



**PDC Energy, Inc.**  
**Fourth Quarter 2024 Groundwater Monitoring Summary**

December 5, 2024  
Former Ikenouye F29-22, 23 Tank Battery  
NWSE Section 29 T5N R65W  
Remediation # 31424

This groundwater monitoring summary has been prepared by Tasman, Inc. for the former Ikenouye F29-22, 23 tank battery location.

### **Site History and Background**

On October 30, 2023, field screening and confirmation soil sampling activities were conducted in accordance with the ECMC Rule 911 during the decommissioning of the Ikenouye F29-22, 23 tank battery (Figure 1). On October 31, 2023, it was determined that a historic release was discovered when visually impacted soils were observed in contact with groundwater at the produced water vaults (PWVs) at approximately 6.5 feet bgs. Two additional historical releases were discovered on November 10, 2023, upon receipt of final analytical results from samples collected from under the above ground storage tanks on site. During decommissioning activities, groundwater was discovered beneath the produced water vaults at a depth of 6.5 feet bgs.

Between October 31, 2023, and March 11, 2024, approximately 2,727 cubic yards (CY) of impacted material were removed from the Ikenouye F29-22, 23 Tank Battery and transported off-site for disposal. Additionally, groundwater vacuum recovery was conducted concurrent with excavation activities and approximately 4,930 barrels (BBLs) of groundwater were removed from the former excavation.

### **Monitoring Well Installation Activities**

On June 3, 2024, 11 monitoring wells (BH01 – BH11) [Figure 1] were installed to delineate dissolved-phase hydrocarbon impacts within and surrounding the former excavation extent. Lithologic descriptions and volatile organic compound (VOC) concentrations measured using a photoionization detector (PID) were recorded for each monitoring well. Per the COA issued in the approved Supplemental Form 27 (Document No. 403711161), samples were collected from the interval exhibiting the highest PID reading and the terminus of each soil boring. Twenty two (22) soil samples were collected from the borings at depths ranging from 5-6 feet to 11-12 feet bgs and were submitted to Summit Scientific Laboratory (Summit) for analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, total petroleum hydrocarbons (TPH) [C6-C36], benz(a)anthracene, 1-methylnaphthalene (M), 2-M, and the Table 915-1 Metals Suite.

Soil analytical results indicated that organic compound concentrations were in compliance with the applicable ECMC Protection of Groundwater Soil Screening Levels (SSLs) in all 22 soil samples collected



during monitoring well installation activities. Arsenic concentrations were in exceedance of the applicable ECMC regulatory standard in all 22 soil sample locations. Additionally, the barium concentration in soil sample BH01 @ 11-12', the cadmium, lead, nickel, and selenium concentrations in soil sample BH04 @ 11-12', and the lead concentration in BH05 @ 5-6' were all in exceedance of the applicable ECMC regulatory standards. The remaining constituent concentrations were in compliance with the applicable ECMC regulatory standards in all soil sample locations.

Although boring logs were not completed for soil boring BKG01, the proximity of this background soil boring to monitoring well BH03 indicates that soil composition would be comparable between the two locations. Furthermore, monitoring wells BH03, BH04 and BH11 were installed within native material north of the former excavation, thus providing an accurate description of soil composition for the site's background material in this area. As seen in the boring logs completed for monitoring wells BH01 through BH11, site-wide soil types consist mostly of fine to coarse grained sands. Based on the homogeneity of site-wide soil composition from 2 feet to 12 feet bgs, site metals concentrations observed in soil samples BH01 through BH11 were compared to the metals concentrations observed in background soil samples BKG01 @ 2.5' and BKG01 @ 4'. Based on the results, all metals concentrations are below the highest background concentration recorded on site, aside from the cadmium, nickel, and selenium concentrations recorded in soil sample BH04 @ 11-12'.

### Groundwater Monitoring Activities

On October 28, 2024, groundwater monitoring was conducted at all 11 monitoring wells (BH01 – BH11). Eleven groundwater samples were submitted to Summit for analysis of BTEX, naphthalene, 1,2,4-TMB, and 1,3,5-TMB by EPA Method 8260B, chloride and sulfate anions by EPA Method 300.0 and total dissolved solids (TDS) by Method SM 2540C.

Fourth quarter 2024 analytical results indicated that organic compound concentrations were in compliance with the applicable ECMC Table 915-1 regulatory standards in all 11 monitoring well locations. Additionally, inorganic parameter concentrations were in compliance with the applicable regulatory standards or within 1.25x the background concentrations of the up-/cross-gradient monitoring wells (BH05 – BH08) in all 11 monitoring well locations. Sample locations and corresponding analytical results are illustrated on Figures 1 and 2. Groundwater elevation data is illustrated on Figure 3. Groundwater analytical results are summarized in Tables 1 and 2. The laboratory analytical report is included in Attachment A.

## Current Remediation Activities and Path Forward

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the third quarter 2024 and will remain the selected remediation strategy through the first quarter 2025.

Based on analytical results further site investigation activities were conducted on November 21, 2024 to vertically and horizontally delineate cadmium, nickel, and selenium exceedances observed in soil boring BH04 @ 11-12' and to continue to assess cadmium, nickel, and selenium concentrations in native soil on site. Analytical results for the soil borings are currently pending, and will be provided in a forthcoming Form 27. The soil boring locations are illustrated on Figure 4.

First quarter 2025 groundwater sampling will be conducted in January 2025.



BH11		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	115	124
Sulfate	<b>271</b>	<b>267</b>
TDS	917	796
Depth to Water (ft. bgs)	3.90	3.70

BH03		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	137	129
Sulfate	<b>331</b>	<b>275</b>
TDS	916	827
Depth to Water (ft. bgs)	4.15	3.92

BH04		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	132	150
Sulfate	<b>310</b>	<b>313</b>
TDS	874	947
Depth to Water (ft. bgs)	3.55	3.35

BH01		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	138	131
Sulfate	<b>325</b>	<b>276</b>
TDS	899	826
Depth to Water (ft. bgs)	3.33	3.18

BH10		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	135	122
Sulfate	<b>319</b>	<b>263</b>
TDS	897	808
Depth to Water (ft. bgs)	3.65	3.58

BH05		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	125	146
Sulfate	287	<b>305</b>
TDS	869	935
Depth to Water (ft. bgs)	4.38	5.31

**Legend**

- Underground Flowline Location (Collected via Trimble GPS)
- Excavation Extent (Collected via Trimble GPS)
- Monitoring Well Location (Collected via Trimble GPS)
- Excavation Groundwater Sample Location
- Groundwater Flow Direction (4Q24)

**Notes**

All locations are approximate unless otherwise noted.

GPS – Global Positioning System  
 mg/L – Milligrams per liter  
 TDS – Total Dissolved Solids  
 ft. bgs – Feet below ground surface

Black Bold text denotes an exceedance of ECMC standards, but within 1.25x the background concentration.

ECMC – Colorado Energy and Carbon Management Commission

Image Source: Google Earth; June 2021  
 Projection: WGS 84 UTM Zone 13 North

BH02		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	118	132
Sulfate	<b>273</b>	<b>279</b>
TDS	923	815
Depth to Water (ft. bgs)	3.12	3.19

BH06		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	124	148
Sulfate	298	313
TDS	858	923
Depth to Water (ft. bgs)	3.23	3.24

BH09		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	130	120
Sulfate	<b>306</b>	<b>260</b>
TDS	921	827
Depth to Water (ft. bgs)	3.25	3.29

BH08		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	137	121
Sulfate	314	263
TDS	921	819
Depth to Water (ft. bgs)	3.07	3.14

BH07		
Compound (mg/L)	7/24/2024	10/28/2024
Chloride	130	129
Sulfate	300	279
TDS	905	771
Depth to Water (ft. bgs)	3.15	3.20

DATE: August 2, 2024

DESIGNED BY: C. Hamlin

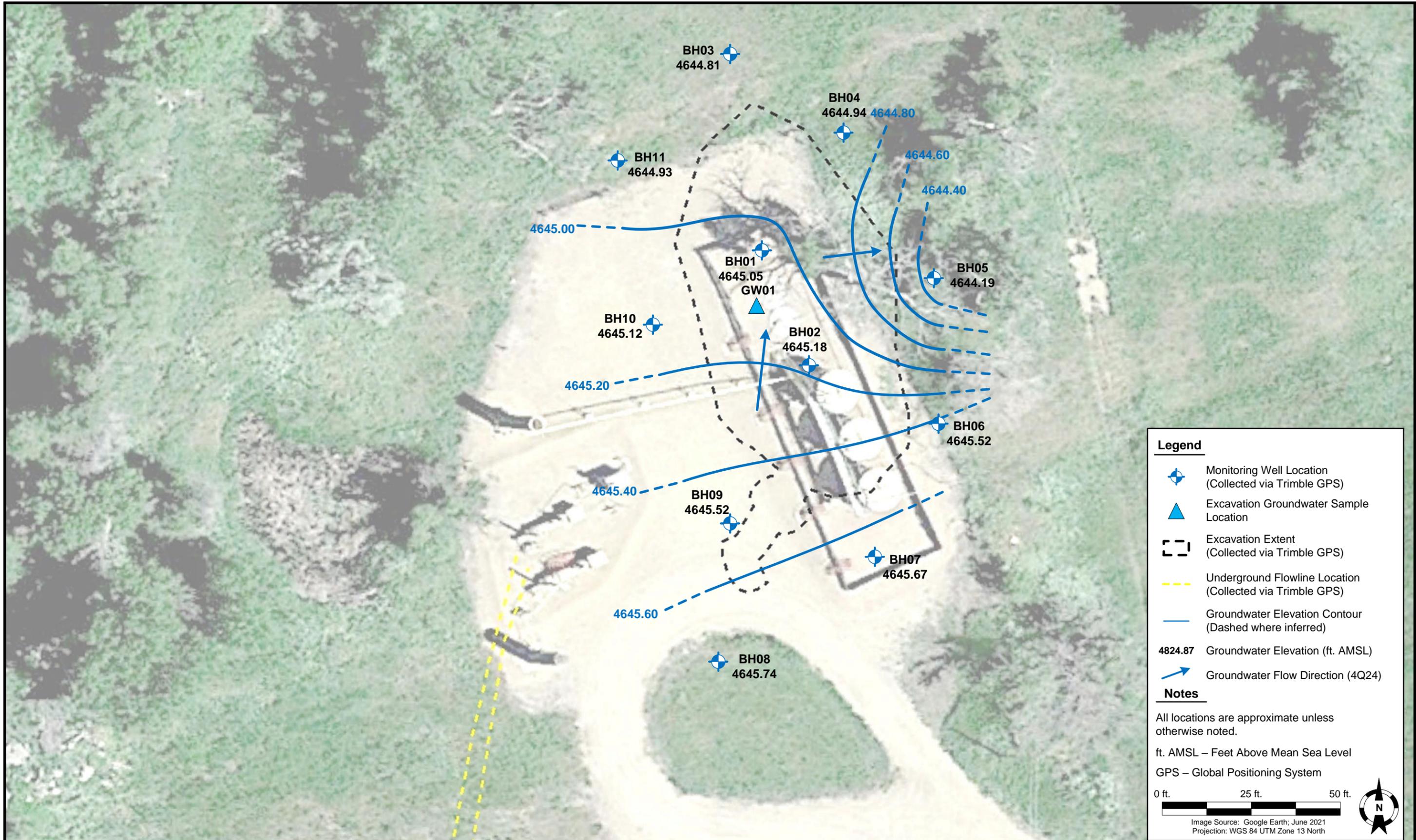
DRAWN BY: G. Semenza

**Tasman, Inc.**  
 6855 W. 119<sup>th</sup> Ave.  
 Broomfield, CO 80020

**PDC Energy, Inc. (69175) – DJ Basin**  
**Former Ikenouye F29-22, 23 Tank Battery**  
 NWSE, Section 29, Township 5 North, Range 65 West  
 Weld County, Colorado

GROUNDWATER ANALYTICAL RESULTS MAP (INORGANIC PARAMETERS)

FIGURE 2



DATE: November 11, 2024

DESIGNED BY: B. Nelson

DRAWN BY: J. Woffinden

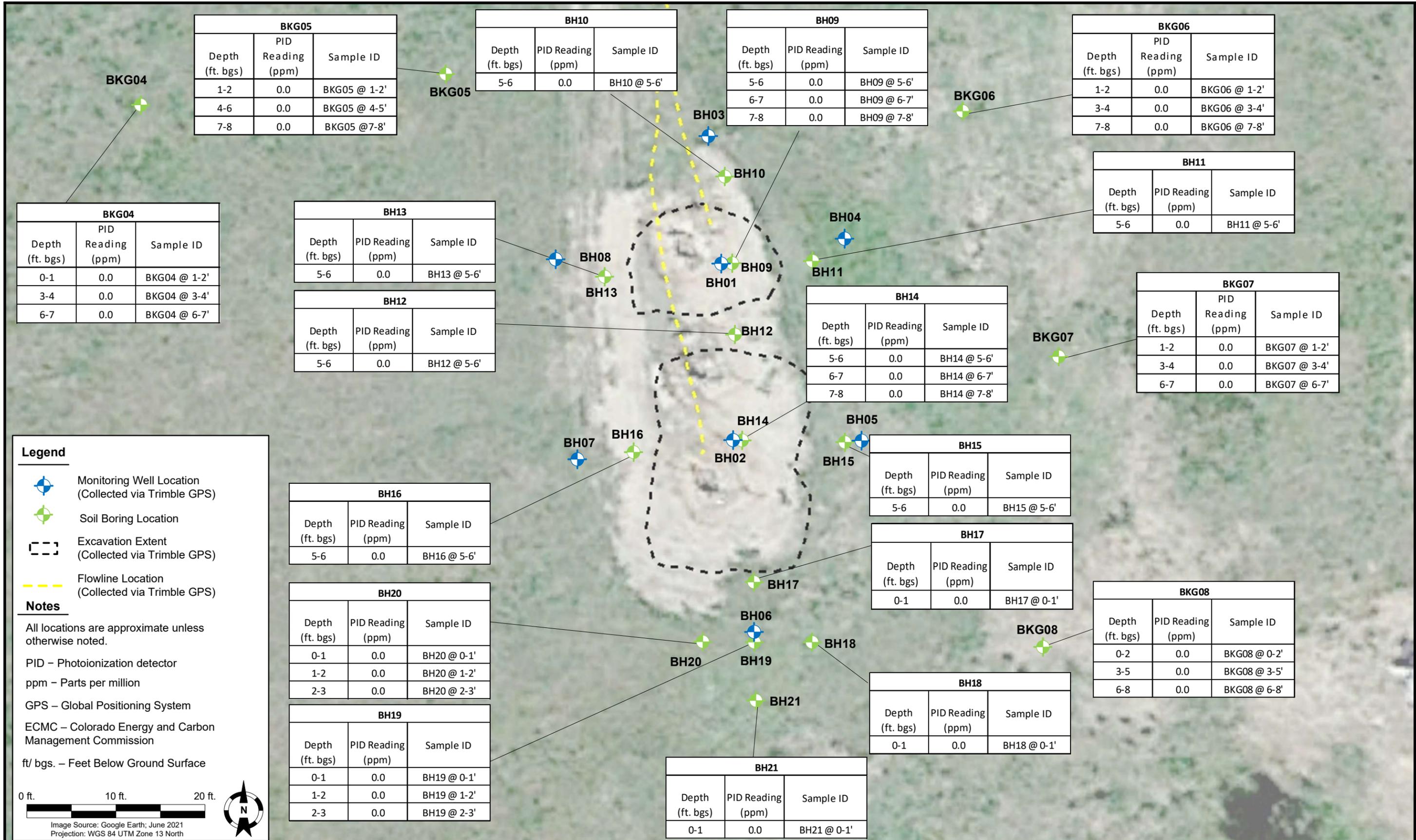


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**GROUNDWATER ELEVATION CONTOUR MAP (10/28/2024)**

**FIGURE 3**



DATE: December 11, 2024

DESIGNED BY: C. Hamlin

DRAWN BY: B. Wagner

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Broomfield, CO 80020

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SOIL  
BORING LOCATION MAP

FIGURE

**TABLE 4**  
**FORMER IKENOUYE F29-22, 23 WELLHEADS**  
**GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE**  
**ORGANIC COMPOUNDS**

Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Naphthalene (µg/L)	1,2,4-TMB (µg/L)	1,3,5-TMB (µg/L)	Depth to Water <sup>(2)</sup> (ft.)	Groundwater Elevation (ft. AMSL)
<b>ECMC Table 915-1 Groundwater Standard (µg/L) <sup>(1)</sup></b>		<b>5</b>	<b>560</b>	<b>700</b>	<b>1,400</b>	<b>140</b>	<b>67</b>	<b>67</b>	-	-
GW01 @ 6.5'	10/31/2023	<b>670</b>	11	<b>6,300</b>	<b>54,000</b>	38	<b>6,500</b>	<b>3,700</b>	~6.50	NA
BH01	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.33	4644.90
BH01	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.18	4645.05
BH02	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.12	4645.25
BH02	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.19	4645.18
BH03	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	4.15	4644.58
BH03	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.92	4644.81
BH04	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.55	4644.74
BH04	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.35	4644.94
BH05	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	4.38	4645.12
BH05	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	5.31	4644.19
BH06	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.23	4645.53
BH06	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.24	4645.52
BH07	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.15	4645.72
BH07	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.20	4645.67
BH08	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.07	4645.81
BH08	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.14	4645.74
BH09	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.25	4645.56
BH09	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.29	4645.52
BH10	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.65	4645.05
BH10	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.58	4645.12
BH11	7/24/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.90	4644.73
BH11	10/28/2024	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	3.70	4644.93

**Notes:**

1. Groundwater standards referenced from 2 CCR 404-1, Table 915-1, January 15, 2021.

2. Depth to water measurements were measured from ground surface for excavation samples. Monitoring well measurements were collected from top of casing and adjusted using survey data to reflect depth of water from ground surface.

TMB = Trimethylbenzene

ECMC = Colorado Energy and Carbon Management Commission

µg/L = Micrograms per liter

(<) = Analytical result is less than the indicated laboratory reporting limit.

ft. = Feet

AMSL = Above Mean Sea Level

NA = Not applicable

**BOLD** = Analytical result is in exceedance of applicable standard.

**TABLE 5**  
**FORMER IKENOUE F29-22, 23 WELLHEADS**  
**GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE**  
**INORGANIC PARAMETERS**

Sample ID	Date Sampled	TDS (mg/L)	Chloride (mg/L)	Sulfate Ion (mg/L)	Depth to Water <sup>(2)</sup> (ft.)	Groundwater Elevation (ft. AMSL)
<b>ECMC Table 915-1 Groundwater Standard (mg/L) (1)</b>		<b>&lt;1.25 x BCKG</b>	<b>250 or &lt;1.25 x BCKG</b>	<b>250 or &lt;1.25 x BCKG</b>	-	-
BH01	7/24/2024	899	138	<b>325</b>	3.33	4644.90
BH01	10/28/2024	826	131	<b>276</b>	3.18	4645.05
BH02	7/24/2024	923	118	<b>273</b>	3.12	4645.25
BH02	10/28/2024	815	132	<b>279</b>	3.19	4645.18
BH03	7/24/2024	916	137	<b>331</b>	4.15	4644.58
BH03	10/28/2024	827	129	<b>275</b>	3.92	4644.81
BH04	7/24/2024	874	132	<b>310</b>	3.55	4644.74
BH04	10/28/2024	947	150	<b>313</b>	3.35	4644.94
BH05	7/24/2024	869	125	287	4.38	4645.12
BH05	10/28/2024	935	146	<b>305</b>	5.31	4644.19
BH06	7/24/2024	858	124	298	3.23	4645.53
BH06	10/28/2024	923	148	313	3.24	4645.52
BH07	7/24/2024	905	130	300	3.15	4645.72
BH07	10/28/2024	771	129	279	3.20	4645.67
BH08	7/24/2024	921	137	314	3.07	4645.81
BH08	10/28/2024	819	121	263	3.14	4645.74
BH09	7/24/2024	921	130	<b>306</b>	3.25	4645.56
BH09	10/28/2024	827	120	<b>260</b>	3.29	4645.52
BH10	7/24/2024	897	135	<b>319</b>	3.65	4645.05
BH10	10/28/2024	808	122	<b>263</b>	3.58	4645.12
BH11	7/24/2024	917	115	<b>271</b>	3.90	4644.73
BH11	10/28/2024	796	124	<b>267</b>	3.70	4644.93

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<b>ECMC Table 915-1 Groundwater Standard (mg/L)</b> (1)		<b>&lt;1.25 x BCKG</b>	<b>250 or &lt;1.25 x BCKG</b>	<b>250 or &lt;1.25 x BCKG</b>	-	-

**Notes:**

1. Groundwater standards referenced from 2 CCR 404-1, Table 915-1, January 15, 2021.
2. Depth to water measurements were measured from ground surface for excavation samples. Monitoring well measurements were collected from top of casing and adjusted using survey data to reflect depth of water from ground surface.

TDS = Total dissolved solids

ECMC = Colorado Energy and Carbon Management Commission

BCKG = Background

mg/L = Milligrams per liter

(<) = Analytical result is less than the indicated laboratory reporting limit.

ft. = Feet

AMSL = Above Mean Sea Level

  = Up-/Cross-gradient well location used for background concentration.

**BOLD** = Analytical result is in exceedance of applicable standard, but below 1.25x background concentration.