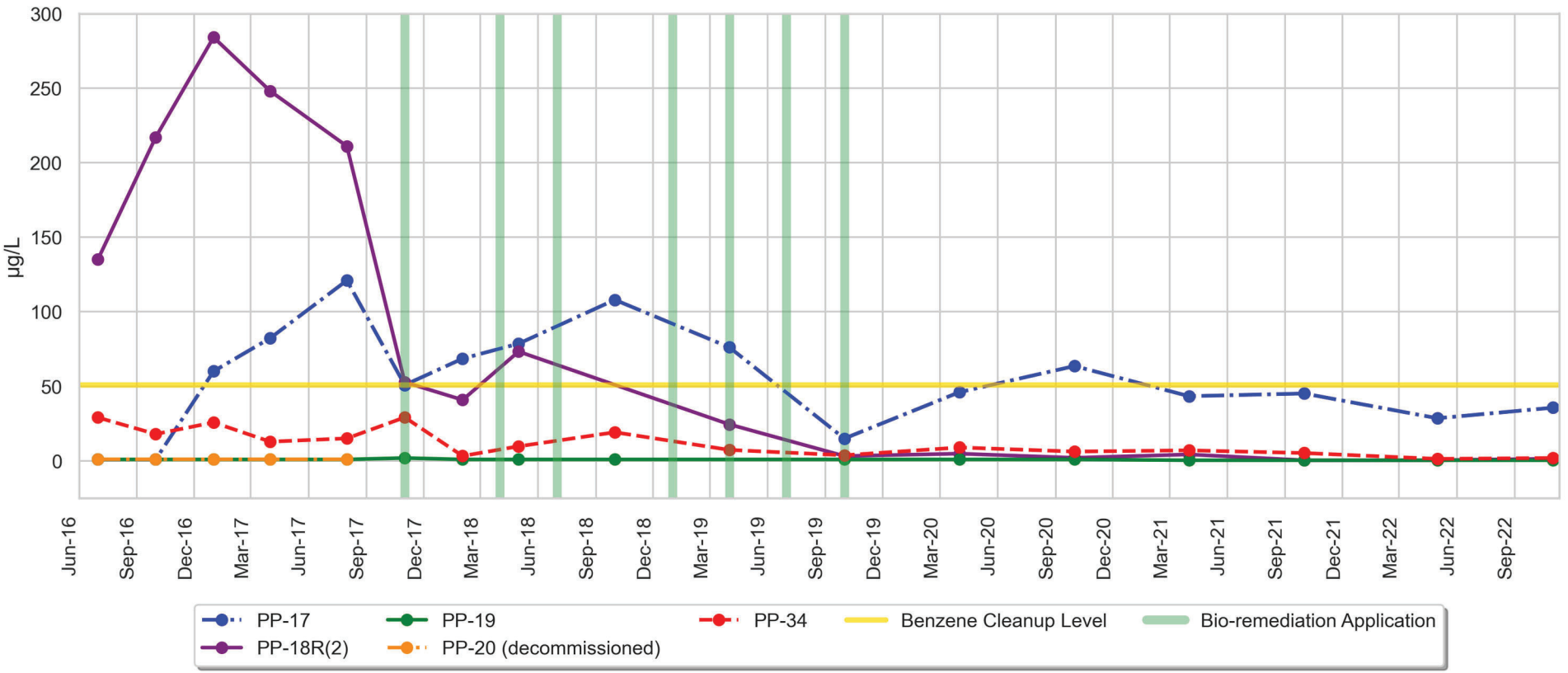
1/13/2023



Abbreviations: CPOC = Conditional point of compliance, µg/L = Microgram per liter

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Figure 2.6
Post-Remediation CPOC Benzene Concentrations in Groundwater

1/17/2023

2022 Annual Progress Report for the K Ply Site

K Ply Site

Appendix A
Cumulative Post-Remediation Groundwater Analytical Results (2016 to 2022)

Table A.1
Groundwater Analytical Results: Contaminants of Concern

Analyte	Total Petroleum Hydrocarbons (TPH)			Benzene, Toluene, Ethylbenzene, and Xylenes			
	Gasoline-Range Organics	Diesel-Range Organics [1]	Oil-Range Organics [1,2]	Benzene	Ethylbenzene	Toluene	Xylene (total)
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Criteria	800	500	500	51	--	--	--
Sample Location and Date							
Conditional Point of Compliance Monitoring Wells							
PP-17 (Screened Interval 5–15 ft)							
7/27/2016	59.5	417 JM	**1,010**	1.00 U	1.00 U	1.00 U	1.00 U
10/27/2016	102	257 (153)	**1,180 (543)**	1.00 U	1.00 U	1.00 U	1.00 U
1/26/2017	195	160 (49.8 U)	**1,520 (633)**	**60.1**	1.00 U	1.00 U	1.00 U
4/26/2017	287	167	**931**	**82.3**	1.10	1.09	2.01
8/2/2017	147	135 [3]	**969**	**121**	1.32	1.31	2.33
11/07/1027	404	471 [3]	**1,210**	50.9	1.00 U	1.00 U	1.23
2/8/2018	228	91.1 [3]	**525**	**68.6**	1.06	1.00 U	1.39
05/2/2018 [4]	352	218 [3]	**834**	**78.6**	1.76	1.07	2.52
10/25/2018	417	354	**1,130**	**108**	2.70	1.04	2.76
4/8/2019	341	49.6 U	**996**	**76.2**	1.00 U	1.80	2.62
10/22/2019	150	49.8 UJ (49.8 UJ)	234 J (178 J)	15.0	1.00 U	1.00 U	1.00 U
04/27/2020 [4]	353	158 [3]	**1,290**	46.1	1.53	1.00 U	2.70
10/21/2020	375	49.3 U	**1,100**	**63.6**	1.90	1.00 U	3.34
4/21/2021	272	99.5 U	**1,990**	43.4	1.68	0.750 U	2.75
10/13/2021	397	**873**	98.1 U	45.2	1.77	0.750 U	2.98
5/4/2022 [4]	291	**1,010**[3] **(651)**[3]	91.8 U (91.8 U)	28.6	1.41	0.750 U	2.40
11/10/2022	317	**1,190**[3] (194 J[3,5])	94.2 U (94.2 U)	35.7	3.56	1.31	5.52
PP-18R2 [6] (Screened Interval 10–20 ft)							
7/28/2016	**835**	151 JM	163	**135**	2.10	2.82	6.69
10/27/2016	503	**1,090** (406)	**2,140 (1,200)**	**217**	1.31	1.00 U	2.05
1/26/2017	**921**	494 (279)	**4,470 (1,760)**	**284**	11.2	4.32	19.4
4/26/2017	**1,130**	**643**	**2,620**	**248**	12.9	4.46	22.6
8/2/2017	**1,780**	**572 J** [3]	**2,350**	**211**	15.5	3.93	19.8
11/7/2017	538	425 [3]	**789**	**52.8**	7.06	1.20	9.74
2/8/2018	401	**596** [3]	**1,320**	40.9	14.4	1.65	15.7
5/2/2018	**1,900**	**781** [3]	**1,920**	**73.3**	17.8	1.94	20.2
10/25/2018	--	--	--	--	--	--	--
04/8/2019 [4]	**4,320**	50.4 U	**1,340 (1,120)**	24.5	1.00 U	19.8	6.09
10/22/2019	**1,950**	84.6 J [3] (129 J [3])	462 J (375 J)	3.28	13.4	1.00 U	1.23 U
4/27/2020	**1,730**	271 [3]	**1,130**	4.87	9.84	1.00 U	1.61
10/21/2020	**829**	242 [3]	**526**	2.09	7.14	1.00 U	1.00 U
4/21/2021	**933**	394 [3]	**1,500**	4.34	4.20	0.750 U	1.31
10/13/2021	337	**828**	98.9 U	0.440 U	0.400 U	0.750 U	1.00 U
5/4/2022	336 [3]	**591**[3,5] (307[3,5])	93.9 U (93.9 U)	0.485	1.27	0.750 U	1.00 U
11/10/2022	217	**910**[3] (172J[5])	94.7 U (94.7 U)	1.47	1.02	1.00 U	1.00 U
PP-19 (Screened Interval 5–15 ft)							
7/27/2016	50.0 U	49.9 U	99.7 U	1.00 U	1.00 U	1.00 U	1.00 U
10/27/2016	50.0 U	50.0 U	127	1.00 U	1.00 U	1.00 U	1.00 U
1/26/2017	50.0 U	49.8 U (49.8 U)	500 (248)	1.00 U	1.00 U	1.00 U	1.00 U
4/26/2017	50.0 U	49.8 U	260	1.00 U	1.00 U	1.00 U	1.00 U
8/2/2017	50.0 U	50.0 U	100 U	1.00 U	1.00 U	1.00 U	1.00 U
11/7/2017	50.0 U	49.7 U	99.4 U	1.96	1.00 U	1.00 U	1.00 U
2/8/2018	50.0 U	50.0 U	159	1.00 U	1.00 U	1.00 U	1.00 U
5/2/2018	50.0 U	50.2 U	203	1.00 U	1.00 U	1.00 U	1.00 U
10/25/2018	50.0 U	50.0 U	215	1.00 U	1.00 U	1.00 U	1.00 U
10/22/2019	50.0 U	49.9 UJ	99.9 UJ	1.00 U	1.00 U	1.00 U	1.00 U
4/27/2020	50.0 U	49.9 U	266	1.00 U	1.00 U	1.00 U	1.00 U
10/21/2020	50.0 U	49.5 U	99.0 U	1.00 U	1.00 U	1.00 U	1.00 U
4/20/2021	50.0 U	98.5 U	425	0.440 U	0.400 U	0.750 U	1.00 U
10/13/2021	50.0 U	181	98.8 U	0.440 U	0.400 U	0.750 U	1.00 U
5/4/2022	50.0 U	156[3] (94.9 U)	94.9 U (94.9 U)	0.440 U	0.400 U	0.750 U	1.00 U
11/10/2022	50.0 U	166.0 [3]	94 U	0.440 U	0.400 U	1.00 U	1.00 U
PP-34 (Screened Interval 8–18 ft)							
7/28/2016	**1,510**	328 JM	433	29.1	76.3	7.19	132
10/27/2016	665	**603** (493)	**1,310 (772)**	18.0	35.1	3.77	62.6
1/26/2017	**1,220**	**503** (348)	**2,290 (688)**	25.8	61.8	4.10	88.7
4/26/2017	**1,420**	357	**1,490**	12.9	70.4	3.81	83.9
8/2/2017	**1,480**	238 [3]	**1,040**	15.1	117	5.26	122
11/7/2017 [4]	**1,000**	**695** [3]	**1,200**	29.2	82.6	3.92	86.1
2/8/2018	309	212 [3]	**560**	3.31	15.2	1.00 U	15.0
5/2/2018	**1,130**	458 [3]	**1,320**	9.78	44.6	1.81	45.0
10/25/2018	**1,140**	417 [3]	**1,040**	19.2	60.8	2.30	51.9
4/8/2019	749	50.0 U	**1,970**	7.39	1.38	29.4	23.9
10/22/2019	249	90.7 J [3] (105 J [3])	**1,460 J (1,030 J)**	3.79	9.81	1.00 U	6.53
4/27/2020	552	376 [3]	**1,580**	9.01	17.4	1.00 U	10.6
10/21/2020	351	114 [3]	**1,640**	6.28	20.9	1.00 U	11.6
4/21/2021 [4]	307	99.3 U	**1,710**	7.09	13.8	0.750 U	8.54
10/13/2021	403	**2,510**	98.2 U	5.28	16.9	0.750 U	10.1
5/4/2022	174	**1,890**[3] **(969**[3]**)**	93.7 U (93.7 U)	1.37	5.23	0.750 U	3.30
11/10/2022	140	**2,420**[3] (260 J[5])	94.3 U (94.3 U)	1.94	7.56	1.00 U	4.96

Table A.1
Groundwater Analytical Results: Contaminants of Concern

Analyte	Total Petroleum Hydrocarbons (TPH)			Benzene, Toluene, Ethylbenzene, and Xylenes			
	Gasoline-Range Organics	Diesel-Range Organics [1]	Oil-Range Organics [1,2]	Benzene	Ethylbenzene	Toluene	Xylene (total)
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Criteria	800	500	500	51	--	--	--
Sample Location and Date							
Other Site Monitoring Wells							
PP-13R (Screened Interval 5–15 ft)							
7/28/2016	**4,560**	124 JM	377	1.00 U	5.44	24.3	43.2
10/27/2016	340	157	**611**	**106**	1.00 U	1.96	2.55
1/25/2017	66.5	49.8	**1,030**	7.43	1.00 U	1.00 U	1.00 U
4/25/2017	**1,460**	80.7 J	**1,060**	**518**	1.31	6.61	4.96
8/2/2017	**6,700**	156 [3]	**518**	**1,730**	3.94	26.6	32.9
11/7/2017	**7,630**	289 [3]	**481**	**2,150**	4.49	28.0	32.9
2/8/2018	159	106 [3]	**565**	39.8	1.00 U	1.00 U	1.43
5/2/2018	**1,110**	302 [3]	**1,150**	**358**	1.68	6.00	7.48
10/25/2018 [4]	546	94.9 [3]	398	**123**	1.00 U	1.54	2.17
4/8/2019	433	50.0 U	**684**	**163**	1.52	1.00 U	2.07
10/21/2019	**1,100**	49.7 UJ	**646 J**	**606**	1.00 U	2.50	3.99
4/27/2020	446	122 [3]	**975**	**209**	1.00 U	1.00 U	1.00 U
10/21/2020	250	49.2 U	201	**80.1**	1.00 U	1.00 U	1.00 U
4/21/2021	71.4	99.3 U	**909**	20.8	0.400 U	0.750 U	1.00 U
10/13/2021	93.8	**501**	99.4 U	26.7	0.400 U	0.750 U	1.00 U
5/4/2022	50.0 U	**845**[3] (414[3])	93.3 U (93.3 U)	2.81	0.400 U	0.750 U	1.00 U
11/11/2022	50.0 U	**873**[3] (123[3])	98.1 U (98.1 U)	2.81	0.400 U	1.00 U	1.00 U
PP-14R (Screened Interval 5–15 ft)							
7/28/2016	**4,350**	105 JM	99.4 U	**1,550**	35.7	42.6	51.2
10/27/2016	**5,640**	90.0	193	**2,120**	20.9	35.1	51.7
1/25/2017	**4,140**	266	**1,440**	**1,180**	12.7	20.8	20.7
4/25/2017	**7,290**	60.3	**552**	**1,870**	15.6	27.7	27.5
8/2/2017	**6,480**	168 [3]	480	**1,960**	6.51	19.1	19.1
11/7/2017	**7,430**	185 [3]	299	**2,100**	7.67	18.7	20.6
2/8/2018	**1,320**	249 [3]	**710**	**415**	2.78	3.60	3.20
5/2/2018	**6,690**	156 [3]	475	**1,290**	3.42	4.93	4.21
10/25/2018	**1,490**	282 [3]	**674**	**362**	1.76	3.07	3.30
4/8/2019	**830**	49.6 U	141	**356**	2.67	1.58	2.00
10/21/2019	209	49.3 UJ	296 J	38.4	1.00 U	1.00 U	1.00 U
4/27/2020	375	80.6 [3]	290	**83.8**	1.00 U	1.00 U	1.00 U
10/21/2020	420	56.5 [3]	472	**105**	1.00 U	1.00 U	1.00 U
4/20/2021	78.0	99.2 U	477	25.9	0.400 U	0.750 U	1.00 U
10/13/2021[4]	156	**1,570 J**	98.5 U	24.4	0.400 U	0.750 U	1.00 U
5/4/2022	82.1 [3]	**752 J**[3] (200[3])	95.4 UJ (95.4 U)	9.91	0.400 U	0.750 U	1.00 U
11/10/2022	127	353.0 [3]	94.3 U	3.18	0.400 U	1.00 U	1.00 U
PP-15R2 (Screened Interval 5–15 ft)							
7/27/2016	**9,940**	**574 JM**	**526**	1.00 U	215	29.7	41.8
10/26/2016	**1,040**	217	289	**542 J**	106	13.7	33.1
01/25/2017 [4]	**15,200**	**1,110**	**3,640**	**622**	704	42.9	351
4/25/2017	**18,500**	**501**	**2,810**	**490**	912	31.9	520
8/2/2017	**7,260**	277 [3]	**1,520**	**1,190**	171	11.2	68.6
11/8/2017	**4,480**	**649** [3]	**1,470**	**1,200**	48.5	11.6	71.3
2/8/2018	**11,600**	**990** [3]	**2,010**	**265**	887	52.6	234
5/2/2018	**10,600**	**843** [3]	**2,190**	**1,440**	324	18.4	78.9
10/25/2018	**3,560**	405 [3]	**959**	**828**	21.2	10.0 U	27.6
4/8/2019	**7,540**	**574** (499)	**1,990 (1,380)**	**367**	10.1	117	79.8
10/21/2019	**6,950**	411 [3]	**871 J**	**1,680**	44.6	8.10	40.2
4/27/2020	**7,480**	447 [3]	**2,120**	**404**	232	15.7	79.9
10/21/2020	**5,070**	189 [3]	**1,530**	**809**	62.0	5.82	42.0
4/20/2021	**6,800**	335 [3]	**3,210**	**456**	388	23.7	91.2
10/13/2021	**7,660**	**2,240**	99 U	**1,550**	70.2	7.15	33.3
5/4/2022	**8,870**	**7,330**[3,5] (**2,930**[3,5])	96.0 U (96.0 U)	**359**	482	23.5	130
11/11/2022	**8,140**	**3,110 J**[3,5] (**1,200 J**[5])	95.4 UJ (95.4 U)	**502**	183	26.1	71.4
PP-27 (Screened Interval 5–15 ft)							
7/27/2016	507	90.4 JM	257	**64.0**	28.0	5.51	27.5
10/26/2016	298	72.4	421	19.0	3.97	1.00 U	4.24
1/25/2017	**3,810**	**1,060**	**2,960**	**455**	75.1	16.3	80.7
4/25/2017	**4,460**	**744**	**1,360**	**464**	130	15.1	86.5
8/2/2017	**1,230**	120 [3]	323	**101**	31.6	2.80	17.4
11/8/2017	323 J	249 [3]	434	**73.8**	17.4	2.02	10.2
2/8/2018	**2,060**	**1,390** [3]	**1,330**	**240**	99.7	11.3	66.2
5/3/2018	**1,700**	**585** [3]	**1,090**	**136**	51.7	4.50	26.0
10/25/2018	428	198 [3]	235	27.6	11.2	1.00 U	6.47
4/8/2019	**1,710**	**1,050**	405	**95.7**	5.85	58.8	38.7
10/21/2019	**960**	150 J [3]	158 J	43.2	31.4	1.83	12.1
4/27/2020	**1,940**	**681** [3]	**992**	**85.1**	67.3	6.15	34.9
10/21/2020	**1,220**	179 [3]	**525**	**69.4**	46.3	3.42	19.5
4/20/2021	**1,740**	**1,360** [3]	**906**	**73.6**	61.5	5.68	38.1
10/13/2021	**1,100**	**841**	98.5 U	31.3	31.8	1.60	11.2
5/4/2022	**1,810**	**1,710**[3,5] (**1,170**[3,5])	93.1 U (93.1 U)	**58.1**	56.1	4.15	28.0
11/11/2022	**1,800**	**1,780 J**[3,5] (**547 J**[5])	94.6 U (94.6 U)	**54.0**	54.9	4.91	27.3

Table A.1
Groundwater Analytical Results: Contaminants of Concern

Analyte	Total Petroleum Hydrocarbons (TPH)			Benzene, Toluene, Ethylbenzene, and Xylenes			
	Gasoline-Range Organics	Diesel-Range Organics [1]	Oil-Range Organics [1,2]	Benzene	Ethylbenzene	Toluene	Xylene (total)
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Criteria	800	500	500	51	--	--	--
Sample Location and Date							
Other Site Monitoring Wells (cont.)							
PP-29 (Screened Interval 5–15 ft)							
7/28/2016	4,170	531 JM	985	1,480	40.8	14.6	83.9
10/26/2016	160	268 J	402	35.3	1.00 U	1.00 U	1.00 U
1/25/2017	1,550	174	1,650	448	13.2	4.97	24.4
04/25/2017 [4]	3,180	586	1,750	878	19.7	6.40	30.6
8/2/2017	752	183 [3]	1,190	202	4.67	1.53	6.81
11/8/2017	997	646 [3]	1,560	326	5.29	1.85	7.33
2/8/2018	288	387 [3]	664	55.7	6.12	3.93	15.8
5/3/2018	324	179 [3]	921	38.9	3.10	1.00 U	5.78
10/25/2018	170	487 [3]	952	10.9	1.00 U	1.00 U	1.00 U
4/8/2019	145	49.9 U	1,660	17.9	1.00 U	1.28	1.41
10/21/2019	252	49.2 UJ	836 J	26.4	1.00 U	1.00 U	1.00 U
4/27/2020	322	112 [3]	1,420	20.3	4.14	1.00 U	1.00 U
10/21/2020 [4]	55.8	93.8 [3]	863	1.00 U	1.00 U	1.00 U	1.00 U
4/20/2021	50.0 U	99.7 U	1,400	4.23	0.400 U	0.750 U	1.00 U
10/13/2021	65.6	1,180 J	98.8 U	0.440 U	0.400 U	0.750 U	1.00 U
5/4/2022	115	1,790[3] (790[3])	93.4 U (93.4 U)	7.88	0.753	0.750 U	1.00 U
11/11/2022 [4]	55.7	1,130[3] (112[3])	96.7 U (96.7 U)	1.48	0.529	1.00 U	1.00 U
PP-30 (Screened Interval 5–15 ft)							
7/28/2016	2,310	1,210	1,430	450	61.2	8.89	86.9
10/27/2016	2,980	164	353	539	10.1	4.42	39.5
1/25/2017	1,570	1,510	4,330	139	25.9	4.55	43.6
4/25/2017	1,920	1,040	3,090	132	37.9	5.92	81.3
8/2/2017	1,460	453 [3]	1,890	184	26.5	4.15	56.3
11/7/2017	1,280	987 [3]	1,640	229	32.1	4.12	56.3
2/8/2018	862	910 [3]	3,560	26.7	11.0	1.40	14.2
5/2/2018	2,800	865 [3]	2,530	99.5	125	4.47	108
10/25/2018	1,640	547 [3]	1,200	294	22.1	1.52	31.3
4/8/2019	1,180	49.9 U	3,060 (1,760)	26.7	2.74	44.4	42.9
10/22/2019	963	167 J [3] (138 J [3])	2,690 J (1,610 J)	119	12.6	1.54	15.0
4/27/2020	1,220	668 [3]	2,530	60.7	19.2	1.44	18.6
10/21/2020	853	394 [3]	2,680	118	13.6	1.74	16.5
4/21/2021	522	99.5 U	2,420	37.2	9.68	0.961	8.07 U
10/13/2021	863	1,580	99.3 U	31.5	3.96	0.750 U	1.00 U
5/4/2022	365	704[3,5] (755[3,5])	94.7 U (94.7 U)	17.9	3.83	0.750 U	2.80
8/2/2017	158	72.3 [3]	496	1.45	16.1	1.00 U	11.4
PP-32 (Screened Interval 8–18 ft)							
7/28/2016	296	50.0 U	142	113	1.00 U	1.00 U	1.00 U
10/27/2016	50.0 U	50.3 U	152	2.74	1.00 U	1.00 U	1.00 U
1/26/2017	373	50.0 U	542	160	1.00 U	1.00 U	1.00 U
4/26/2017	289	49.8 U	114	97.0	1.00 U	1.00 U	1.00 U
8/2/2017	114	49.8 U	99.6 U	80.4	1.00 U	1.00 U	1.00 U
11/8/2017	50.0 U	50.0 U	159	40.3	1.00 U	1.00 U	1.00 U
2/8/2018	50.0 U	49.7 U	99.4 U	26.1	1.00 U	1.00 U	1.00 U
5/2/2018	221	49.9 U	175 J	88.4	1.00 U	1.00 U	1.00 U
10/25/2018	85.1	50.1 U	100 U	30.1	1.00 U	1.00 U	1.00 U
4/8/2019	50.0 U	49.9 U	271	2.37	1.00 U	1.00 U	1.00 U
10/22/2019	95.0	49.4 UJ	146 J	34.1	1.00 U	1.00 U	1.00 U
4/27/2020	50.0 U	49.6 U	231	1.00 U	1.00 U	1.00 U	1.00 U
10/21/2020	50.0 U	49.3 U	332	16.2	1.00 U	1.00 U	1.00 U
4/20/2021	50.0 U	98.6 U	414	0.440 U	0.400 U	0.750 U	1.00 U
10/13/2021	57.1	347	98.6 U	8.86	0.400 U	0.750 U	1.00 U
5/4/2022	50.0 U	187[3] (92.0 U)	92.0 U (92.0 U)	1.20	0.400 U	0.750 U	1.00 U
11/10/2022	50.0 U	355 [3]	95.8 U	8.16	0.400 U	1.00 U	1.00 U
PP-33 (Screened Interval 5–15 ft)							
7/28/2016	1,560	55.0 JM	99.5 U	670	3.90	6.30	4.38
10/26/2016 [4]	50.0 U	94.8	140	1.00 U	1.00 U	1.00 U	1.00 U
1/25/2017	316	109	520	49.6	1.00 U	1.00 U	1.00 U
4/25/2017	442	170	685	80.6	1.00 U	1.00 U	1.11
8/2/2017	457	49.8 U	99.6 U	207	1.00 U	1.24	1.03
11/7/2017	50.0 U	146 [3]	264	20.1	1.00 U	1.00 U	1.12
02/8/2018 [4]	1,160	218 [3]	614	128	2.09	1.57	1.93
5/3/2018	647	205 [3]	690	164	1.00 U	1.10	1.00 U
10/25/2018	81.4	142	302	1.00 U	1.00 U	1.10	1.00 U
4/8/2019	128	49.9 U	416	1.04	1.00 U	1.00 U	1.00 U
10/21/2019	50.0 U	49.4 UJ	254 J	1.00 U	1.00 U	1.00 U	1.00 U
4/27/2020	50.0 U	68.6 [3,7]	831	1.00 U	1.00 U	1.00 U	1.00 U
10/21/2020	50.0 U	50.0 U	366	1.00 U	1.00 U	1.00 U	1.00 U
4/20/2021	50.0 U	98.7 U	1,460	0.440 U	0.400 U	0.750 U	1.00 U
10/13/2021	50.0 U	663	99.6 U	0.440 U	0.400 U	0.750 U	1.00 U
5/4/2022	243 [3]	1,380[3] (800[3])	96.9 U (96.9 U)	31.5	1.82	1.37	1.00 U
8/2/2017	50.0 U	49.9 U	99.8 U	1.00 U	1.00 U	1.00 U	1.00 U

Table A.1
Groundwater Analytical Results: Contaminants of Concern

Analyte	Total Petroleum Hydrocarbons (TPH)			Benzene, Toluene, Ethylbenzene, and Xylenes			
	Gasoline-Range Organics	Diesel-Range Organics [1]	Oil-Range Organics [1,2]	Benzene	Ethylbenzene	Toluene	Xylene (total)
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Criteria	800	500	500	51	--	--	--
Sample Location and Date							
Other Site Monitoring Wells (cont.)							
PP-36 (Screened Interval 5–15 ft)							
7/27/2016	297	49.8 U	99.7 U	**90.6**	4.72	1.00 U	3.50
10/26/2016	**2,900**	49.8 U	**622**	**321**	246	4.28	9.83
1/25/2017	**6,000**	255	**1,240**	**323**	355	4.01	15.2
4/25/2017	**6,170**	282	**693**	**530**	301	6.95	27.7
08/2/2017 [4]	**1,320**	63.3 [3]	374	**153**	39.6	1.64	6.77
11/8/2017	515	229 [3]	435	**153**	22.2	1.04	4.38
2/8/2018	**5,310**	408 [3]	497	**272**	348	5.09	17.5
5/3/2018	**5,350**	274 [3]	337 J	**290**	346	5.04	19.1
10/25/2018	513	58.9 [3]	149	23.6	4.13	1.00 U	1.00 U
4/8/2019	**4,200**	49.5 U	327	**160**	3.02	194	8.51
10/22/2019	**1,610**	110 J [3]	624 J	37.5	37.9	1.00 U	34.1
4/27/2020	**2,910**	219 [3]	424	39.5	72.2	1.13	3.86
10/21/2020	**1,970**	103 [3]	379	47.7	42.1	1.42	1.85
4/21/2021	**1,520**	152 J [3]	466 J	37.6	26.5	0.762	2.78
10/13/2021	**898**	458	98.1 U	5.09	0.928	0.750 U	1.00 U
5/4/2022	**2,710 J [3]**	**822[3,5] (861[3,5])**	93.9 U (93.9 U)	31.0	19.4	0.750 U	2.80
11/10/2022	**1,810**	**944 J[3,5]** (490 J[5])	93.8 U (93.8 U)	29.6	20.9	1.00 U	3.39
PP-37R [8] (Screened Interval 10–20 ft)							
8/4/2017	**3,640**	56.9 [3]	99.7 U	**1,420**	1.00 U	3.97	1.22
11/8/2017	50.0 U	131 [3]	339	20.1	1.00 U	1.00 U	1.00 U
2/8/2018	50.0 U	50.0 U	123	1.00 U	1.00 U	1.00 U	1.00 U
5/2/2018	50.0 U	49.8 U	131	15.7	1.00 U	1.00 U	1.00 U
4/8/2019	135	50.1 U	324	**72.1**	1.00 U	1.00 U	1.00 U
10/21/2019 [4]	219	49.1 UJ	49.1 UJ	**135 J**	80.6	1.00 U	1.00 U
4/27/2020	50.0 U	49.7 U	401	5.50	1.00 U	1.00 U	1.00 U
10/21/2020	221	49.2 U	251	**100**	1.00 U	1.00 U	1.00 U
4/21/2021	177	98.2 U	**958**	**89.7**	0.400 U	0.750 U	1.00 U
10/13/2021	235	**548**	98.1 U	**100**	0.400 U	0.750 U	1.00 U
5/4/2022	50.0 U	349[3] (288[3])	94.3 U (94.3 U)	0.492	0.400 U	0.750 U	1.00 U
8/3/2017	176	73.0 [3]	268	14.1	2.07	1.00 U	2.87

Notes:

-- Not analyzed or not available.

RED/BOLD Detected concentration that exceeds criteria.

1 Results without and (with) silica gel cleanup.

2 Coordination with laboratory on quantification of DRO versus ORO was conducted between the April and October 2021 monitoring events. Laboratory concluded that overlap of DRO and ORO carbon ranges in a single peak is more indicative of a weathered diesel rather than heavy oil. ORO results collected prior to October 2021 interpreted as a weathered-diesel product based on labortory coordination and conceptual site model of residual diesel contamination in soil acting as source to groundwater.

3 Chromatogram indiciates unresolved compounds, refer to annual reports for laboratory specific comments.

4 A field duplicate was collected. The greatest value is reported.

5 Detection is biased due to overlap with gasoline range material, refer to annual reports for laboratory specific comments.

6 PP-18R was replaced by PP-18R2 in March 2019, approximately 25 feet north.

7 Chromatographic pattern is not consistent with a petroleum standard.

8 PP-37 was screened 5–15 feet bgs, but was replaced by PP-37R in March 2019, which is screened 10–20 ft bgs.

Abbreviations:

bgs Below ground surface

DRO Deisel-range organics

ft Feet

µg/L Micrograms per liter

ORO Oil-range organics

Qualifiers:

J Concentration is estimated but acceptable for most uses.

JM Analyte is detected; concentration is considered to be an estimate due to poor match to chromatographic standard used for quantitation.

U Analyte is not detected at the associated reporting limit.

UJ Analyte is not detected at the associated reporting limit, which is considered to be an estimate.

Table A.2
Groundwater Analytical Results: Geochemical Parameters

	Conventionals					Metals		Field Parameters	
Analyte	Biochemical Oxygen Demand	Chemical Oxygen Demand	Bromide	Methane	Sulfate	Iron, Dissolved	Iron, Total	Dissolved Oxygen	Oxidation-Reduction Potential
Units	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mV
Sample Location and Date [1]									
Conditional Point of Compliance Monitoring Wells									
PP-17 (Screened Interval 5–15 ft)									
7/27/2016	5.64	57.7	--	0.005 U	--	617	835	NM	NM
10/27/2016	11.2	--	--	0.193	--	592	1,020	0	-75
1/26/2017	6.57	--	--	0.229	570	213	444	0.72	-94
4/26/2017	--	--	--	--	110	--	--	0.78	-165
11/7/2017	--	--	--	--	39.7	--	--	0	57
2/8/2018	--	--	--	0.279	257	--	--	0	-147
05/2/2018 [2]	--	--	2.18	--	191	--	--	0	-143
10/25/2018	--	--	3.84 JQ	--	161	--	--	0	-134
4/8/2019	--	--	--	--	243	--	--	3.36	-108.7
10/22/2019	--	--	77 J	--	1,410 J	--	--	0.23	-207
04/27/2020 [2]	--	--	--	--	144	--	--	0	-180.9
10/21/2020	--	--	--	--	114	--	--	0.75	-98.7
4/21/2021	--	--	--	--	89.5	--	--	0.50	0.0
10/13/2021	--	--	--	--	92.5	--	--	1.15	108
5/4/2022 [2]	--	--	--	--	--	--	--	0.66	96.0
11/10/2022	--	--	--	--	--	--	--	6.23	-164.9
PP-18R2 [3] (Screened Interval 10–20 ft)									
7/28/2016	15.2	38.5	--	5.48 J	--	100 U	676	NM	NM
10/27/2016	20.3	--	--	0.117	--	100 U	100 U	0	-244
1/26/2017	11.6	--	--	0.259	41.0	100 U	101	0.66	-192
4/26/2017	--	--	--	--	44.2	--	--	0.96	-180
11/7/2017	--	--	--	--	45.9	--	--	0	2
2/8/2018	--	--	--	0.381	97.8	--	--	0	-184
5/2/2018	--	--	0.361	--	62.0	--	--	0	-226
04/8/2019 [2]	--	--	--	--	130	--	--	0.63	-83
10/22/2019	--	--	16.4 J	--	266 J	--	--	0.53	-61
4/27/2020	--	--	2.98	--	148	--	--	0.11	-93
10/21/2020	--	--	--	--	300	--	--	0.76	-66.6
4/21/2021	--	--	--	--	163	--	--	0.63	24.7
10/13/2021	--	--	--	--	286	--	--	1.07	74.7
5/4/2022	--	--	--	--	--	--	--	2.27	127.5
11/10/2022	--	--	--	--	--	--	--	5.79	-143.2
PP-19 (Screened Interval 5–15 ft)									
7/27/2016	2 U	80.9	--	0.007	--	100 U	100 U	NM	NM
10/27/2016	2 U	--	--	0.005 U	--	500 U	500 U	3.01	49
1/26/2017	2 U	--	--	0.0051	610	100 U	291	4.50	105
4/26/2017	--	--	--	--	518	--	--	4.00	154
10/22/2019	--	--	--	--	740 J	--	--	2.39	0.5
4/27/2020	--	--	--	--	274	--	--	1.38	58.5
10/21/2020	--	--	--	--	1,010	--	--	1.64	176.5
4/20/2021	--	--	--	--	210	--	--	1.26	102.1
10/13/2021	--	--	--	--	1,170	--	--	3.16	154.5
5/4/2022	--	--	--	--	--	--	--	8.6	107.1
11/10/2022	--	--	--	--	--	--	--	2.64	22.2
PP-34 (Screened Interval 8–18 ft)									
7/28/2016	10.8	53.1	--	1.03	--	100 U	422	NM	NM
10/27/2016	8.26	--	--	0.0795	--	100 U	771	0	-178
1/26/2017	7.16	--	--	0.838	38.6	100 U	134	0.78	-244
4/26/2017	--	--	--	--	47.8	--	--	0.76	-143
11/07/2017 [2]	--	--	--	--	41.8	--	--	0	-3
2/8/2018	--	--	--	0.197	106	--	--	0	-186
5/2/2018	--	--	0.410	--	63.0	--	--	1.24	103
10/25/2018	--	--	1.490 JQ	--	53.5	--	--	0	-211
4/8/2019	--	--	--	--	101	--	--	0.44	-94
10/22/2019	--	--	24.9 J	--	403 J	--	--	0.21	-232
4/27/2020	--	--	3.31	--	60.6	--	--	0.03	-104
10/21/2020	--	--	--	--	51.0	--	--	0.70	-264
4/21/2021 [2]	--	--	--	--	40.4	--	--	0.57	-6.80
10/13/2021	--	--	--	--	35.4	--	--	0.74	17.3
5/4/2022	--	--	--	--	--	--	--	0.75	141.2
11/10/2022	--	--	--	--	--	--	--	5.66	-656.9

Table A.2
Groundwater Analytical Results: Geochemical Parameters

Analyte	Conventionals					Metals		Field Parameters	
	Biochemical Oxygen Demand	Chemical Oxygen Demand	Bromide	Methane	Sulfate	Iron, Dissolved	Iron, Total	Dissolved Oxygen	Oxidation-Reduction Potential
Units	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mV
Sample Location and Date [1]									
Other Site Monitoring Wells									
PP-13R (Screened Interval 5–15 ft)									
7/28/2016	32.9	51.7	--	12.1 J	--	152	1,470	NM	NM
10/27/2016	30.7	--	--	1.74	--	259	427	0	-110
1/25/2017	2 U	--	--	0.0915	164	100 U	100 U	0	-208
4/25/2017	--	--	--	--	54.9	--	--	0.61	-207
11/7/2017	--	--	--	--	5.07	--	--	0	-68
2/8/2018	--	--	--	0.308	148	--	--	0	-226
5/2/2018	--	--	--	--	208	--	--	0	-192
10/25/2018 [2]	--	--	1.88	--	14.7	--	--	0.17	-159
4/8/2019	--	--	--	--	129	--	--	0.38	-191
10/21/2019	--	--	6.36 J	--	74 J	--	--	0.42	-135
4/27/2020	--	--	--	--	91.4	--	--	0.29	-176.6
10/21/2020	--	--	--	--	49.9	--	--	0.80	28.8
4/21/2021	--	--	--	--	108	--	--	0.52	48.9
10/13/2021	--	--	--	--	64.2	--	--	1.53	-213.2
5/4/2022	--	--	--	--	--	--	--	7.34	-85.1
11/10/2022	--	--	--	--	--	--	--	2.02	-150.9
PP-14R (Screened Interval 5–15 ft)									
7/28/2016	25.5	35.9	--	8.28 J	--	100 U	287	NM	NM
10/27/2016	35.5	--	--	2.23	--	100 U	206	0	-110
1/25/2017	12.0	--	--	6.80 J	221	100 U	100 U	0.54	-208
4/25/2017	--	--	--	--	231	--	--	0.60	-151
11/7/2017	--	--	--	--	11.0	--	--	0	-78
2/8/2018	--	--	--	0.911	337	--	--	0	-157
5/2/2018	--	--	--	--	155	--	--	0	-87
10/25/2018	--	--	1.32	--	30.4	--	--	0.22	-155
4/8/2019	--	--	--	--	334	--	--	0.41	-140
10/21/2019	--	--	--	--	1,060 J	--	--	0.18	-247
4/27/2020	--	--	--	--	264	--	--	0.33	-151.4
10/21/2020	--	--	--	--	58.4	--	--	0.21	-203.1
4/20/2021	--	--	--	--	201	--	--	0.61	56.4
10/13/2021 [2]	--	--	--	--	178	--	--	0.77	20.6
5/4/2022	--	--	--	--	--	--	--	7.02	-125.6
11/10/2022	--	--	--	--	--	--	--	1.93	-80.6
PP-15R2 (Screened Interval 5–15 ft)									
7/27/2016	30.9	70.9	--	7.4 J	--	212	1,670	NM	NM
10/26/2016	39.6	--	--	1.05	--	1,950	2,210	0.81	-130
01/25/2017 [2]	21.6	--	--	5.34	225	535	1,100	0.60	-166
4/25/2017	--	--	--	--	181	--	--	0.62	-152
11/8/2017	--	--	--	--	7.70	--	--	0	-56
2/8/2018	--	--	--	1.54	68.8	--	--	0.16	-199.6
5/2/2018	--	--	--	--	11.8	--	--	0	-165
10/25/2018	--	--	1.13	--	0.78	--	--	0.22	-127
4/8/2019	--	--	--	--	14.9	--	--	0.45	-146
10/21/2019	--	--	--	--	4.78 J	--	--	0.18	-240
4/27/2020	--	--	3.34	--	45	--	--	0.22	-282.5
10/21/2020	--	--	--	--	3 U	--	--	0.29	-110.8
4/20/2021	--	--	--	--	0.864	--	--	0.41	-129.3
10/13/2021	--	--	--	--	6 U	--	--	0.60	-21.8
5/4/2022	--	--	--	--	--	--	--	0.53	-6.5
11/11/2022	--	--	--	--	--	--	--	1.82	-120.9
PP-27 (Screened Interval 5–15 ft)									
7/27/2016	10.4	54.4	--	3.51	--	199	20,100	NM	NM
10/26/2016	8.23	--	--	0.111	--	100 U	4,090	0	-192
1/25/2017	17.7	--	--	1.11	18.8	100 U	1,520	0.7	-139
4/25/2017	--	--	--	--	31.0	--	--	0.77	-210
11/8/2017	--	--	--	--	16.4	--	--	0.15	-193
2/8/2018	--	--	--	1.14	52.6	--	--	0.60	-177
5/3/2018	--	--	--	--	124	--	--	1.25	74
10/25/2018	--	--	0.838	--	0.714	--	--	0.23	-158
4/8/2019	--	--	--	--	118	--	--	3.80	27.4
10/21/2019	--	--	--	--	42.5 J	--	--	0.14	-385
4/27/2020	--	--	--	--	16.4	--	--	0	-143.2
10/21/2020	--	--	--	--	6.74	--	--	0.64	-156
4/20/2021	--	--	--	--	6.69	--	--	0.5	110.8
10/13/2021	--	--	--	--	2.21	--	--	1.44	-364.4
5/4/2022	--	--	--	--	--	--	--	0.6	91.9
11/11/2022	--	--	--	--	--	--	--	6.66	-193.8

Table A.2
Groundwater Analytical Results: Geochemical Parameters

	Conventionals					Metals		Field Parameters	
Analyte	Biochemical Oxygen Demand	Chemical Oxygen Demand	Bromide	Methane	Sulfate	Iron, Dissolved	Iron, Total	Dissolved Oxygen	Oxidation-Reduction Potential
Units	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mV
Sample Location and Date [1]									
Other Site Monitoring Wells (cont.)									
PP-29 (Screened Interval 5–15 ft)									
7/28/2016	20.3	69.6	--	3.34	--	100 U	1,750	NM	NM
10/26/2016	37.9	--	--	1.70	--	100 U	811	0	-101
1/25/2017	15.6	--	--	2.45	152	100 U	100 U	1.11	-104
04/25/2017 [2]	--	--	--	--	123	--	--	0.60	-173
11/8/2017	--	--	--	--	6.90	--	--	0	-47
2/8/2018	--	--	--	0.227	279	--	--	2.75	-16.7
5/3/2018	--	--	--	--	163	--	--	0.07	-49
10/25/2018	--	--	0.79	--	2.21	--	--	0	-77
4/8/2019	--	--	--	--	264	--	--	3.56	14.7
10/21/2019	--	--	--	--	27.4 J	--	--	0.36	-106
4/27/2020	--	--	4.12	--	126	--	--	1.80	-106
10/21/2020 [2]	--	--	--	--	26.0	--	--	0.74	-67.1
4/20/2021	--	--	--	--	35.8	--	--	2.93	60.1
10/13/2021	--	--	--	--	3.8 JQ	--	--	1.39	-104.5
5/4/2022	--	--	--	--	--	--	--	0.84	46.1
11/11/2022 [2]	--	--	--	--	--	--	--	7.59	-42.1
PP-30 (Screened Interval 5–15 ft)									
7/28/2016	13.0	91.5	--	3.34	--	100 U	287	NM	NM
10/27/2016	11.3	--	--	2.14	--	163	267	0	-171
1/25/2017	21.0	--	--	2.1	43.2	100 U	339	0.55	-278
4/25/2017	--	--	--	--	59.8	--	--	0.60	-272
11/7/2017	--	--	--	--	25.1	--	--	0	-155
2/8/2018	--	--	--	0.21	60.0	--	--	0	-277
5/2/2018	--	--	--	--	108	--	--	0	-221
10/25/2018	--	--	0.702	--	15.3	--	--	0	-221
4/8/2019	--	--	--	--	130	--	--	4.16	-90.4
10/22/2019	--	--	--	--	199 J	--	--	0.42	-205
4/27/2020	--	--	2.56	--	90.0	--	--	0.01	-126.3
10/21/2020	--	--	--	--	54.8	--	--	0.29	-21
4/21/2021	--	--	--	--	66.2	--	--	0.5	-3.60
10/13/2021	--	--	--	--	15.6	--	--	0.71	20.5
5/4/2022	--	--	--	--	--	--	--	7.0	-209.60
11/10/2022	--	--	--	--	--	--	--	1.9	-153.90
PP-32 (Screened Interval 8–18 ft)									
7/28/2016	22.4	54.4	--	7.63 J	--	503	2,290	NM	NM
10/27/2016	33.2	--	--	2.14	--	466	672	0	-107
1/26/2017	34.6	--	--	10 J	16.6	1,390	1,820	0.55	-173
4/26/2017	--	--	--	--	67.6	--	--	0.65	-148
4/8/2019	--	--	--	--	81.3	--	--	0.40	-156
10/22/2019	--	--	--	--	3.45 J	--	--	0.15	-248
4/27/2020	--	--	--	--	161	--	--	0.45	-160.6
10/21/2020	--	--	--	--	4.21	--	--	0.27	25.2
4/20/2021	--	--	--	--	140	--	--	0.68	77.2
10/13/2021	--	--	--	--	1.25	--	--	1.46	-199.6
5/4/2022	--	--	--	--	--	--	--	7.53	-37.2
11/10/2022	--	--	--	--	--	--	--	6.39	-142.7
PP-33 (Screened Interval 5–15 ft)									
7/28/2016	21.0	48.4	--	5.67 J	--	609	2,530	NM	NM
10/26/2016 [2]	26.0	--	--	1.07	--	1,820	2,030	0.07	-127
1/25/2017	11.8	--	--	2.71	135	588	1,710	0.55	-135
4/25/2017	--	--	--	--	109	--	--	0.66	-138
11/7/2017	--	--	--	--	5.64	--	--	0	-86
02/08/2018 [2]	--	--	--	0.798	192	--	--	0.24	-167
5/3/2018	--	--	--	--	49.1	--	--	1.05	52
10/25/2018	--	--	0.936	--	11.6	--	--	0.19	-143
4/8/2019	--	--	--	--	265	--	--	0.39	-136
10/21/2019	--	--	--	--	26.4 J	--	--	0.39	-130
4/27/2020	--	--	--	--	138	--	--	0.69	-146.7
10/21/2020	--	--	--	--	16.2	--	--	0.27	-104.5
4/20/2021	--	--	--	--	108	--	--	0.53	77.8
10/13/2021	--	--	--	--	14.2	--	--	0.72	-5.9
5/4/2022	--	--	--	--	--	--	--	7.08	-7.9
11/11/2022	--	--	--	--	--	--	--	2.1	-86.5

Table A.2
Groundwater Analytical Results: Geochemical Parameters

Analyte	Conventionals					Metals		Field Parameters	
	Biochemical Oxygen Demand	Chemical Oxygen Demand	Bromide	Methane	Sulfate	Iron, Dissolved	Iron, Total	Dissolved Oxygen	Oxidation-Reduction Potential
Units	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mV
Sample Location and Date [1]									
Other Site Monitoring Wells (cont.)									
PP-36 (Screened Interval 5–15 ft)									
7/27/2016	11.0	30.6	--	2.80	--	100 U	10,600	NM	NM
10/26/2016	10.1	--	--	0.128	--	100 U	12,100	0	-112
1/25/2017	14.2	--	--	1.41	113	507	1,560	0.60	-173
4/25/2017	--	--	--	--	49	--	--	0.63	-207
11/8/2017	--	--	--	--	33.8	--	--	0	-94
2/8/2018	--	--	--	0.211	148	--	--	0.16	-236.5
5/3/2018	--	--	--	--	131	--	--	1.49	32
10/25/2018	--	--	0.403	--	2.5	--	--	0.22	-130
4/8/2019	--	--	--	--	68.5	--	--	3.82	-72.6
10/22/2019	--	--	--	--	40.1 J	--	--	0.2	-199
4/27/2020	--	--	2 U	--	30.1	--	--	0.29	-186.5
10/21/2020	--	--	--	--	10.1	--	--	0.27	-108.1
4/21/2021	--	--	--	--	12	--	--	0.53	15.2
10/2/2021	--	--	--	--	0.6 U	--	--	1.49	-185.3
5/4/2022	--	--	--	--	--	--	--	6.78	-164.4
11/10/2022	--	--	--	--	--	--	--	5.73	-209.1
PP-37R [4] (Screened Interval 10–20 ft)									
11/8/2017	--	--	--	--	7.02	--	--	0.13	-4
2/8/2018	--	--	--	0.0218	148	--	--	1.8	9.2
5/2/2018	--	--	--	--	131	--	--	1.2	66
4/8/2019	--	--	--	--	12.8	--	--	3.4	-12.7
10/21/2019 [2]	--	--	1.92 J	--	42 J	--	--	0.18	-242
4/27/2020	--	--	--	--	80.2	--	--	0.06	-67.3
10/21/2020	--	--	--	--	31.7	--	--	0.71	-68.1
4/21/2021	--	--	--	--	50	--	--	0.62	15.2
10/13/2021	--	--	--	--	4.43 JQ	--	--	1.87	-196.8
5/4/2022	--	--	--	--	--	--	--	74	136.9
11/10/2022	--	--	--	--	--	--	--	1.8	-121.9

Notes:

-- Not analyzed or not available.

1 No geochemical parameters were analyzed during the August 2017 sampling event.

2 A field duplicate was collected. The greatest value is reported.

3 PP-18R was replaced by PP-18R2 in March 2019, approximately 25 feet north.

4 PP-37 was screened 5–15 ft bgs, but was replaced by PP-37R in March 2019, which is screened 10–20 ft bgs.

Abbreviations:

bgs Below ground surface

ft Feet

µg/L Micrograms per liter

mg/L Milligrams per liter

mV Millivolt

NM Not measured

Qualifiers:

J Concentration is estimated but acceptable for most uses.

JQ Concentration is reported between the method detection limit and reporting limit and is considered an estimate.

U Analyte is not detected at the associated reporting limit.