Memorandum

DATE: January 31, 2025

TO: John Mefford, Department of Ecology

FROM: Kyle Johnson, LG / Tom Mergy, LHG

PROJECT: Coleman Oil Yakima Bulk Plant Site
Ecology Agreed Order No. DE 23182
PBS No. 41392.000, Phase 0021, Task 03A

REGARDING: Preliminary Results of the Bioventing Pilot Test – November 2024

This memorandum provides a summary of the bioventing pilot test conducted at the Coleman Oil Yakima Bulk Plant. The test was conducted on November 6-7, 2024, and performed as outlined in the approved Pilot Test Work Plan (PBS, 2024). The test was designed to evaluate the feasibility of bioventing as a remediation approach to stimulate the in-situ biodegradation of hydrocarbon contamination in the vadose zone, as a contingent component of a combined remedy. The pilot test involved installing vapor monitoring points (VMPs) and a vapor extraction well (VEW), injecting atmospheric air with helium tracer gas, and monitoring changes in soil gas parameters and differential pressure.

WELL INSTALLATION AND SAMPLING

Three vapor monitoring points (VMP1, VMP2, and VMP3) and one vapor extraction well (VEW1) were installed to support the bioventing and soil vapor extraction (SVE) pilot tests. Monitoring points were placed at varying distances to observe subsurface gas movement and microbial activity. VEW1 was drilled to a depth of 12.5 feet below ground surface (bgs) with a 2-inch diameter PVC casing and a 5-foot screen. The depth was chosen to allow a spacing of five feet above the water table. VMP1 and VMP3 were each drilled to 12 feet bgs, with a 6-inch vapor screen at the bottom connected to the surface by ¼-inch Teflon tubing. VMP2, used as the injection well, was drilled to 16.5 feet bgs with a 6-inch vapor screen placed approximately 1 foot above the water table. The depth to groundwater was measured at 17.5 feet below ground surface (bgs) in MW-4.

- VMP1: 10 feet from VMP2 (injection point) and 10 feet from VEW1.
- VMP2: (Injection point) 20 feet from VEW1.
- VMP3: 20 feet from VMP2 (injection point) and 40 feet from VEW1.

Soil samples were collected from all boreholes at depths of 2–3 feet bgs and from the bottom 1 foot of each hole. Soil samples were analyzed for gasoline range hydrocarbons (TPH-Gx); diesel range hydrocarbons (TPH-Dx); benzene, toluene, ethylbenzene, and xylenes (BTEX); soil moisture; pH; particle sizing; alkalinity; total iron; and nutrients. See Table 1 and Table 4 (appended) for results.

BIOVENTING PILOT TEST

The test was conducted to assess the distribution of injected air and its effects on hydrocarbon biodegradation in the vadose zone. Air was injected into VMP2 at a flow rate of approximately 3 liters per minute (L/min) for six hours. A total of approximately 1,000 liters of atmospheric air were injected during the test, which met the

threshold volume as presented in the work plan. Helium was introduced as a tracer gas to track airflow distribution.

Monitoring points VMP1 (10 ft downgradient from VMP2) and VMP3 (20 ft upgradient from VMP2) were used to monitor soil gas parameters (O_2, CO_2, VOCs, and He) and differential pressure throughout the test and during a 17.5-hour recovery period. A Landtec GEM2000+ instrument was used to collect measurements of Carbon Dioxide, Oxygen, and total volatile organics (VOCs) in the vapor monitoring points, A MGD-2002 helium detector was used to provide real-time helium data. Additionally, vapor samples were collected prior and post injection from VMP1 using Summa canisters and delivered to the laboratory for analysis.

A schematic of the actual bioventing pilot test layout is presented below. The vapor point locations on the project site are shown in Figure 2 (attached).

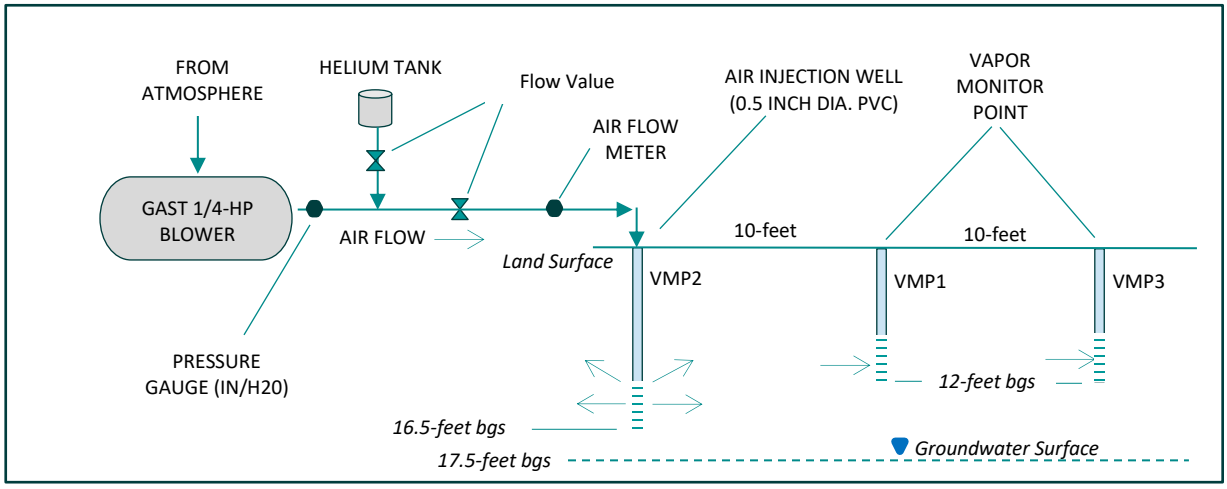


Figure 1: Bioventing pilot test schematic

Results

Baseline Conditions (Before Injection)

Baseline conditions were measured by field meters at all monitoring points prior to the start of injection:

- VMP1: O_2 was measured at 14.3%, CO_2 at 4.6%, and VOCs at 2.3 ppm.
- VMP2 (injection well): O_2 was 19.8%, CO_2 was 1%, and VOCs were 0.2 ppm.
- VMP3: O_2 was 13.1%, CO_2 was 5.3%, and VOCs were 1.5 ppm.

Baseline differential pressure readings were also collected and were used to adjust pressure readings during the injection period.

Initial Stabilization Period (10:00 AM–11:25 AM)

The first 1.42 hours of the test were dedicated to adjusting helium concentrations to the target of ~2%. This process proved challenging due to the design of the valves used, which made fine adjustments difficult. During this period, airflow and helium delivery were inconsistent, limiting the assessment of gas migration and lateral airflow. The data collected during this period reflects this transitional phase and do not represent steady-state injection conditions.

Steady Injection Period (11:25 AM–4:00 PM)

After 1.42 hours (11:25 AM), helium concentrations in the injected air were stabilized at ~2%, and air injection proceeded consistently at 3 L/min. Throughout the injection period, changes in O_2, CO_2, VOC, and helium concentrations, as well as differential pressure, were observed at both monitoring points. Rates of change varied, with the most significant impacts in VMP1 which is closer to the injection well.

Oxygen:

- VMP1: O_2 initially decreased to 13.9% during the stabilization period. Following this initial drop, O_2 began to rise, reaching 14.8% by the end of the injection period. The increase was faster earlier in the period (0.24% per hour from 1.52 to 3.28 hours) and slowed later (0.18% per hour from 3.28 to 6.00 hours).
- VMP3: O_2 initially decreased to 12.7% during the stabilization period. Following this initial drop, O_2 began to rise, reaching 13.4% by the end of the injection period, with a consistent average increase of 0.16% per hour.

Carbon dioxide:

- VMP1: CO_2 decreased to 4.2% during the injection period. The decrease was faster early in the period (0.12% per hour from 1.52 to 3.28 hours) and slowed later (0.05% per hour from 3.28 to 6.00 hours).
- VMP3: CO_2 decreased to 4.8% during the injection period. The decrease was faster early in the period (0.15% per hour from 1.62 to 4.82 hours) and slowed later (0.07% per hour from 4.82 to 6.00 hours).

VOCs:

- VMP1: VOCs decreased to 0.8 ppm during the injection period. Early in the injection period, the rate of decline was faster (0.48 ppm per hour from 1.52 to 3.28 hours) but slowed later (0.33 ppm per hour from 3.28 to 6.00 hours).
- VMP3: VOCs decreased to 0.5 ppm during the injection period, with a consistent average decrease of 0.22 ppm per hour.

Differential pressure:

- VMP1: Pressure increased 0.1 inches water (in H_2O) after 2.77 hours and remained stable for the remainder of the injection period.
- VMP3: No noticeable change was observed to the magnehelic gauge at VMP3.

Helium was not detected at either VMP1 or VMP3 during the injection period.

Post-Injection Period (After 4:00 PM, November 6, 2024)

After injection ceased at 4:00 PM on November 6, 2024, O_2 and CO_2 levels continued to change as the subsurface equilibrated through passive diffusion of injected air and microbial respiration. After approximately 17.50 hours post-injection, 9:30 AM on November 7, 2024, both O_2 and CO_2 levels at VMP-1 and VMP-3 had returned to within 5% of their respective baseline values, indicating that soil gas conditions had stabilized.

Oxygen:

- VMP-1: O_2 increased from 14.8% at 6.00 hours to a peak of 18.8% at 16.25 hours before decreasing to 14.2% by 17.50 hours, within 5% of the baseline of 14.3%.
- VMP2 (Injection Well): O_2 increased slightly from 20.3% to 20.5% within approximately 40 minutes post-injection before gradually decreasing to 15.7% by the end of the post injection period, below the baseline of 19.8%.

- VMP3: O_2 increased slightly from 13.4% to 13.6% within approximately 35 minutes post-injection before gradually decreasing to 12.7% by the end of the post injection period, within 5% of the baseline of 13.1%.

Carbon Dioxide:

- VMP1: CO_2 dropped from 4.2% to 2.5% within 28 minutes post-injection before gradually increasing to 4.8%, within 5% of the baseline of 4.6%, within 17.5 hours.
- VMP2 (Injection Well): CO_2 fluctuated between 0.0% and 0.3% throughout the first hour of the post-injection period. By 16.5 hours post-injection, CO_2 had increased to 4.0%, well above the baseline of 1.0%.
- VMP3: CO_2 decreased slightly early in the recovery period and stabilized at 5.5%, within 5% of the baseline of 5.3%, by 15.5 hours post-injection.

VOCs:

- VMP-1: VOCs stabilized at 0.8 ppm, below the baseline of 2.3 ppm.
- VMP-2 (Injection Well): VOCs were initially measured at 0.0 ppm immediately following injection. By the end of the post-injection period, VOCs increased slightly to 0.2 ppm, matching the baseline.
- VMP-3: VOCs stabilized at 0.5 ppm, below the baseline of 1.5 ppm.

Helium:

- VMP-1: Helium was first detected at 125 ppm (~0.0125%) approximately 17.5 hours post-injection (27.5 hours after injection began).
- VMP-2 (Injection Well): Helium increased from 0.34% to 1.76% within the first 49 minutes post injection but returned to the baseline of 0 ppm by 17 hours post-injection recovery period.
- VMP-3: Helium was first detected at 50 ppm (~0.005%) approximately 17.5 hours post-injection (27.5 hours after injection began).

VAPOR SAMPLING

As outlined in the work plan, air samples were collected in Summa canisters to evaluate soil gas composition during the bioventing pilot test. The samples were analyzed for VOCs using EPA Method TO-15, as well as for oxygen, carbon dioxide, other major gasses, and helium. Sampling was conducted at VMP1 to assess hydrocarbon concentrations and oxygen delivery before and after air injection.

- Pre-Injection Sampling: A vapor sample was collected from VMP1 prior to the start of injection to establish baseline soil gas conditions.
- Post-Injection Sampling: A second vapor sample was collected from VMP1 immediately after the completion of the injection period to evaluate the impact of the bioventing.
- Post-Residency Sampling: A final vapor sample was collected from VMP1 following the post-injection (residency) period to assess effectiveness of the system in promoting hydrocarbon biodegradation.

Vapor Sampling Results

The total VOC concentrations decreased over the course of the pilot test, indicating a reduction in hydrocarbon contamination in soil gas. See Table 2 and the laboratory report (appended) for full results.

- Pre-Injection Sample: The total VOC concentration was 178.9 µg/m^3, with detected compounds including benzene (47 µg/m^3), toluene (110 µg/m^3), ethylbenzene (7.9 µg/m^3), and xylenes (14 µg/m^3). Oxygen and carbon dioxide levels were 14.3% and 4.6%, respectively.
- Post-Injection Sample: Total VOCs decreased to 104.1 µg/m^3 (41.8% reduction). Benzene, toluene, ethylbenzene, and xylenes decreased by 57.4%, 36.4%, 43.0%, and 31.4%, respectively. Oxygen

increased to 15.5%, and carbon dioxide decreased to 3.2%, consistent with microbial activity and soil gas displacement.

- Post-Residency Sample: Total VOCs further decreased to 81.5 µg/m³ (54.4% reduction). Benzene, toluene, ethylbenzene, and xylenes decreased cumulatively by 74.5%, 48.2%, 51.9%, and 38.1%, respectively. Oxygen levels increased to 17.5%, and carbon dioxide levels decreased to 2.5%, reflecting sustained biodegradation and oxygen utilization during the post-injection phase.

RADIUS OF INFLUENCE

The radius of influence (ROI) for the bioventing pilot test was assessed based on changes in oxygen, carbon dioxide, VOCs, differential pressure, and helium concentrations during the injection and recovery periods. Observations indicate that the test influenced conditions up to 20 feet from the injection well.

Oxygen and carbon dioxide showed clear trends of greater impact within 10 lateral feet to the injection well. The changes in O_2 and CO_2 concentrations at VMP1 and VMP3 reflect effective delivery of injected air and the stimulation of microbial activity within the ROI. However, the more moderate changes observed at VMP3, combined with the absence of measurable changes at greater distances, suggest that the influence of injection weakens beyond 20 feet.

Using linear extrapolation of changes in O_2 and CO_2 relative to baseline, the radius at which no measurable change would occur is estimated to be approximately 30 feet.

BIODEGRADATION ANALYSIS

The bioventing test data reveals clear trends in oxygen, carbon dioxide, and VOC concentrations, providing evidence of biodegradation during the injection and post-injection phases.

Injection Phase

During the injection phase, three distinct trends were observed at VMP1. Initially, while helium was being dialed in, O_2 and CO_2 concentrations decreased. This suggests oxygen was consumed by microbial activity during the intermittent air injections. In the second phase, O_2 levels began to increase steadily while CO_2 concentrations continued to decrease, likely reflecting the flushing of existing soil gas and the influx of atmospheric oxygen into the subsurface. During the third phase, O_2 levels continued to rise, but at a slower rate, while CO_2 levels began to slightly increase, suggesting a balance between oxygen delivery and microbial respiration.

VOCs, including benzene, toluene, ethylbenzene, and xylenes (BTEX), decreased by 26% at VMP1 during the injection phase. This reduction is likely due to a combination of volatilization and microbial degradation.

Post-Injection Phase

During the post-injection period, up to 17.5 hours after injection was halted, two distinct trends were observed. Initially, O_2 levels continued to rise while CO_2 decreased, indicating continued oxygen diffusion. After peaking, O_2 concentrations decreased to baseline levels, while CO_2 increased to baseline levels, suggesting renewed microbial activity as the system equilibrated. VOC concentrations continued to decrease, with a total BTEX reduction in soil gas of 55% by the end of the post-injection period compared to baseline levels.

Biodegradation Rates

The oxygen utilization observed during the post-injection phase is a direct indicator of microbial respiration. Using the stoichiometric relationship:

$C_6H_{14}+9.5O_2 \rightarrow 6CO_2+7H_2O$

This relationship indicates that CO_2 would increase if biodegradation is occurring with infusion of oxygen into the system, which was shown through the measured levels collected during the post-injection period. Oxygen utilization during the post-injection period corresponded to approximately 0.025 moles/hr of hydrocarbon degradation near VMP1.

CONCLUSIONS

The bioventing pilot test demonstrated that injected air effectively reached the monitoring points, as shown by changes in oxygen, carbon dioxide, and VOC concentrations. These changes indicate that the bioventing system effectively delivered air to the subsurface and stimulated microbial respiration.

During the injection period, O_2 and CO_2 levels at VMP-1 changed more rapidly early on, with the rate slowing as injection continued. This shift was likely due to the initial displacement of native soil gas and the subsequent stabilization of subsurface airflow. In contrast, VMP-3 exhibited steadier rates of change throughout the injection period, reflecting weaker but more consistent airflow at the more distant monitoring point. These differences suggest that proximity to the injection well influenced the distribution and effectiveness of the injected air.

After injection ceased, passive diffusion became the dominant process influencing soil gas conditions. O_2 levels continued to rise at both monitoring points, peaking post-injection before stabilizing near baseline levels. CO_2 levels followed a complementary pattern, dropping initially and then gradually returning to baseline. Helium, used as a tracer gas, was detected only after injection ceased, with concentrations diminishing with distance from the injection well.

The sustained reductions in VOC concentrations, combined with observed O_2 increases and CO_2 decreases, confirm that microbial respiration was enhanced by bioventing. The radius of influence extended up to 20 feet from the injection well, with diminished effects observed at this distance.

The pilot test confirmed the feasibility of bioventing as a remediation strategy for enhancing aerobic biodegradation of hydrocarbons in the vadose zone.

Sincerely,

Kyle Johnson
2025.01.31
17:09:55 -08'00'

Kyle Johnson, LG
Project Geologist

Tom Mergy

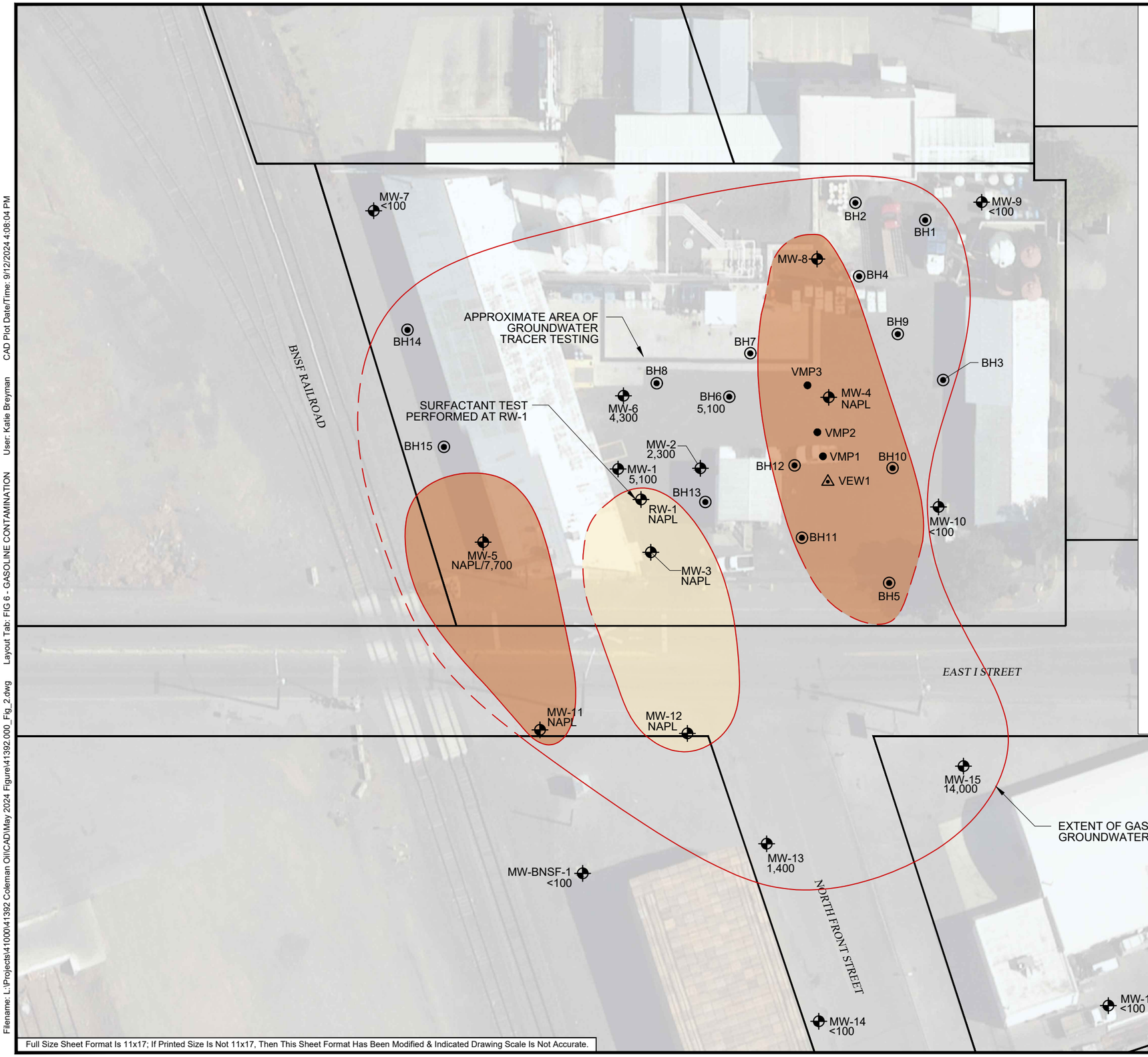
Digitally signed by Tom Mergy
Date: 2025.01.31 17:04:50 -08'00'

Tom Mergy, LHG
Principal Geologist

State of Washington
Hydrogeologist
1921
Licensed Geologist
Thomas J Mergy

Attachments:
Figure 2 – Pilot Test Plan
Table 1 – Soil Analytical Results
Table 2 – Soil Gas Analytical Results
Table 4 – Soil Grain Size Distribution
Field Notes
Analytical Results

Reviewer: TM



LEGEND

	APPROXIMATE PARCEL BOUNDARIES FROM YAKIMA COUNTY GIS, ACCESSED ON 12/15/23
MW-1	EXISTING GROUNDWATER MONITORING WELL
BH1	EXISTING SOIL BORING
VEW1	VAPOR EXTRACTION WELL
VMP1	VAPOR MONITORING PROBE
2,100	CONCENTRATION OF GASOLINE IN GROUNDWATER (µg/L) (JUL 2022)
NAPL	WELL CONTAINS MEASURABLE NON-AQUEOUS PHASE LIQUIDS (NAPL). GROUNDWATER SAMPLE NOT COLLECTED.
	AREAS CONTAINING NAPL IN THE FORM OF WEATHERED FUEL
	AREA CONTAINING NAPL IN THE FORM OF MIXED FRESH & WEATHERED FUEL
MTCA CUL	MODEL TOXICS CONTROL ACT METHOD A GROUNDWATER CLEANUP LEVEL FOR GASOLINE (800 µg/L)
(µg/L)	MICROGRAMS PER LITER

NOTE: ALL LOCATIONS APPROXIMATE

GENERAL NOTES

1. SOIL BIOVENTING TEST; INSTALL ONE VAPOR EXTRACTION WELL AND TWO VAPOR/PRESSURE MONITORING PROBES. THE 2-DAY VAPOR EXTRACTION PILOT TEST WILL USE THE VEW-1 AS POINT OF EXTRACTION.

2. SURFACTANT NAPL TEST; INTRODUCE A KNOWN QUANTITY OF SURFACTANT INTO THE RW-1 LOCATION. MEASUREMENT OF NAPL LEVELS AND CONTENT WILL BE CONDUCTED AT RW-1, MW-1, AND MW-3. WITHIN 24 HOURS OF SURFACTANT INJECTION, USE A SUBMERSIBLE PUMP IN RW-1 TO WITHDRAW WATER/NAPL AT APPROXIMATE 3-TIMES THE QUANTITY OF SURFACTANT INTRODUCED INTO RW-1. CONTAINERIZE ALL LIQUIDS EXTRACTED FOR OFF-SITE DISPOSAL

Scale 1" = 40'

0' 20' 40' 80'

PREPARED FOR: COLEMAN OIL

PBS Engineering and Environmental Inc.
214 East Galer Street, Ste. 300
Seattle, WA 98102
206.233.9639
pbsusa.com

PBS

PILOT TEST PLAN

COLEMAN OIL

1 EAST I STREET, YAKIMA, WASHINGTON

PROJECT	41392.000
DATE	JUNE 2024
SHEET ID	2

TABLE 1
SOIL ANALYTICAL RESULTS
PILOT TEST DRILLING
Coleman Oil: 1 East I St., Yakima, WA
PBS Project No. 41392.000

Location - Depth	Sample Date	pH	TPH			BTEX				Metals		Conventional Chemistry				
			Gasoline	Diesel	Heavy Oil	Benzene	Toluene	Ethyl-benzene	Xylenes	Total Iron	Total Potassium	Total Nitrate + Nitrite	TKN	Total Nitrogen	TOC	Total Phosphorus
Comparison Criteria	**MTCA Method A Cleanup Levels For Soil[a]**	**-**	**100 30**	**2,000**	**2,000**	**1500**	**7**	**6**	**9**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
VMP1-12.0	11/5/2024	7.0	<5 h	<50 h	<250 h	<0.02 h	<0.02 h	<0.02 h	<0.06 h	34,800	1,050	73.5	153	227	<0.05	655
VMP2-3.0	11/5/2024	8.2	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	38,100	1,380	94.1	402	496	0.162	531
VMP2-16.0	11/5/2024	7.6	<5 h	<50 h	<250 h	<0.02 h	<0.02 h	<0.02 h	<0.06 h	27,800	790	125	148	272	<0.05	498
VMP3-12.0	11/5/2024	7.1	<5 h	<50 h	<250 h	<0.02 h	<0.02 h	<0.02 h	<0.06 h	30,700	719	113	162	275	<0.05	622
VEW1-12.0	11/5/2024	7.2	<5 h	<50 h	<250 h	<0.02 h	<0.02 h	<0.02 h	<0.06 h	34,000	1,300	78.3	132	210	<0.05	525

Notes:
Gasoline analyzed by Northwest Total Petroleum Hydrocarbon Method - Volatile Petroleum Products (Extended) (NWTPH-Gx)
Diesel and Heavy Oil analyzed by Northwest Total Petroleum Hydrocarbon Method - Semi-volatile Petroleum Products (Extended) (NWTPH-Dx)
BTEX constituents analyzed by Environmental Protection Agency Method 8021B
Metals analyzed by EPA Method 6010D
Conventional chemistry analyzed by various standard methods (SM)

Footnotes:
[a] From Model Toxics Control Act Table 740-1 Soil Cleanup Levels for Unrestricted Land Use
[h] The analysis was performed outside the method or client-specified holding time requirement.

TABLE 2
SOIL GAS ANALYTICAL RESULTS
BIO-VENTING PILOT TEST
Coleman Oil: 1 East I St., Yakima, WA
PBS Project No. 41392.000

Results (µg/m³)													
				Major Gasses				Volatile Organic Compounds (VOCs)					
Sample Location	**Date**	**Description**	**Helium (%)**	**Carbon Dioxide (%)**	**Nitrogen (%)**	**Oxygen (%)**	**Other Major Gasses**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene-o**	**Xylene-m,p**	**Other VOCs**
BVPT-1	11/6/2024	Pre-injection	<0.6	2.26	87.9	9.87	ND	47	<110	7.9	<6.5	14	ND
BVPT-2	11/6/2024	Post-injection	<0.6	1.84	90.6	7.55	ND	20	70	4.5	4.0	9.6	ND
BVPT-3	11/6/2024	Post-stabilization	<0.6	2.28	89	8.75	ND	12	57	3.8	3.5	8.7	ND

µg/m³ - micrograms per cubic meter
<6.5 - not detected above laboratory method detection limit
ND - not detected above laboratory method detection limit

TABLE 4
SOIL GRAIN SIZE DISTRIBUTION
Coleman Oil: 1 East I St., Yakima, WA
PBS Project No. 41392.000

Results (%)														
Sample Location	**4.75 mm (Gravel)**	**4.00 mm**	**2.00 mm**	**1.00 mm (Sand)**	**0.50 mm**	**0.25 mm**	**0.125 mm**	**0.063 mm**	**0.032 mm (Silt)**	**0.016 mm**	**0.008 mm**	**0.004 mm**	**0.002 mm (Clay)**	**<0.001 mm**
VMP2-3.0	0.1	0.1	0.1	0.8	3	15.3	19.3	4.2	29.7	8.1	5.3	4.1	1.9	6.2
VMP2-16.0	10	1.5	9	5.8	9.1	24.3	9.3	6.8	4.1	3.2	3.6	2.7	2	7.5
VEW1-12.0	17.5	3.6	11.6	9.5	14	21.8	5.5	4	1.1	2.6	1.9	1.5	1	4
VMP1-12.0	9.7	3.4	13.8	11.5	11.5	14.6	7.2	5.3	4.5	4.5	4.2	2.9	1.5	4.4
VMP3-12.0	16.5	4.5	18.9	11.9	10.9	10.3	4.7	4.7	3.4	4.1	2.9	2.6	1.1	2.9

Grain size distribution was analyzed using ASTM D422

PROJECT: Coleman Oil - Bioventing Pilot Test DATE: 11/6-11/7/2024

AUTHOR: REVIEWER:

VMP1

11/6/24		He	CH4	CO2	O2	VOCs	Pressure
Baseline	0940	0	0	4.6	14.3	2.3	1/5
	1030	0	0	4.4	14.0	2.5	1/5
	1131	0	0	4.3	13.9	2.1	1/5
	1147	0	0	4.3	13.8	1.8	1/5
	1212	0	0	4.2	14.1	1.6	1/5
	1246	0	0	4.2	14.1	1.5	1.5/5
	1325	0	0	4.2	14.3	1.3	1.5/5
	1445	0	0	4.3	14.2	1.3	1.5/5
	1525	0	0	4.3	14.5	1.1	1.5/5
	1551	0	0	4.4	14.5	1.0	1.5/5
	1618	0	0	4.4	14.8	0.8	1.5/5
	1628	0	0	2.5	17.3	0.9	1.5/5
	1637	0	0	2.6	17.2	0.9	1/5
	1645	0	0	4.3	15.1	0.6	1.5/5
11/7/24							
	0816	0	0	1.5	18.8	0.1	1/5
	0913	0	0	2.7	16.0	0.3	
	0926	0	0	4.8	14.0	0.5	
	0936	125	0	4.8	14.2		

VMP2 (injection point)

11/6/24		He	CH4	CO2	O2	VOCs	Pressure
Base	0958	0	0	1.0	18.9	0.2	1.5/5
	1000						
	1203	2.2					8 4/5
	1224	2.1					8 3/5
	1245						8 4/5
	1258	1.6					8 4/5
	1315	1.7					
	1348	1.8					
	1420	1.6					
	1448	1.6					8 4/5
	1530	1.7					
	1550	1.6					
	1607	0.34	0	0	20.3	0	1.5/5
	1621	0.64	0	0	20.4	0	
	1633	0.72	0	0	20.5	0	
	1640	0.72	0	0.1	20.2	0	
	1649	1.76	0	0.3	19.2	0	
11/7/24							
	0823	0	0	4.0	15.7	0.2	

% injected Valve adjusted @ these times

VMP3

11/6/24		He	CH4	CO2	O2	VOCs	Pressure
Baseline	0941	0	0	5.3	13.1	1.5	2/5
	1038	0	0	5.1	12.8		2/5
	1137	0	0	5.0	12.7	1.3	2/5
	1151	0	0	4.9	12.7	1.1	2/5
	1216	0	0	4.9	12.9	1.0	2/5
	1249	0	0	4.8	12.9	0.9	15/5
	1326	0	0	4.9	13.2	0.7	1.5/5
	1449	0	0	4.9	13.1	0.8	2/5
	1530	0	0	5.0	13.3	0.7	1.5/5
	1553	0	0	5.1	13.3	0.6	1.5/5
	1615	0	0	5.1	13.4	0.5	1.5/5
	1626	0	0	5.1	13.5	0.6	1.5/5
	1635	0	0	5.1	13.6	0.6	1.5/5
	1643	0	0	5.1	13.6	0.5	1/5
	1656	0	0	5.2	13.6	0.6	1.5/5
11/7/24							
	0827	0	0	5.7	13.5	0.3	1.5/5
	0915	50	0	5.5	12.6	0.2	
	0930		0	5.5	12.9		

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

5500 4th Ave South
Seattle, WA 98108-2419
(206) 285-8282
office@friedmanandbruya.com
www.friedmanandbruya.com

January 20, 2025

Kyle Johnson, Project Manager
PBS Engineering and Environmental, Inc.
214 E. Galer St, Suite 300
Seattle, WA 98102

Dear Mr Johnson:

Included are the additional results from the testing of material submitted on November 6, 2024 from the Coleman Oil-Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411078 project. There are 6 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
PBS0120R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 6, 2025 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental Coleman Oil-Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411078 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	PBS Engineering and Environmental
411078 -01	VMP2-3.0
411078 -02	VMP2-16.0
411078 -03	VEW1-3.0
411078 -04	VEW1-12.0
411078 -05	VMP1-3.0
411078 -06	VMP1-12.0
411078 -07	VMP3-3.0
411078 -08	VMP3-12.0
411078 -09	Trip Blank

The NWTPH-Dx and NWTPH-Gx samples were extracted outside the method recommended holding time. The data were flagged accordingly.

All other quality control requirements were acceptable.

Date of Report: 01/20/25
Date Received: 11/06/24
Project: Coleman Oil-Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411078
Date Extracted: 01/16/25
Date Analyzed: 01/16/25

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES
FOR BENZENE, TOLUENE, ETHYLBENZENE,
XYLENES AND TPH AS GASOLINE
USING METHODS 8021B AND NWTPH-Gx**

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
VMP2-16.0 ht 411078-02	<0.02	<0.02	<0.02	<0.06	<5	94
VEW1-12.0 ht 411078-04	<0.02	<0.02	<0.02	<0.06	<5	91
VMP1-12.0 ht 411078-06	<0.02	<0.02	<0.02	<0.06	<5	88
VMP3-12.0 ht 411078-08	<0.02	<0.02	<0.02	<0.06	<5	89
Method Blank 05-047 MB2	<0.02	<0.02	<0.02	<0.06	<5	92

Date of Report: 01/20/25
Date Received: 11/06/24
Project: Coleman Oil-Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411078
Date Extracted: 01/14/25
Date Analyzed: 01/14/25

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
VMP2-16.0 ht 411078-02	<50	<250	84
VEW1-12.0 ht 411078-04	<50	<250	91
VMP1-12.0 ht 411078-06	<50	<250	89
VMP3-12.0 ht 411078-08	<50	<250	87
Method Blank 05-185 MB	<50	<250	91

Date of Report: 01/20/25
Date Received: 11/06/24
Project: Coleman Oil-Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411078

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 501138-01 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Benzene	mg/kg (ppm)	<0.02	<0.02	nm
Toluene	mg/kg (ppm)	<0.02	<0.02	nm
Ethylbenzene	mg/kg (ppm)	<0.02	<0.02	nm
Xylenes	mg/kg (ppm)	<0.06	<0.06	nm
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/kg (ppm)	1.0	77	70-130
Toluene	mg/kg (ppm)	1.0	77	70-130
Ethylbenzene	mg/kg (ppm)	1.0	75	70-130
Xylenes	mg/kg (ppm)	3.0	77	70-130
Gasoline	mg/kg (ppm)	40	70	70-130

Date of Report: 01/20/25
Date Received: 11/06/24
Project: Coleman Oil-Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411078

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 501123-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	102	100	63-146	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	102	77-123

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported between the method detection limit and the lowest calibration point. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411078

SAMPLE CHAIN OF CUSTODY

11/06/24 VW1/N4

Report To Kyle Johnson
Company PBS Engineering & Environmental
Address 141 NW Greenwood Ave., #
City, State, ZIP Bend, OR 97702
Phone 541.233.3202 Email kyle.johnson@pbsusa.com

SAMPLERS (*signature*)

PROJECT NAME: Coleman Oil - Yakima Bulk Plant
PO #: 41392.000 T.0021 Ph. 03B

REMARKS: Project specific RLs? - Yes / No

INVOICE TO

Page # _____ of _____

TURNAROUND TIME
☒ Standard turnaround
☐ RUSH _____
Rush charges authorized by: _____

SAMPLE DISPOSAL
☐ Archive samples
☐ Other _____
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Moisture, pH, Reactivity	Alkalinity	Total Iron	Nutrients	ⓧ per KJ 1/13/25 ME Notes
VMP2-3.0	01 A-F	11/5/24	1130	S	6	X	X	X					X	X	X	X	
VMP2-16.0	02	11/5/24	1150	S	6	ⓧ	ⓧ	ⓧ					X	X	X	X	[redacted]
VEW1-3.0	03	11/5/24	1245	S	6	X	X	X					X	X	X	X	HOLD
VEW1-[redacted]12.0	04	11/5/24	1300	S	6	ⓧ	ⓧ	ⓧ					X	X	X	X	[redacted]
VMP1-3.0	05	11/5/24	1330	S	6	X	X	X					X	X	X	X	HOLD
VMP1-[redacted]12.0	06	11/5/24	1350	S	6	ⓧ	ⓧ	ⓧ					X	X	X	X	[redacted]
VMP3-3.0	07	11/5/24	1455	S	6	X	X	X					X	X	X	X	HOLD
VMP3-12.0	08	11/5/24	1505	S	6	ⓧ	ⓧ	ⓧ					X	X	X	X	[redacted]
Trip Blank	09 A-B	-	-	Water	2												Added at lab AP 11/06

ANALYSES REQUESTED

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Kyle Johnson	PBS	11/5/24	1630
Received by:	Anh Phan	FBI	11/06/24	08:39
Relinquished by:				
Received by:		~~Samples received at~~ 4 °C		

Friedman & Bruya, Inc.
5500 4th Ave S.
Seattle WA 98108
(206) 285-8282
office@friedmanandbruya.com

SAMPLE CONDITION UPON RECEIPT CHECKLIST

PROJECT # 411078 CLIENT PES INITIALS/ DATE: AP 11/06/24

If custody seals are present on cooler, are they intact? ☑ NA ☐ YES ☐ NO

Cooler/Sample temperature 4 °C
Thermometer ID: Fluke 96312917

Were samples received on ice/cold packs? ☑ YES ☐ NO

How did samples arrive?
☐ Over the Counter ☐ Picked up by F&BI ☑ FedEx/UPS/GSO

Is there a Chain-of-Custody* (COC)? ☑ YES ☐ NO Initials/ Date: AP 11/06/24
*or other representative documents, letters, and/or shipping memos

Number of days samples have been sitting prior to receipt at laboratory 1 days

Are the samples clearly identified? (explain "no" answer below) ☐ YES ☑ NO

Were all sample containers received intact (i.e. not broken, leaking etc.)? (explain "no" answer below) ☑ YES ☐ NO

Were appropriate sample containers used? ☑ YES ☐ NO ☐ Unknown

If custody seals are present on samples, are they intact? ☑ NA ☐ YES ☐ NO

Are samples requiring no headspace, headspace free? ☐ NA ☑ YES ☐ NO

Is the following information provided on the COC, and does it match the sample label?
(explain "no" answer below)

Sample ID's	☑ Yes ☐ No		☐ Not on COC/label
Date Sampled	☑ Yes ☐ No		☐ Not on COC/label
Time Sampled	☐ Yes ☑ No	Time on 4 VOAs 14:55 for VMP3-12 (OBC-F)	☐ Not on COC/label
# of Containers	☐ Yes ☑ No	Added Trip Blank at lab.	
Relinquished	☑ Yes ☐ No		
Requested analysis	☑ Yes ☐ On Hold		

Other comments (use a separate page if needed)

Air Samples: Were any additional canisters/tubes received? ☑ NA ☐ YES ☐ NO

Number of unused TO15 canisters _____ Number of unused TO17 tubes _____

...t using this tag.

ORIGIN ID:YKMA (000) 000-0000

PBS ENVIRONMENTAL
400 BRADLEY BLVD STE 106

RICHLAND, WA 99352
UNITED STATES US

SHIP DATE: 05NOV24
ACTWGT: 44.45 LB
CAD: 6995175/SSFE2560
DIMS: 24x13x14 IN

BILL THIRD PARTY

Part # 156297-[illegible] 09/25

TO

FRIEDMAN & BRUYA INC
5500 4TH AVE S

SEATTLE WA 98108
(206) 285-8282 REF:
INV:
PO: DEPT:

FedEx
Express

E

J244924091001uv

WED - 06 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 2814 7030 2501

AHS
98108
WA-US SEA

85 BFIA

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

Professional Analytical Services

December 12, 2024

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL

Project: Friedman & Bruya (CHEM)
Project Number: 411078
COC Number: 411078

MICHAEL ERDAHL:

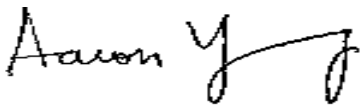
Enclosed please find the analytical data for your Friedman & Bruya (CHEM) project.

Your sample(s) were received on Thursday, November 7, 2024 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.
Sincerely,



Aaron Young
President
aarony@amtestlab.com

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

ANALYSIS REPORT

Professional Analytical Services

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

Date Received: 11/07/24
Date Reported: 12/12/24

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A24K0137-01	VMP2-3.0	Solid		11/05/2024	11/07/2024
A24K0137-02	VMP2-16.0	Solid		11/05/2024	11/07/2024
A24K0137-04	VEW1-12.0	Solid		11/05/2024	11/07/2024
A24K0137-06	VMP1-12.0	Solid		11/05/2024	11/07/2024
A24K0137-08	VMP3-12.0	Solid		11/05/2024	11/07/2024

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

AMTEST Identification Number: A24K0137-01
Client Identification: VMP2-3.0
Sampling Date: 11/05/24 11:30

Metals by EPA 6000/7000 Series Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Iron	38,100	mg/kg dry		76.5	EPA 6010D	AY	11/14/2024
Total Potassium	1,380	mg/kg dry		51.0	EPA 6010D	AY	11/14/2024

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
% Solids	83.8	%			SM 2540G_2011	HV	11/18/2024
Total Nitrate + Nitrite	94.1	mg/kg dry		1.19	SM 4500-NO3-F_2011	LF	11/11/2024
pH	8.2	pH Units			SM 4500-H+B_2011	KH	12/06/2024
Total Kjeldahl Nitrogen	402	mg/kg dry		6.0	SM 4500Norg C_2011	LF	11/22/2024
Total Nitrogen	496	mg/kg dry			Calculated	LF	11/22/2024
Total Organic Carbon (TOC)	0.162	%		0.0500	EPA 9060A_1_2004	AS	12/01/2024
Total Phosphorus (TP)	531	mg/kg dry		1.6	SM 4500-P F_2011	LF	11/22/2024

Full Grain Size (Hydrometer/Sieve)

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
PHI -2.25 (4.75 mm) Gravel	1.1	%		0.1	ASTM D422	HV	11/19/2024
PHI -2.00 (4.00 mm)	ND	%		0.1	ASTM D422	HV	11/19/2024
PHI -1.00 (2.00 mm)	0.1	%		0.1	ASTM D422	HV	11/19/2024
PHI 0.00 (1.00 mm) Sand	0.8	%		0.1	ASTM D422	HV	11/19/2024
PHI +1.00 (0.50 mm)	3.0	%		0.1	ASTM D422	HV	11/19/2024
PHI +2.00 (0.25 mm)	15.3	%		0.1	ASTM D422	HV	11/19/2024
PHI +3.00 (0.125 mm)	19.3	%		0.1	ASTM D422	HV	11/19/2024
PHI +4.00 (0.063 mm)	4.2	%		0.1	ASTM D422	HV	11/19/2024
PHI +5.00 (0.032 mm) Silt	29.7	%		0.1	ASTM D422	HV	11/19/2024
PHI +6.00 (0.016 mm)	8.1	%		0.1	ASTM D422	HV	11/19/2024
PHI +7.00 (0.008 mm)	5.3	%		0.1	ASTM D422	HV	11/19/2024
PHI +8.00 (0.004 mm)	4.1	%		0.1	ASTM D422	HV	11/19/2024
PHI +9.00 (0.002 mm) Clay	1.9	%		0.1	ASTM D422	HV	11/19/2024
PHI +10.0 (0.001 mm)	0.9	%		0.1	ASTM D422	HV	11/19/2024
PHI >10.0 (< 0.001 mm)	6.2	%		0.1	ASTM D422	HV	11/19/2024

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

AMTEST Identification Number: A24K0137-01
Client Identification: VMP2-3.0
Sampling Date: 11/05/24 11:30

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

AMTEST Identification Number: A24K0137-02
Client Identification: VMP2-16.0
Sampling Date: 11/05/24 11:50

Metals by EPA 6000/7000 Series Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Iron	27,800	mg/kg dry		62.2	EPA 6010D	AY	11/14/2024
Total Potassium	970	mg/kg dry		41.5	EPA 6010D	AY	11/14/2024

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
% Solids	88.0	%			SM 2540G_2011	HV	11/18/2024
Total Nitrate + Nitrite	124	mg/kg dry		1.14	SM 4500-NO3-F_2011	LF	11/11/2024
pH	7.2	pH Units			SM 4500-H+B_2011	KH	12/06/2024
Total Kjeldahl Nitrogen	148	mg/kg dry		5.7	SM 4500Norg C_2011	LF	11/22/2024
Total Nitrogen	272	mg/kg dry			Calculated	LF	11/22/2024
Total Organic Carbon (TOC)	ND	%	U	0.0500	EPA 9060A_1_2004	AS	12/01/2024
Total Phosphorus (TP)	498	mg/kg dry		1.4	SM 4500-P F_2011	LF	11/22/2024

Full Grain Size (Hydrometer/Sieve)

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
PHI -2.25 (4.75 mm) Gravel	10.0	%		0.1	ASTM D422	HV	11/19/2024
PHI -2.00 (4.00 mm)	1.5	%		0.1	ASTM D422	HV	11/19/2024
PHI -1.00 (2.00 mm)	9.0	%		0.1	ASTM D422	HV	11/19/2024
PHI 0.00 (1.00 mm) Sand	5.8	%		0.1	ASTM D422	HV	11/19/2024
PHI +1.00 (0.50 mm)	9.1	%		0.1	ASTM D422	HV	11/19/2024
PHI +2.00 (0.25 mm)	24.3	%		0.1	ASTM D422	HV	11/19/2024
PHI +3.00 (0.125 mm)	9.3	%		0.1	ASTM D422	HV	11/19/2024
PHI +4.00 (0.063 mm)	6.8	%		0.1	ASTM D422	HV	11/19/2024
PHI +5.00 (0.032 mm) Silt	4.1	%		0.1	ASTM D422	HV	11/19/2024
PHI +6.00 (0.016 mm)	3.2	%		0.1	ASTM D422	HV	11/19/2024
PHI +7.00 (0.008 mm)	3.6	%		0.1	ASTM D422	HV	11/19/2024
PHI +8.00 (0.004 mm)	2.7	%		0.1	ASTM D422	HV	11/19/2024
PHI +9.00 (0.002 mm) Clay	2.0	%		0.1	ASTM D422	HV	11/19/2024
PHI +10.0 (0.001 mm)	1.1	%		0.1	ASTM D422	HV	11/19/2024
PHI >10.0 (< 0.001 mm)	7.5	%		0.1	ASTM D422	HV	11/19/2024

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

AMTEST Identification Number: A24K0137-04
Client Identification: VEW1-12.0
Sampling Date: 11/05/24 13:00

Metals by EPA 6000/7000 Series Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Iron	34,000	mg/kg dry		73.9	EPA 6010D	AY	11/14/2024
Total Potassium	1,300	mg/kg dry		49.3	EPA 6010D	AY	11/14/2024

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
% Solids	94.6	%			SM 2540G_2011	HV	11/18/2024
Total Nitrate + Nitrite	78.3	mg/kg dry		1.06	SM 4500-NO3-F_2011	LF	11/11/2024
pH	7.2	pH Units			SM 4500-H+B_2011	KH	12/06/2024
Total Kjeldahl Nitrogen	132	mg/kg dry		5.3	SM 4500Norg C_2011	LF	11/22/2024
Total Nitrogen	210	mg/kg dry			Calculated	LF	11/22/2024
Total Organic Carbon (TOC)	ND	%	U	0.0500	EPA 9060A_1_2004	AS	12/01/2024
Total Phosphorus (TP)	525	mg/kg dry		1.3	SM 4500-P F_2011	LF	11/22/2024

Full Grain Size (Hydrometer/Sieve)

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
PHI -2.25 (4.75 mm) Gravel	17.5	%		0.1	ASTM D422	HV	11/19/2024
PHI -2.00 (4.00 mm)	3.6	%		0.1	ASTM D422	HV	11/19/2024
PHI -1.00 (2.00 mm)	11.6	%		0.1	ASTM D422	HV	11/19/2024
PHI 0.00 (1.00 mm) Sand	9.5	%		0.1	ASTM D422	HV	11/19/2024
PHI +1.00 (0.50 mm)	14.0	%		0.1	ASTM D422	HV	11/19/2024
PHI +2.00 (0.25 mm)	21.8	%		0.1	ASTM D422	HV	11/19/2024
PHI +3.00 (0.125 mm)	5.5	%		0.1	ASTM D422	HV	11/19/2024
PHI +4.00 (0.063 mm)	4.0	%		0.1	ASTM D422	HV	11/19/2024
PHI +5.00 (0.032 mm) Silt	1.1	%		0.1	ASTM D422	HV	11/19/2024
PHI +6.00 (0.016 mm)	2.6	%		0.1	ASTM D422	HV	11/19/2024
PHI +7.00 (0.008 mm)	1.9	%		0.1	ASTM D422	HV	11/19/2024
PHI +8.00 (0.004 mm)	1.5	%		0.1	ASTM D422	HV	11/19/2024
PHI +9.00 (0.002 mm) Clay	1.0	%		0.1	ASTM D422	HV	11/19/2024
PHI +10.0 (0.001 mm)	0.5	%		0.1	ASTM D422	HV	11/19/2024
PHI >10.0 (< 0.001 mm)	4.0	%		0.1	ASTM D422	HV	11/19/2024

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

AMTEST Identification Number: A24K0137-06
Client Identification: VMP1-12.0
Sampling Date: 11/05/24 13:50

Metals by EPA 6000/7000 Series Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Iron	34,800	mg/kg dry		62.8	EPA 6010D	AY	11/14/2024
Total Potassium	1,050	mg/kg dry		41.9	EPA 6010D	AY	11/14/2024

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
% Solids	95.6	%			SM 2540G_2011	HV	11/18/2024
Total Nitrate + Nitrite	73.5	mg/kg dry		1.05	SM 4500-NO3-F_2011	LF	11/11/2024
pH	7.0	pH Units			SM 4500-H+B_2011	KH	12/06/2024
Total Kjeldahl Nitrogen	153	mg/kg dry		5.2	SM 4500Norg C_2011	LF	11/22/2024
Total Nitrogen	227	mg/kg dry			Calculated	LF	11/22/2024
Total Organic Carbon (TOC)	ND	%	U	0.0500	EPA 9060A_1_2004	AS	12/01/2024
Total Phosphorus (TP)	655	mg/kg dry		1.3	SM 4500-P F_2011	LF	11/22/2024

Full Grain Size (Hydrometer/Sieve)

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
PHI -2.25 (4.75 mm) Gravel	9.7	%		0.1	ASTM D422	HV	11/19/2024
PHI -2.00 (4.00 mm)	3.4	%		0.1	ASTM D422	HV	11/19/2024
PHI -1.00 (2.00 mm)	13.8	%		0.1	ASTM D422	HV	11/19/2024
PHI 0.00 (1.00 mm) Sand	11.5	%		0.1	ASTM D422	HV	11/19/2024
PHI +1.00 (0.50 mm)	11.5	%		0.1	ASTM D422	HV	11/19/2024
PHI +2.00 (0.25 mm)	14.6	%		0.1	ASTM D422	HV	11/19/2024
PHI +3.00 (0.125 mm)	7.2	%		0.1	ASTM D422	HV	11/19/2024
PHI +4.00 (0.063 mm)	5.3	%		0.1	ASTM D422	HV	11/19/2024
PHI +5.00 (0.032 mm) Silt	4.5	%		0.1	ASTM D422	HV	11/19/2024
PHI +6.00 (0.016 mm)	4.5	%		0.1	ASTM D422	HV	11/19/2024
PHI +7.00 (0.008 mm)	4.2	%		0.1	ASTM D422	HV	11/19/2024
PHI +8.00 (0.004 mm)	2.9	%		0.1	ASTM D422	HV	11/19/2024
PHI +9.00 (0.002 mm) Clay	1.5	%		0.1	ASTM D422	HV	11/19/2024
PHI +10.0 (0.001 mm)	0.8	%		0.1	ASTM D422	HV	11/19/2024
PHI >10.0 (< 0.001 mm)	4.4	%		0.1	ASTM D422	HV	11/19/2024

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

AMTEST Identification Number: A24K0137-08
Client Identification: VMP3-12.0
Sampling Date: 11/05/24 15:05

Metals by EPA 6000/7000 Series Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Iron	30,700	mg/kg dry		58.2	EPA 6010D	AY	11/14/2024
Total Potassium	719	mg/kg dry		38.8	EPA 6010D	AY	11/14/2024

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
% Solids	96.8	%			SM 2540G_2011	HV	11/18/2024
Total Nitrate + Nitrite	113	mg/kg dry		1.03	SM 4500-NO3-F_2011	LF	11/11/2024
pH	7.1	pH Units			SM 4500-H+B_2011	KH	12/06/2024
Total Kjeldahl Nitrogen	162	mg/kg dry		5.2	SM 4500Norg C_2011	LF	11/22/2024
Total Nitrogen	275	mg/kg dry			Calculated	LF	11/22/2024
Total Organic Carbon (TOC)	ND	%	U	0.0500	EPA 9060A_1_2004	AS	12/01/2024
Total Phosphorus (TP)	622	mg/kg dry		1.3	SM 4500-P F_2011	LF	11/22/2024

Full Grain Size (Hydrometer/Sieve)

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
PHI -2.25 (4.75 mm) Gravel	16.5	%		0.1	ASTM D422	HV	11/19/2024
PHI -2.00 (4.00 mm)	4.5	%		0.1	ASTM D422	HV	11/19/2024
PHI -1.00 (2.00 mm)	18.9	%		0.1	ASTM D422	HV	11/19/2024
PHI 0.00 (1.00 mm) Sand	11.9	%		0.1	ASTM D422	HV	11/19/2024
PHI +1.00 (0.50 mm)	10.9	%		0.1	ASTM D422	HV	11/19/2024
PHI +2.00 (0.25 mm)	10.3	%		0.1	ASTM D422	HV	11/19/2024
PHI +3.00 (0.125 mm)	4.7	%		0.1	ASTM D422	HV	11/19/2024
PHI +4.00 (0.063 mm)	4.7	%		0.1	ASTM D422	HV	11/19/2024
PHI +5.00 (0.032 mm) Silt	3.4	%		0.1	ASTM D422	HV	11/19/2024
PHI +6.00 (0.016 mm)	4.1	%		0.1	ASTM D422	HV	11/19/2024
PHI +7.00 (0.008 mm)	2.9	%		0.1	ASTM D422	HV	11/19/2024
PHI +8.00 (0.004 mm)	2.6	%		0.1	ASTM D422	HV	11/19/2024
PHI +9.00 (0.002 mm) Clay	1.1	%		0.1	ASTM D422	HV	11/19/2024
PHI +10.0 (0.001 mm)	0.5	%		0.1	ASTM D422	HV	11/19/2024
PHI >10.0 (< 0.001 mm)	2.9	%		0.1	ASTM D422	HV	11/19/2024

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

ANALYSIS REPORT

Professional Analytical Services

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

Date Received: 11/07/24
Date Reported: 12/12/24

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

Quality Control

Metals by EPA 6000/7000 Series Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0168 - EPA 3050A (Acid Digest - Soil)										
Blank (BBK0168-BLK1)					Prepared: 11/13/24 Analyzed: 11/14/24					
Iron	ND	U	0.150	mg/kg wet						
Potassium	ND	U	1.00	mg/kg wet						
LCS (BBK0168-BS1)					Prepared: 11/13/24 Analyzed: 11/14/24					
Iron	2.02		0.150	mg/kg wet	2.000		101%	85-115%		
Potassium	1.76		1.00	mg/kg wet	2.000		88%	85-115%		
Calibration Blank (BBK0168-CCB1)					Prepared: 11/13/24 Analyzed: 11/14/24					
Iron	ND	U		mg/kg wet						
Potassium	ND	U		mg/kg wet						
Calibration Check (BBK0168-CCV1)					Prepared: 11/13/24 Analyzed: 11/14/24					
Iron	2.02		0.150	mg/kg wet	2.000		101%	85-115%		
Potassium	4.00		1.00	mg/kg wet	4.000		100%	85-115%		
Matrix Spike (BBK0168-MS1)		**Source: A24K0137-08**			Prepared: 11/13/24 Analyzed: 11/14/24					
Potassium	833		41.5	mg/kg dry	83.03	719	137%	70-130%		
Matrix Spike Dup (BBK0168-MSD1)		**Source: A24K0137-08**			Prepared: 11/13/24 Analyzed: 11/14/24					
Potassium	804		40.2	mg/kg dry	80.39	719	106%	70-130%	4	25

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0133 - No Prep - WC Soil										
Calibration Blank (BBK0133-CCB1)					Prepared: 11/21/24 Analyzed: 11/22/24					
Total Kjeldahl Nitrogen	1.7			mg/kg wet						
Calibration Check (BBK0133-CCV1)					Prepared: 11/21/24 Analyzed: 11/22/24					
Total Kjeldahl Nitrogen	20.0		5.0	mg/kg wet	20.00		100%	85-115%		
Duplicate (BBK0133-DUP1)		**Source: A24K0137-08**			Prepared: 11/21/24 Analyzed: 11/22/24					

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0133 - No Prep - WC Soil (Continued)										
Duplicate (BBK0133-DUP1)		**Source: A24K0137-08**			Prepared: 11/21/24 Analyzed: 11/22/24					
Total Kjeldahl Nitrogen	154		5.2	mg/kg dry		162			5	25
Batch: BBK0134 - No Prep - WC Soil										
Blank (BBK0134-BLK1)					Prepared & Analyzed: 11/11/24					
Total Nitrate + Nitrite	ND	U	1.00	mg/kg wet						
LCS (BBK0134-BS1)					Prepared & Analyzed: 11/11/24					
Total Nitrate + Nitrite	25.9		1.00	mg/kg wet	25.00		104%	90-110%		
Calibration Blank (BBK0134-CCB1)					Prepared & Analyzed: 11/11/24					
Total Nitrate + Nitrite	0.0009			mg/kg wet						
Calibration Check (BBK0134-CCV1)					Prepared & Analyzed: 11/11/24					
Total Nitrate + Nitrite	49.6		1.00	mg/kg wet	50.00		99%	85-115%		
Duplicate (BBK0134-DUP1)		**Source: A24K0137-08**			Prepared & Analyzed: 11/11/24					
Total Nitrate + Nitrite	122		1.03	mg/kg dry		113			7	20
Matrix Spike (BBK0134-MS1)		**Source: A24K0137-08**			Prepared & Analyzed: 11/11/24					
Total Nitrate + Nitrite	2,840		1.03	mg/kg dry	2,789	113	98%	70-130%		
Batch: BBK0248 - No Prep - WC Soil										
Blank (BBK0248-BLK1)					Prepared: 11/21/24 Analyzed: 11/22/24					
Total Phosphorus (TP)	ND	U	0.5	mg/kg wet						
LCS (BBK0248-BS1)					Prepared: 11/21/24 Analyzed: 11/22/24					
Total Phosphorus (TP)	5.1		0.5	mg/kg wet	5.000		102%	70-130%		
Calibration Blank (BBK0248-CCB1)					Prepared: 11/21/24 Analyzed: 11/22/24					
Total Phosphorus (TP)	0.004			mg/kg wet						
Calibration Check (BBK0248-CCV1)					Prepared: 11/21/24 Analyzed: 11/22/24					
Total Phosphorus (TP)	10.8		0.5	mg/kg wet	10.00		108%	85-115%		
Duplicate (BBK0248-DUP1)		**Source: A24K0137-08**			Prepared: 11/21/24 Analyzed: 11/22/24					

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Date Received: 11/07/24
Date Reported: 12/12/24

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0248 - No Prep - WC Soil (Continued)										
Duplicate (BBK0248-DUP1)		**Source: A24K0137-08**			Prepared: 11/21/24 Analyzed: 11/22/24					
Total Phosphorus (TP)	671		1.3	mg/kg dry		622			7	40
Matrix Spike (BBK0248-MS1)		**Source: A24K0137-08**			Prepared: 11/21/24 Analyzed: 11/22/24					
Total Phosphorus (TP)	1,760		1.3	mg/kg dry	1,052	622	108%	65-135%		
Batch: BBK0295 - No Prep - WC Soil										
Duplicate (BBK0295-DUP1)		**Source: A24K0284-05**			Prepared & Analyzed: 11/18/24					
% Solids	72.7			%		72.8			0.2	20
Duplicate (BBK0295-DUP2)		**Source: A24K0284-05**			Prepared & Analyzed: 11/18/24					
% Solids	72.4			%		72.8			0.6	20
Batch: BBL0091 - No Prep - WC Soil										
Calibration Check (BBL0091-CCV1)					Prepared: 12/05/24 Analyzed: 12/06/24					
pH	6.9			pH Units	6.860		100%	85-115%		
Calibration Check (BBL0091-CCV2)					Prepared: 12/05/24 Analyzed: 12/06/24					
pH	6.9			pH Units	6.860		100%	85-115%		
Duplicate (BBL0091-DUP1)		**Source: A24L0112-01**			Prepared: 12/05/24 Analyzed: 12/06/24					
pH	5.6			pH Units		5.6			0.7	10
Duplicate (BBL0091-DUP2)		**Source: A24L0112-05**			Prepared: 12/05/24 Analyzed: 12/06/24					
pH	5.2			pH Units		5.2			0.2	10
Batch: BBL0110 - No Prep - WC Soil										
Blank (BBL0110-BLK1)					Prepared & Analyzed: 12/01/24					
Total Organic Carbon (TOC)	ND	U	0.0500	%						
Calibration Blank (BBL0110-CCB1)					Prepared & Analyzed: 12/01/24					
Total Organic Carbon (TOC)	ND	U		%						
Calibration Check (BBL0110-CCV1)					Prepared & Analyzed: 12/01/24					
Total Organic Carbon (TOC)	53.4		0.0500	%	47.00		114%	75-125%		

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

ANALYSIS REPORT

Professional Analytical Services

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

Date Received: 11/07/24
Date Reported: 12/12/24

Quality Control
(Continued)

Conventional Chemistry Parameters by APHA/EPA Methods (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Quality Control
(Continued)

Full Grain Size (Hydrometer/Sieve)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit

Batch: BBK0297 - Hydrometer/Sieve

Duplicate (BBK0297-DUP1)		**Source: A24K0284-05**		Prepared & Analyzed: 11/19/24						
PHI +1.00 (0.50 mm)	43.2		0.1	%		39.6			9	200
PHI +10.0 (0.001 mm)	ND		0.1	%		ND				200
PHI +2.00 (0.25 mm)	36.8		0.1	%		39.5			7	200
PHI +3.00 (0.125 mm)	2.5		0.1	%		3.8			41	200
PHI +4.00 (0.063 mm)	0.1		0.1	%		0.5			133	200
PHI +5.00 (0.032 mm) Silt	ND		0.1	%		0.8			200	200
PHI +6.00 (0.016 mm)	ND		0.1	%		ND				200
PHI +7.00 (0.008 mm)	ND		0.1	%		ND				200
PHI +8.00 (0.004 mm)	ND		0.1	%		ND				200
PHI +9.00 (0.002 mm) Clay	ND		0.1	%		ND				200
PHI >10.0 (< 0.001 mm)	2.7		0.1	%		2.7			0	200
PHI 0.00 (1.00 mm) Sand	12.4		0.1	%		11.2			10	200
PHI -1.00 (2.00 mm)	2.2		0.1	%		1.8			20	200
PHI -2.00 (4.00 mm)	0.1		0.1	%		0.1			0	200
PHI -2.25 (4.75 mm) Gravel	ND		0.1	%		ND				200
Duplicate (BBK0297-DUP2)		**Source: A24K0284-05**		Prepared & Analyzed: 11/19/24						
PHI +1.00 (0.50 mm)	41.2		0.1	%		39.6			4	200
PHI +10.0 (0.001 mm)	ND		0.1	%		ND				200
PHI +2.00 (0.25 mm)	36.3		0.1	%		39.5			8	200
PHI +3.00 (0.125 mm)	2.3		0.1	%		3.8			49	200
PHI +4.00 (0.063 mm)	0.1		0.1	%		0.5			133	200
PHI +5.00 (0.032 mm) Silt	0.1		0.1	%		0.8			156	200
PHI +6.00 (0.016 mm)	ND		0.1	%		ND				200
PHI +7.00 (0.008 mm)	ND		0.1	%		ND				200
PHI +8.00 (0.004 mm)	ND		0.1	%		ND				200
PHI +9.00 (0.002 mm) Clay	ND		0.1	%		ND				200
PHI >10.0 (< 0.001 mm)	2.7		0.1	%		2.7			0	200
PHI 0.00 (1.00 mm) Sand	15.2		0.1	%		11.2			30	200

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

Date Received: 11/07/24
Date Reported: 12/12/24

Quality Control
(Continued)

Full Grain Size (Hydrometer/Sieve) (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BBK0297 - Hydrometer/Sieve (Continued)										
Duplicate (BBK0297-DUP2)			**Source: A24K0284-05**		Prepared & Analyzed: 11/19/24					
PHI -1.00 (2.00 mm)	2.1		0.1	%		1.8			15	200
PHI -2.00 (4.00 mm)	0.1		0.1	%		0.1			0	200
PHI -2.25 (4.75 mm) Gravel	ND		0.1	%		ND				200

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

ANALYSIS REPORT

Professional Analytical Services

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project Name: Friedman & Bruya (CHEM)
Project #: 411078

Date Received: 11/07/24
Date Reported: 12/12/24

Notes and Definitions

Item	Definition
U	The compound was analyzed for but was not detected (Non-detect) at or above the MRL/MDL.
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

AZ4K0137

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 5500 4th Ave S

City, State, ZIP Seattle, WA 98108

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Amtest

PROJECT NAME/NO.	PO #
411078	E-503

REMARKS

TURNAROUND TIME
- ☒ Standard TAT
- ☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL
- Dispose after 30 days
- Return samples
- Will call with instructions

	Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Particle Size	Alkalinity	Total Iron	Nutrients							Notes
01	VMP2-3.0		11/5/2024	1130	soil	1	x	x	x	x							
02	VMP2-16.0		11/5/2024	1150	soil	1	x	x	x	x							
03	VEW1-3.0		11/5/2024	1245	soil	1	~~x~~	~~x~~	~~x~~	~~x~~							HOLD
11/18/24 04 ~~05~~	VEW1-12.0		11/5/2024	1300	soil	1	x	x	x	x							
05	VMP1-3.0		11/5/2024	1330	soil	1	~~x~~	~~x~~	~~x~~	~~x~~							HOLD
06	VMP1-12.0		11/5/2024	1350	soil	1	x	x	x	x							
07	VMP3-3.0		11/5/2024	1455	soil	1	~~x~~	~~x~~	~~x~~	~~x~~							HOLD
08	VMP3-12.0		11/5/2024	1505	soil	1	x	x	x	x							

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
~~Relinquished by:~~		Michael Erdahl	Friedman & Bruya	11/7/24	0910
Received by:		SF	AmTest	11/7/24	
Relinquished by:					
Received by:					

7.3°C

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

5500 4th Ave South
Seattle, WA 98108-2419
(206) 285-8282
office@friedmanandbruya.com
www.friedmanandbruya.com

November 27, 2024

Kyle Johnson, Project Manager
PBS Engineering and Environmental, Inc.
141 NW Greenwood Ave
Bend, OR 97703

Dear Mr Johnson:

Included are the results from the testing of material submitted on November 8, 2024 from the Coleman Oil- Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411133 project. There are 10 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
PBS1127R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 8, 2024 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental Coleman Oil- Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411133 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	PBS Engineering and Environmental
411133 -01	BVPT-1
411133 -02	BVPT-2
411133 -03	BVPT-3

Non-petroleum compounds identified in the air phase hydrocarbon (APH) ranges were subtracted per the MA-APH method.

The samples were sent to Alliance Technical Group for major gases analysis. The report is enclosed.

The TO-15 calibration standard for vinyl chloride and 1,1,2-trichloroethane exceeded the acceptance criteria. The compounds were not detected, therefore this did not represent an out of control condition, and were qualified with a "k" qualifier.

All other quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	BVPT-1	Client:	PBS Engineering and Environmental
Date Received:	11/08/24	Project:	Coleman Oil- Yakima Bulk Plant
Date Collected:	11/06/24	Lab ID:	411133-01 1/15
Date Analyzed:	11/13/24	Data File:	111319.D
Matrix:	Air	Instrument:	GCMS8
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	96	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<3.8 k	<1.5 k
Chloroethane	<40	<15
1,1-Dichloroethene	<5.9	<1.5
trans-1,2-Dichloroethene	<5.9	<1.5
1,1-Dichloroethane	<6.1	<1.5
cis-1,2-Dichloroethene	<5.9	<1.5
1,2-Dichloroethane (EDC)	<0.61	<0.15
1,1,1-Trichloroethane	<8.2	<1.5
Benzene	47	15
Trichloroethene	<1.6	<0.3
Toluene	<110	<30
1,1,2-Trichloroethane	<0.82 k	<0.15 k
Tetrachloroethene	<100	<15
Ethylbenzene	7.9	1.8
m,p-Xylene	14	3.3
o-Xylene	<6.5	<1.5
Naphthalene	<3.9	<0.75

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	BVPT-2	Client:	PBS Engineering and Environmental
Date Received:	11/08/24	Project:	Coleman Oil- Yakima Bulk Plant
Date Collected:	11/06/24	Lab ID:	411133-02 1/7.4
Date Analyzed:	11/13/24	Data File:	111318.D
Matrix:	Air	Instrument:	GCMS8
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	96	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<1.9 k	<0.74 k
Chloroethane	<20	<7.4
1,1-Dichloroethene	<2.9	<0.74
trans-1,2-Dichloroethene	<2.9	<0.74
1,1-Dichloroethane	<3	<0.74
cis-1,2-Dichloroethene	<2.9	<0.74
1,2-Dichloroethane (EDC)	<0.3	<0.074
1,1,1-Trichloroethane	<4	<0.74
Benzene	20	6.3
Trichloroethene	<0.8	<0.15
Toluene	70	19
1,1,2-Trichloroethane	<0.4 k	<0.074 k
Tetrachloroethene	<50	<7.4
Ethylbenzene	4.5	1.0
m,p-Xylene	9.6	2.2
o-Xylene	4.0	0.92
Naphthalene	<1.9	<0.37

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	BVPT-3	Client:	PBS Engineering and Environmental
Date Received:	11/08/24	Project:	Coleman Oil- Yakima Bulk Plant
Date Collected:	11/06/24	Lab ID:	411133-03 1/7.5
Date Analyzed:	11/13/24	Data File:	111316.D
Matrix:	Air	Instrument:	GCMS8
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	97	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<1.9 k	<0.75 k
Chloroethane	<20	<7.5
1,1-Dichloroethene	<3	<0.75
trans-1,2-Dichloroethene	<3	<0.75
1,1-Dichloroethane	<3	<0.75
cis-1,2-Dichloroethene	<3	<0.75
1,2-Dichloroethane (EDC)	<0.3	<0.075
1,1,1-Trichloroethane	<4.1	<0.75
Benzene	12	3.9
Trichloroethene	<0.81	<0.15
Toluene	57	15
1,1,2-Trichloroethane	<0.41 k	<0.075 k
Tetrachloroethene	<51	<7.5
Ethylbenzene	3.8	0.88
m,p-Xylene	8.7	2.0
o-Xylene	3.5	0.80
Naphthalene	<2	<0.37

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	PBS Engineering and Environmental
Date Received:	Not Applicable	Project:	Coleman Oil- Yakima Bulk Plant
Date Collected:	Not Applicable	Lab ID:	04-2768 mb
Date Analyzed:	11/13/24	Data File:	111312.D
Matrix:	Air	Instrument:	GCMS8
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	85	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26 k	<0.1 k
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	<0.04	<0.01
1,1,1-Trichloroethane	<0.55	<0.1
Benzene	<0.32	<0.1
Trichloroethene	<0.11	<0.02
Toluene	<7.5	<2
1,1,2-Trichloroethane	<0.055 k	<0.01 k
Tetrachloroethene	<6.8	<1
Ethylbenzene	<0.43	<0.1
m,p-Xylene	<0.87	<0.2
o-Xylene	<0.43	<0.1
Naphthalene	<0.26	<0.05

Date of Report: 11/27/24
Date Received: 11/08/24
Project: Coleman Oil- Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411133
Date Extracted: 11/18/24
Date Analyzed: 11/19/24

RESULTS FROM THE ANALYSIS OF AIR SAMPLES FOR HELIUM USING METHOD ASTM D1946

Results Reported as % Helium

Sample ID Laboratory ID	Helium
BVPT-1 411133-01	<0.6
BVPT-2 411133-02	<0.6
BVPT-3 411133-03	<0.6
Method Blank O4-2846 MB	<0.6

Date of Report: 11/27/24
Date Received: 11/08/24
Project: Coleman Oil- Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411133

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 411133-03 1/7.5 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Vinyl chloride	ug/m3	<1.9	<1.9	nm
Chloroethane	ug/m3	<20	<20	nm
1,1-Dichloroethene	ug/m3	<3	<3	nm
trans-1,2-Dichloroethene	ug/m3	<3	<3	nm
1,1-Dichloroethane	ug/m3	<3	<3	nm
cis-1,2-Dichloroethene	ug/m3	<3	<3	nm
1,2-Dichloroethane (EDC)	ug/m3	<0.3	<0.3	nm
1,1,1-Trichloroethane	ug/m3	<4.1	<4.1	nm
Benzene	ug/m3	12	13	8
Trichloroethene	ug/m3	<0.81	<0.81	nm
Toluene	ug/m3	57	<57	nm
1,1,2-Trichloroethane	ug/m3	<0.41	<0.41	nm
Tetrachloroethene	ug/m3	<51	<51	nm
Ethylbenzene	ug/m3	3.8	3.7	3
m,p-Xylene	ug/m3	8.7	8.6	1
o-Xylene	ug/m3	3.5	3.4	3
Naphthalene	ug/m3	<2	2.0	nm

Date of Report: 11/27/24
Date Received: 11/08/24
Project: Coleman Oil- Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411133

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Vinyl chloride	ug/m3	35	141 vo	70-130
Chloroethane	ug/m3	36	123	70-130
1,1-Dichloroethene	ug/m3	54	123	70-130
trans-1,2-Dichloroethene	ug/m3	54	119	70-130
1,1-Dichloroethane	ug/m3	55	130	70-130
cis-1,2-Dichloroethene	ug/m3	54	112	70-130
1,2-Dichloroethane (EDC)	ug/m3	55	123	70-130
1,1,1-Trichloroethane	ug/m3	74	124	70-130
Benzene	ug/m3	43	115	70-130
Trichloroethene	ug/m3	73	123	70-130
Toluene	ug/m3	51	112	70-130
1,1,2-Trichloroethane	ug/m3	74	137 vo	70-130
Tetrachloroethene	ug/m3	92	129	70-130
Ethylbenzene	ug/m3	59	109	70-130
m,p-Xylene	ug/m3	120	104	70-130
o-Xylene	ug/m3	59	112	70-130
Naphthalene	ug/m3	71	82	70-130

Date of Report: 11/27/24
Date Received: 11/08/24
Project: Coleman Oil- Yakima Bulk Plant 41392.000 T.0021 Ph.03B, F&BI 411133

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR HELIUM USING METHOD ASTM D1946

Laboratory Code: (Duplicate)

Analyte	Sample Result (%)	Duplicate Result (%)	Relative Percent Difference	Acceptance Criteria
Helium	<0.6	<0.6	nm	0-20

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported between the method detection limit and the lowest calibration point. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411133

SAMPLE CHAIN OF CUSTODY

11/08/24

Page # 1 of 1

Report To Kyle Johnson
Company PBS
Address 141 NW Greenwood Ave
City, State, ZIP Bend, OR
Phone 541.233.3203 Email kyle.johnson@pbsusa.com

SAMPLERS (signature)

PROJECT NAME & ADDRESS: Coleman Oil - Yakima Bulk Plant
PO # 41392.000 T.0021 Ph.03B

NOTES: Bio-Venting Pilot Test

INVOICE TO

TURNAROUND TIME
✓Standard
RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
Default: Clean following final report delivery
Hold (Fee may apply):

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium	O_2, CO_2, CH_4, 2 D1946 Mod	Notes
BVPT-1	01	9899	61	IA / (SG)	11/6/24	28	0929	2	0935		X	X		X	X	
BVPT-2	02	2296	234	IA / (SG)	11/6/24	28	1607	2	1615		X	X		X	X	
BVPT-3	03	2295	117	IA / (SG)	11/7/24	28	0954	2	0959		X	X		X	X	
				IA / SG	~~11/7/24~~ KS		~~1554~~ KS									
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												

Friedman & Bruya, Inc.
5500 4th Avenue South
Seattle, WA 98108
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Kyle Johnson	PBS	11/7/24	1630
Received by:	Anh Phan	FBI	11/08/24	09:16
Relinquished by:		Samples received at 18 °C		
Received by:				

FORMS\COC\COCTO-15.DOC

SAMPLE CONDITION UPON RECEIPT CHECKLIST

PROJECT # 411133 CLIENT PBS INITIALS/ DATE: AP 11/08/24

If custody seals are present on cooler, are they intact? ☑ NA ☐ YES ☐ NO

Cooler/Sample temperature 18 °C
Thermometer ID: Fluke 96312917

Were samples received on ice/cold packs? ☐ YES ☑ NO

How did samples arrive?
☐ Over the Counter ☐ Picked up by F&BI ☑ FedEx/UPS/GSO

Is there a Chain-of-Custody* (COC)? ☑ YES ☐ NO Initials/ Date: AP 11/08/24
*or other representative documents, letters, and/or shipping memos

Number of days samples have been sitting prior to receipt at laboratory _____ days

Are the samples clearly identified? (explain "no" answer below) ☑ YES ☐ NO

Were all sample containers received intact (i.e. not broken, leaking etc.)? (explain "no" answer below) ☑ YES ☐ NO

Were appropriate sample containers used? ☑ YES ☐ NO ☐ Unknown

If custody seals are present on samples, are they intact? ☑ NA ☐ YES ☐ NO

Are samples requiring no headspace, headspace free? ☑ NA ☐ YES ☐ NO

Is the following information provided on the COC, and does it match the sample label?
(explain "no" answer below)

Sample ID's	☑ Yes ☐ No	☐ Not on COC/label
Date Sampled	☑ Yes ☐ No	☐ Not on COC/label
Time Sampled	☑ Yes ☐ No	☐ Not on COC/label
# of Containers	☑ Yes ☐ No	
Relinquished	☑ Yes ☐ No	
Requested analysis	☑ Yes ☐ On Hold	

Other comments (use a separate page if needed)

Air Samples: Were any additional canisters/tubes received? ☐ NA ☑ YES ☐ NO

Number of unused TO15 canisters 01 (3252) **Number of unused TO17 tubes** _____

ORIGIN ID:YKMA (000) 000-0000
PBS ENVIRONMENTAL
400 BRADLEY BLVD STE 106
RICHLAND, WA 99352
UNITED STATES US

SHIP DATE: 07NOV24
ACTWGT: 8.75 LB
CAD: 6995176/SSFE2560
DIMS: 10x10x16 IN
BILL THIRD PARTY

Part # 156297-435 RRDB EXP 09/25

TO FRIEDMAN & BRUYA INC.
SAMPLE RECEIVING
5500 4TH AVE SO.

SEATTLE WA 98108
(206) 285-8282 REF:
INV:
PO: DEPT:

FedEx
Express
E

J244024091001uv

FRI - 08 NOV 10:30A
TRK# 0201 2815 5661 5895 PRIORITY OVERNIGHT

85 BFIA
98108
WA-US SEA

3600 Fremont Ave N
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Friedman & Bruya
Michael Erdahl
5500 4th Ave S
Seattle, WA 98108

RE: 411133,
Work Order Number: 2411384

November 26, 2024

Attention Michael Erdahl:

Fremont Analytical, Inc, an Alliance Technical Group company, received 3 sample(s) on 11/19/2024 for the analyses presented in the following report.

Major Gases by EPA Method 3C

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Kelley Lovejoy
Project Manager

Date: *11/26/2024*

CLIENT: Friedman & Bruya
Project: 411133
Work Order: 2411384

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2411384-001	BVPT-1	11/19/2024 11:15 AM	11/19/2024 1:20 PM
2411384-002	BVPT-2	11/19/2024 11:15 AM	11/19/2024 1:20 PM
2411384-003	BVPT-3	11/19/2024 11:15 AM	11/19/2024 1:20 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **2411384**

Date: **11/26/2024**

CLIENT: Friedman & Bruya

Project: 411133

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Major gases are reported as % ratio of the Major Gases analyzed (Carbon dioxide, Carbon Monoxide, Methane, Nitrogen, Oxygen and Hydrogen).

The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS). The LCS is processed with the samples to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Note: The estimated BTU calculation is based off of the methane result.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2411384**
Date Reported: **11/26/2024**

CLIENT: Friedman & Bruya
Project: 411133

Lab ID: 2411384-001 **Collection Date:** 11/19/2024 11:15:00 AM
Client Sample ID: **BVPT-1** **Matrix:** Air

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Major Gases by EPA Method 3C				Batch ID: R95957		Analyst: CO
Carbon Dioxide	2.26	0.0500		%	1	11/20/2024 12:25:00 PM
Carbon Monoxide	ND	0.0500		%	1	11/20/2024 12:25:00 PM
Methane	ND	0.0500		%	1	11/20/2024 12:25:00 PM
Nitrogen	87.9	0.0500		%	1	11/20/2024 12:25:00 PM
Oxygen	9.87	0.0500		%	1	11/20/2024 12:25:00 PM
Hydrogen	ND	0.0500		%	1	11/20/2024 12:25:00 PM
BTU	0.0304			BTU/ft^3	1	11/20/2024 12:25:00 PM

Lab ID: 2411384-002 **Collection Date:** 11/19/2024 11:15:00 AM
Client Sample ID: **BVPT-2** **Matrix:** Air

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Major Gases by EPA Method 3C				Batch ID: R95957		Analyst: CO
Carbon Dioxide	1.84	0.0500		%	1	11/20/2024 12:37:00 PM
Carbon Monoxide	ND	0.0500		%	1	11/20/2024 12:37:00 PM
Methane	ND	0.0500		%	1	11/20/2024 12:37:00 PM
Nitrogen	90.6	0.0500		%	1	11/20/2024 12:37:00 PM
Oxygen	7.55	0.0500		%	1	11/20/2024 12:37:00 PM
Hydrogen	ND	0.0500		%	1	11/20/2024 12:37:00 PM
BTU	ND			BTU/ft^3	1	11/20/2024 12:37:00 PM

Analytical Report

Work Order: **2411384**
Date Reported: **11/26/2024**

CLIENT: Friedman & Bruya
Project: 411133

Lab ID: 2411384-003 **Collection Date:** 11/19/2024 11:15:00 AM
Client Sample ID: **BVPT-3** **Matrix:** Air

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Major Gases by EPA Method 3C				Batch ID: R95957		Analyst: CO
Carbon Dioxide	2.28	0.0500		%	1	11/20/2024 12:59:00 PM
Carbon Monoxide	ND	0.0500		%	1	11/20/2024 12:59:00 PM
Methane	ND	0.0500		%	1	11/20/2024 12:59:00 PM
Nitrogen	89.0	0.0500		%	1	11/20/2024 12:59:00 PM
Oxygen	8.75	0.0500		%	1	11/20/2024 12:59:00 PM
Hydrogen	ND	0.0500		%	1	11/20/2024 12:59:00 PM
BTU	ND			BTU/ft^3	1	11/20/2024 12:59:00 PM

Work Order: 2411384
CLIENT: Friedman & Bruya
Project: 411133

QC SUMMARY REPORT

Major Gases by EPA Method 3C

Sample ID: **LCS-R95957** SampType: **LCS** Units: **%** Prep Date: **11/20/2024** RunNo: **95957**
Client ID: **LCSW** Batch ID: **R95957** Analysis Date: **11/20/2024** SeqNo: **2002315**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Carbon Dioxide	99.1	0.0500	100.0	0	99.1	90	110				
Carbon Monoxide	99.3	0.0500	100.0	0	99.3	90	110				
Methane	99.1	0.0500	100.0	0	99.1	90	110				
Nitrogen	100	0.0500	100.0	0	100	90	110				
Oxygen	101	0.0500	100.0	0	101	90	110				
Hydrogen	99.6	0.0500	100.0	0	99.6	90	110				

Sample ID: **2411384-001AREP** SampType: **REP** Units: **%** Prep Date: **11/20/2024** RunNo: **95957**
Client ID: **BVPT-1** Batch ID: **R95957** Analysis Date: **11/20/2024** SeqNo: **2002310**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Carbon Dioxide	2.26	0.0500						2.261	0.0539	30	
Carbon Monoxide	ND	0.0500						0		30	
Methane	ND	0.0500						0		30	
Nitrogen	87.9	0.0500						87.86	0.0127	30	
Oxygen	9.87	0.0500						9.874	0.0702	30	
Hydrogen	ND	0.0500						0		30	
BTU	ND							0.03043	200	30	

Sample Log-In Check List

Client Name:	FB	Work Order Number:	2411384
Logged by:	Clare Griggs	Date Received:	11/19/2024 1:20:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☐	NA ☑
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2411384

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 5500 4th Ave S
City, State, ZIP Seattle, WA 98108
Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER
Alliance Technical Group

PROJECT NAME/NO.	PO #
411133	E-523

REMARKS

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
Dispose after 30 days
Return samples
Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: major gases										Notes
																Dilution
BVPT-1		11/19/2024	11:15	vapor	1	x										1.6
BVPT-2		11/19/2024	11:15	vapor	1	x										2.4
BVPT-3		11/19/2024	11:15	vapor	1	x										2.0

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	11/19/24	1150
Received by:	ginageirard	ATG	11/19/24	1:20PM
Relinquished by:				
Received by:				