# 2023
# ANNUAL MONITORING REPORT

## TNM 97-18

SW ¼ NE ¼ of SECTION 28, TOWNSHIP 20 SOUTH, RANGE 37 EAST
LEA COUNTY, NEW MEXICO
PLAINS SRS NUMBER: TNM 97-18-KNOWN
NMOCD Reference AP-0013
Incident # nAPP2109543384

Review of the 2023 Annual Monitoring Report for TNM 97-18, Plains Marketing L.P. : content satisfactory
1. Continue to conduct quarterly groundwater monitoring as scheduled.
2. Continue manual over-pumping of select monitoring wells and recovery wells on a monthly basis, and adjust accordingly.
3. Submit the 2024 annual report to OCD via e-permitting online by April 1, 2025.

PREPARED FOR:

**PLAINS MARKETING, L.P.**
333 CLAY STREET, SUITE 1600
HOUSTON, TEXAS 77002

PREPARED BY:

**TRC Environmental Corporation**
10 Desta Drive, Suite 130E
Midland, Texas 79705

**May 2024**

Misti Bryant
Assistant Project Manager

Jonathan P. Repman P.G.
Midland Office Practice Lead

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## INTRODUCTION

On behalf of Plains Marketing, L.P., (Plains), TRC Environmental Corporation (TRC), is pleased to submit this 2023 Annual Monitoring Report in compliance with the New Mexico Oil Conservation Division (NMOCD) letter of May 1998, requiring submittal of an Annual Monitoring Report by April 1 of each year. Beginning on May 29, 2004, project management responsibilities were assumed by TRC, previously NOVA Safety and Environmental (NOVA). The TNM 97-18 Pipeline Release Site (the Site), formerly the responsibility of Enron Oil Trading and Transportation (EOTT), is now the responsibility of Plains. This report is intended to be viewed as a complete document with figures, appendices, tables, and text. The report presents the results of the quarterly groundwater monitoring events conducted in calendar year 2023. Historical groundwater elevation data is summarized in Table 4. For reference, the Site Location Map is provided as Figure 1.

Groundwater monitoring was conducted during each quarter of 2023 to assess the levels and extent of dissolved phase constituents and Phase Separated Hydrocarbon (PSH). Each groundwater monitoring event consisted of measuring static water levels in monitor wells, checking for the presence of PSH on the water column and purging and sampling of each well exhibiting sufficient recharge. Monitor wells containing a thickness of PSH greater than 0.01 foot were not sampled, with the exception of wells selected as part of the monitored natural attenuation (MNA) sampling activities.

## SITE DESCRIPTION AND BACKGROUND INFORMATION

The TNM 97-18 Release occurred on September 10, 1997. The Site is located south of Monument, New Mexico in the Southwest ¼ of the Northeast ¼ of Section 28, Township 20 South, Range 37 East. According to Form C-141, an estimated eighty-three (83) barrels of crude oil was released from the 16-inch pipeline of which none was recovered. The Release Notification and Corrective Action (Form C-141) is provided as Appendix B.

A *Soil Closure Work Plan* (Work Plan) was submitted to the NMOCD in August 2006. The Work Plan proposed soil remediation activities intended to progress the Site toward an NMOCD approved closure.

In February 2008, Plains received approval from the NMOCD to commence the soil remediation activities outlined in the Work Plan. Following the completion of the soil remediation activities, a *Soil Closure Request* dated August 2010 was submitted to the NMOCD for approval. On January 26, 2011, Plains received an email from the NMOCD approving the *Soil Closure Request* at the TNM 97-18 Release Site.

Currently, there are twenty-seven (27) monitor wells (MW-1 through MW-30, excluding MW-13, MW-19, and MW-29, which have been plugged and abandoned) and two (2) recovery wells (RW-1 and RW-2) onsite. A pneumatic product recovery system operated onsite, which incorporated three (3) monitor wells (MW-4, MW-5, and MW-7), was discontinued at the end of 2006, due to declining PSH thicknesses onsite.

Plains began air sparging during the 1st quarter of 2013 in monitor wells MW-21, MW-22, MW-23, MW-25, MW-27, and MW-28 to attenuate the down gradient edge of the dissolved phase plume. The diffusers were installed at a depth of approximately thirty-eight (38) feet below ground surface (bgs) and operated at a pressure of approximately five (5) psi per well. The sparging system was discontinued in the 2nd quarter of 2014, due to mechanical failure of the air pump.

## FIELD ACTIVITIES

### Product Recovery Efforts

Measurable thicknesses of PSH ranging from 0.39 feet to 1.00 feet were detected in monitor well MW-5 during the 2023 reporting period. Measurable thicknesses of PSH ranging from 0.63 feet to 2.35 feet was detected in monitor well MW-7 during the 2023 reporting period. Measurable thicknesses of PSH ranging from 0.15 feet to 0.50 feet were detected in recovery well RW-2 during the reporting period. The maximum PSH thickness of all wells containing PSH was 2.35 feet and was recorded on August 30, 2023, in monitor well MW-7 and is shown on Table 1. The average thickness of PSH in monitor and recovery wells exhibiting PSH was less than 1.14 feet during the reporting period. Approximately 29.6 gallons (0.70 barrels) of PSH was recovered from the Site during the 2023 reporting period. A total of approximately 1,451.84 gallons (34.56 barrels) of PSH has been recovered since project inception.

### Groundwater Monitoring

Quarterly monitoring events for the reporting period were conducted according to the following reduced sampling schedule, which was approved by the NMOCD in correspondence dated April 28, 2004, and amended by NMOCD correspondence dated June 22, 2005, and June 13, 2013.

| NMOCD APPROVED SAMPLING SCHEDULE | | | | | |
|---|---|---|---|---|---|
| **Location** | **Schedule** | **Location** | **Schedule** | **Location** | **Schedule** |
| MW-1 | Annually | MW-12 | Annually | MW-23 | Quarterly |
| MW-2 | Quarterly | MW-13 | Plugged and abandoned | MW-24 | Quarterly |
| MW-3 | Quarterly | MW-14 | Annually | MW-25 | Quarterly |
| MW-4 | Quarterly | MW-15 | Annually | MW-26 | Quarterly |
| MW-5 | Quarterly | MW-16 | Annually | MW-27 | Semi-Annually |
| MW-6 | Quarterly | MW-17 | Quarterly | MW-28 | Annually |
| MW-7 | Quarterly | MW-18 | Quarterly | MW-29 | Plugged and abandoned |
| MW-8 | Annually | MW-19 | Plugged and abandoned | MW-30 | Semi-Annually |
| MW-9 | Annually | MW-20 | Semi-Annually | | |
| MW-10 | Quarterly | MW-21 | Annually | RW-1 | Quarterly |
| MW-11 | Annually | MW-22 | Annually | RW-2 | Quarterly |

The Site monitor wells were gauged and sampled on March 7-9, May 1-3, August 29-31, and November 28-30, 2023. During each sampling event, monitor wells were purged of a minimum of three (3) well volumes of water or until the wells failed to produce water. Purging activities were conducted using a disposable polyethylene bailer for each well or electrical Grundfos pump

and dedicated tubing. Groundwater was allowed to recharge and samples were collected using disposable polyethylene samplers. Water samples were placed in clean glass containers provided by the laboratory and placed on ice in the field. Purge water was collected in a polystyrene tank and disposed of at a licensed disposal facility.

Please note, during the reporting period, monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were sampled using industry standard low-flow sampling techniques. A water quality meter was utilized to monitor the flow of groundwater for pH, temperature (°C), conductivity, Oxygen Reduction Potential (ORP), Dissolved Oxygen (DO), and Turbidity. The above parameters were monitored until three (3) of the six (6) parameters stabilized to within a ten percent (10%) "window", at which time groundwater samples were collected. The five (5) monitor wells (MW-1, MW-6, MW-2, MW-4, and MW-24, and recovery well RW-2) were sampled for concentrations of BTEX using Method EPA 8021B, Total Organic Carbon (TOC) using Method EPA 415.1, Dissolved Methane Gas using RSK-175, Dissolved Ethane Gas using RSK-175, Dissolved Ethene Gas using RSK-175, Dissolved Iron (filtered) using Method EPA 6010B, Dissolved Manganese (filtered) using Method EPA 6010B, Anion Nitrate and Sulfate by Method EPA 300.0, and Chemical Oxygen Demand (COD) by 8000.

Locations of the monitor wells and the inferred groundwater gradient, which were constructed from measurements collected during quarterly sampling events conducted in 2023, are depicted on the Inferred Groundwater Gradient Maps, Figures 2A-2D. Groundwater elevation data for 2023 is provided as Table 1. Historical groundwater elevation data beginning at project inception is summarized in Table 4.

The most recent Groundwater Gradient Map, Figure 2D, indicated a general gradient of 0.0055 feet/foot in a southeast direction as measured between monitor wells MW-5 and MW-4. Groundwater Gradient Maps generated during the 1$^{st}$, 2$^{nd}$, and 3$^{rd}$ quarters of the reporting period indicated a gradient ranging from 0.0054 feet/foot to 0.0062 feet/foot in a southeast direction. The corrected groundwater elevations ranged between 3,464.49 to 3,472.67 feet above mean sea level, in monitor well MW-27 on August 29, 2023, and in monitor well MW-1 on May 3, 2023, respectively.

## LABORATORY RESULTS

Groundwater samples obtained during all four (4) quarterly sampling events of 2023 were delivered to Permian Basin Environmental Laboratories, in Midland, Texas for determination of BTEX constituent concentrations by EPA Method 8021B. Polynuclear Aromatic Hydrocarbons (PAH) analysis by EPA Method 8270 was conducted by Permian Basin Laboratories during the 2023 calendar year on monitor wells monitor wells MW-4, MW-6, MW-10, MW-17, MW-18, and recovery wells RW-1 and RW-2. Based on historical PAH analytical data, only those wells exhibiting elevated constituent concentrations above New Mexico Water Quality Control Commission (NMWQCC) standards were sampled, with the exclusion of those wells containing measurable PSH thicknesses. A listing of BTEX constituent concentrations for 2023 are summarized in Table 2 and historical concentrations of BTEX in groundwater are summarized in Table 5. The 2023 polynuclear aromatic hydrocarbon concentrations in groundwater are summarized in Table 3 and historical polynuclear aromatic hydrocarbon concentrations in

groundwater are summarized in Table 6. Copies of the laboratory reports generated for 2023 are provided in Appendix A. The quarterly groundwater sample results for BTEX constituent concentrations are depicted on Figures 3A through 3D.

**Monitor well MW-1** is sampled on an annual schedule however, MW-1 was selected as an MNA parameter well and as such was sampled during all four (4) quarters. Analytical results indicated BTEX constituent concentrations were less than the laboratory RL and below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. PAH analysis was not required during the 4th quarter sampling event.

Please note, monitor well MW-1 was selected as MNA parameter well and is located "upgradient of plume" location. Groundwater samples collected during the reporting period were obtained using low-flow sampling techniques. The table below list the stabilization levels for the water quality parameters during the reporting period for monitor well MW-1.

| Sample Date | Sample Location | pH (SU) ±10% | Temp C ±10% | Conductivity (u-mhos/cm) ±10% | ORP (mV) ±10% | DO mg/L ±10% | Turbidity (NTUs) ±10% or < 5 NTUs |
|---|---|---|---|---|---|---|---|
| 03/09/23 | MW-1 | 1.50 | 6.39 | 18.59 | 13.8 | 137 | 1.76 |
| 05/03/23 | MW-1 | 0.75 | 7.05 | 20.16 | 12,562 | 12.1 | 0.18 |
| 08/30/23 | MW-1 | 1.00 | 7.11 | 21.74 | 7.98 | -7.7 | 0 |
| 11/30/23 | MW-1 | 1.00 | 7.55 | 19.49 | 0.04 | 109.3 | 7.65 |

Analytical benzene data for up to the previous ten (10) years was entered into the GSI Mann-Kendall Toolkit (GSI-MKT), which indicated the Concentration Trend was "Stable" in monitor well MW-1. Analytical toluene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "No Trend" in monitor well MW-1. Analytical ethylbenzene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Stable" in monitor well MW-1. Analytical xylene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "No Trend" in monitor well MW-1.

Please reference Tables 7 through 10 for benzene, toluene, ethylbenzene, and xylene Constituent Trend Analysis, respectively. Analytical results of MNA constituent samples will be summarized in the Monitored Natural Attenuation Results Summary Section of this Report.

**Please note, due to the limitations of the GSI Mann-Kendall Toolkit, constituents exhibiting concentrations less than the laboratory RL are depicted on the GSI Mann-Kendall Toolkit for Constituent Trend Analysis spreadsheet at the laboratory RL.**

**Monitor well MW-2** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 0.00982 mg/L during the 2nd quarter to 0.0666 mg/L during the 1st quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during the 1st, 3rd, and 4th quarters of the reporting period. Toluene, ethylbenzene, and xylene

concentrations were less than the laboratory RL and NMOCD regulatory guidelines during the 2023 reporting period. PAH analysis was not required during the 4th quarter sampling event.

Please note, monitor well MW-2 was selected as MNA parameter well and is located at the "center of plume" location. Groundwater samples collected during the reporting period were obtained using low-flow sampling techniques. The table below list the stabilization levels for the water quality parameters during the reporting period for monitor well MW-2.

| Sample Date | Sample Location | pH (SU) ±10% | Temp C ±10% | Conductivity (u-mhos/cm) ±10% | ORP (mV) ±10% | DO mg/L ±10% | Turbidity (NTUs) ±10% or < 5 NTUs |
|---|---|---|---|---|---|---|---|
| 03/09/23 | MW-2 | 1.50 | 6.73 | 20.18 | 10.6 | -304 | 0.57 |
| 05/03/23 | MW-2 | 0.75 | 7.09 | 20.21 | 9,968.90 | -357.9 | 0.03 |
| 08/30/23 | MW-2 | 1.25 | 7.02 | 21.29 | 9.41 | -409.8 | 0 |
| 11/30/23 | MW-2 | 0.75 | 7.55 | 20.11 | 0.3 | -280.4 | 3.16 |

Analytical benzene data for up to the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-2. Analytical toluene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-2. Analytical ethylbenzene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-2. Analytical xylene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-2.

Please reference Tables 7 through 10 for benzene, toluene, ethylbenzene, and xylene Constituent Trend Analysis, respectively. Analytical results of MNA constituent samples will be summarized in the Monitored Natural Attenuation Results Summary Section of this Report.

**Please note, due to the limitations of the GSI Mann-Kendall Toolkit, constituents exhibiting concentrations less than the laboratory RL are depicted on the GSI Mann-Kendall Toolkit for Constituent Trend Analysis spreadsheet at the laboratory RL.**

**Monitor well MW-3** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 0.0818 mg/L during the 1st quarter to 0.316 mg/L during the 2nd quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during the four (4) quarters of the reporting period. Toluene concentrations ranged from below the applicable laboratory RL during the 1st and 4th quarters to 0.00285 mg/L during the 2nd quarter of 2023. Toluene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Ethylbenzene and xylene were below the applicable laboratory RL and the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. PAH analysis was not required on samples from MW-3 during the 4th quarter sampling event.

**Monitor well MW-4** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 1.14 mg/L during the 3rd quarter to 2.47 mg/L during the 2nd quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Toluene concentrations ranged from 0.00351 mg/L during the 4th quarter to 0.00510 mg/L during the 3rd quarter of 2023. Toluene concentrations were below the NMOCD regulatory guidelines during the four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from 0.00570 mg/L during the 3rd quarter to 0.0178 mg/L during the 1st quarter of 2023. Ethylbenzene concentrations were below the NMOCD regulatory guidelines all four (4) quarters of the reporting period. Xylene concentrations ranged from 0.0475 mg/L during the 3rd quarter to 0.08963 mg/L during the 4th quarter of 2023. Xylene concentrations were below the NMOCD regulatory guidelines all four (4) quarters of the reporting period.

PAH analysis during the 4th quarter sampling event indicated elevated concentrations above NMWQCC Drinking Water Standards for fluorene (0.0016 mg/L), phenanthrene (0.0016 mg/L), and naphthalene (0.096 mg/L).

Please note, monitor well MW-4 was selected as MNA parameter well and is located at the "down-gradient within plume" location. Groundwater samples collected during the reporting period were obtained using low-flow sampling techniques. The table below list the stabilization levels for the water quality parameters during the reporting period for monitor well MW-4.

| Sample Date | Sample Location | pH (SU) ±10% | Temp C ±10% | Conductivity (u-mhos/cm) ±10% | ORP (mV) ±10% | DO mg/L ±10% | Turbidity (NTUs) ±10% or < 5 NTUs |
|---|---|---|---|---|---|---|---|
| 03/09/23 | MW-4 | 1.50 | 6.79 | 20.50 | 7.50 | -399 | 0.93 |
| 05/03/23 | MW-4 | 0.75 | 7.21 | 21.50 | 7,033.1 | -497 | 0.08 |
| 08/30/23 | MW-4 | 1.50 | 6.94 | 27.95 | 8.18 | -435.3 | 0 |
| 11/30/23 | MW-4 | 0.75 | 7.55 | 20.05 | - | -341 | 5.48 |

Analytical benzene data for up to the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Increasing" in monitor well MW-4. Analytical toluene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-4. Analytical ethylbenzene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-4. Analytical xylene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Probably Decreasing" in monitor well MW-4.

Please reference Tables 7 through 10 for benzene, toluene, ethylbenzene, and xylene Constituent Trend Analysis, respectively. Analytical results of MNA constituent samples will be summarized in the Monitored Natural Attenuation Results Summary Section of this Report.

**Please note, due to the limitations of the GSI Mann-Kendall Toolkit, constituents exhibiting concentrations less than the laboratory RL are depicted on the GSI Mann-Kendall Toolkit for Constituent Trend Analysis spreadsheet at the laboratory RL.**

**Monitor well MW-5** is monitored/sampled on a quarterly schedule. Monitor well MW-5 was not sampled during all four (4) quarters of the reporting period, due to the presence of PSH. PSH thicknesses of 0.39 feet, 0.47 feet, 1.00 feet, and 0.98 feet were reported during the 1st, 2nd, 3rd, and 4th quarters of the reporting period, respectively. PAH analysis was not conducted during the 4th quarter sampling event due to the presence of PSH.

**Monitor well MW-6** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 0.00641 mg/L during the 1st quarter to 0.0126 mg/L during the 3rd quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during 3rd and 4th quarters of the reporting period. Toluene concentrations ranged from 0.00101 mg/L during the 4th quarter to 0.00382 mg/L during the 3rd quarter of 2023. Toluene concentrations were below the NMOCD regulatory guidelines during the four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from less than the laboratory RL during the 2nd and 3rd to 0.00168 mg/L during the 1st quarter of the reporting period. Ethylbenzene concentrations were below the NMOCD regulatory guidelines during the four (4) quarters of the reporting period. Xylene concentrations ranged from less than the laboratory RL during the 4th quarter to 0.000446 mg/L during the 3rd quarter of 2023. Xylene concentrations were below the NMOCD regulatory guidelines all four (4) quarters of the reporting period.

PAH analysis during the 4th quarter sampling event indicated elevated concentrations above NMWQCC Drinking Water Standards for fluorene (0.0016 mg/L) and phenanthrene (0.0012 mg/L).

Please note, monitor well MW-6 was selected as MNA parameter well and is located at the "up-gradient within plume" location. Groundwater samples collected during the reporting period were obtained using low-flow sampling techniques. The table below list the stabilization levels for the water quality parameters during the reporting period for monitor well MW-6.

| Sample Date | Sample Location | pH (SU) ±10% | Temp C ±10% | Conductivity (u-mhos/cm) ±10% | ORP (mV) ±10% | DO mg/L ±10% | Turbidity (NTUs) ±10% or < 5 NTUs |
|---|---|---|---|---|---|---|---|
| 03/09/23 | MW-6 | 1.25 | 6.57 | 20.19 | 16.8 | -299 | 0.53 |
| 05/03/23 | MW-6 | 0.75 | - | 20.27 | 14,980 | -310.5 | 0.78 |
| 08/30/23 | MW-6 | 1.00 | 7.01 | 23.72 | 16.27 | -398.1 | 0.00 |
| 11/30/23 | MW-6 | 1.00 | 7.58 | 20.36 | 0.30 | -279.4 | 3.99 |

Analytical benzene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-6. Analytical toluene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-6. Analytical ethylbenzene data for

the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-6. Analytical xylene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-6.

Please reference Tables 7 through 10 for benzene, toluene, ethylbenzene, and xylene Constituent Trend Analysis, respectively. Analytical results of MNA constituent samples will be summarized in the Monitored Natural Attenuation Results Summary Section of this Report.

**Please note, due to the limitations of the GSI Mann-Kendall Toolkit, constituents exhibiting concentrations less than the laboratory RL are depicted on the GSI Mann-Kendall Toolkit for Constituent Trend Analysis spreadsheet at the laboratory RL.**

**Monitor well MW-7** is monitored/sampled on a quarterly schedule. Monitor well MW-7 was not sampled during all four (4) quarters of the reporting period, due to the presence of PSH. PSH thicknesses of 1.12 feet, 1.26 feet, 2.35 feet, and 1.77 feet were reported during the 1st, 2nd, 3rd, and 4th quarters of the reporting period, respectively. PAH analysis was not conducted during the 4th quarter sampling event due to the presence of PSH.

**Monitor well MW-8** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were less than the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-8 during the 4th quarter sampling event.

**Monitor well MW-9** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were less than the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-9 during the 4th quarter sampling event.

**Monitor well MW-10** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 0.208 mg/L during the 3rd quarter to 1.35 mg/L during the 1st quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Toluene concentrations ranged from 0.00377 mg/L during the 4th quarter to 0.118 mg/L during the 1st quarter of 2023. Toluene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from below the applicable laboratory RL during the 3rd and 4th quarters to 0.130 during the 1st quarter of 2023. Ethylbenzene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Xylene concentrations ranged from 0.0109 mg/L during the 4th quarter to 0.651 mg/L during the 1st quarter of 2023. Xylene concentrations were above the NMOCD regulatory guidelines during the 1st quarter of the reporting period.

PAH analysis during the 4th quarter sampling event indicated elevated concentrations above NMWQCC Drinking Water Standards for fluorene (0.0077 mg/L), phenanthrene (0.0085 mg/L), and naphthalene (0.0509 mg/L).

**Monitor well MW-11** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were less than the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-11 during the 4th quarter sampling event.

**Monitor well MW-12** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were less than the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-12 during the 4th quarter sampling event.

**Monitor well MW-14** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were less than the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-14 during the 4th quarter sampling event.

**Monitor well MW-15** is sampled on an annual schedule but was not sampled due to insufficient water. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-15 during the 4th quarter sampling event.

**Monitor well MW-16** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were less than the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-16 during the 4th quarter sampling event.

**Monitor well MW-17** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 1.55 mg/L during the 1st quarter to 2.04 mg/L during the 4th quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Toluene concentrations ranged from 0.00185 mg/L during the 3rd quarter to 0.00310 mg/L during the 1st quarter of 2023. Toluene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from 0.00126 mg/L during the 3rd quarter to 0.116 mg/L during the 4th quarter of 2023. Ethylbenzene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Xylene concentrations

ranged from 0.0966 mg/L during the 2nd quarter to 0.157 mg/L during the 1st quarter of 2023. Xylene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period.

PAH analysis during the 4th quarter sampling event indicated elevated concentrations above NMWQCC Drinking Water Standards for fluorene (0.0040 mg/L), phenanthrene (0.0023 mg/L) and naphthalene (0.158 mg/L).

**Monitor well MW-18** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 0.361 mg/L during the 4th quarter to 1.57 mg/L during the 3rd quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Toluene concentrations ranged 0.00214 mg/L during the 3rd quarter to 0.00367 mg/L during the 2nd quarter. Toluene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from 0.00396 mg/L during the 2nd quarter to 0.0766 mg/L during the 3rd quarter of 2023. Ethylbenzene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Xylene concentrations ranged from 0.0798 mg/L during the 1st quarter to 0.1024 mg/L during the 4th quarter of 2023. Xylene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period.

PAH analysis during the 4th quarter sampling event indicated elevated concentrations above NMWQCC Drinking Water Standards for fluorene (0.0029 mg/L), phenanthrene (0.0030 mg/L), and naphthalene (0.13381 mg/L).

**Monitor well MW-20** is sampled on a semi-annual schedule and the analytical results indicated benzene concentrations ranged from less than the applicable laboratory RL during the 2nd quarter to 0.00103 mg/L during the 4th quarter of 2023. Benzene concentrations were below the NMOCD regulatory guidelines during the 2nd and 4th quarters of the reporting period. Toluene, ethylbenzene, and xylene concentrations were less than the applicable laboratory RL and the NMOCD regulatory guidelines during the 2nd and 4th quarter sampling event. PAH analysis was not required on samples from MW-20 during the 4th quarter sampling event.

**Monitor well MW-21** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were less than the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-21 during the 4th quarter sampling event.

**Monitor well MW-22** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were below the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-22 during the 4th quarter sampling event.

**Monitor well MW-23** is sampled on a quarterly schedule and the analytical results indicated BTEX constituent concentrations were below the applicable laboratory RL and the NMOCD regulatory guidelines for all four (4) quarters of the reporting period. The analytical results indicated BTEX constituent concentrations have been below the NMOCD regulatory guidelines since the 4th quarter of 2017. PAH analysis was not required on samples from MW-23 during the 4th quarter sampling event.

**Monitor well MW-24** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 3.81 mg/L during the 3rd quarter to 6.14 mg/L during the 4th quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Toluene concentrations ranged from 0.00441 mg/L during the 1st quarter to 0.00665 mg/L during the 3rd quarter of 2023. Toluene concentrations were below the NMOCD regulatory guidelines during the four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from 0.306 mg/L during the 3rd quarter to 0.379 mg/L during the 1st quarter of 2023. Ethylbenzene concentrations were below the NMOCD regulatory guidelines during the four (4) quarters of the reporting period. Xylene concentrations ranged from 0.1724 mg/L during the 3rd quarter to 0.200 mg/L during the 2nd quarter of 2023. Xylene concentrations were below the NMOCD regulatory guidelines all four (4) quarters of the reporting period. PAH analysis was not required on samples from MW-24 during the 4th quarter sampling event.

Please note, monitor well MW-24 was selected as MNA parameter well and is located at the "down-gradient of plume" location. Groundwater samples collected during the reporting period were obtained using low-flow sampling techniques. The table below list the stabilization levels for the water quality parameters during the reporting period for monitor well MW-24.

| Sample Date | Sample Location | pH (SU) ±10% | Temp C ±10% | Conductivity (u-mhos/cm) ±10% | ORP (mV) ±10% | DO mg/L ±10% | Turbidity (NTUs) ±10% or < 5 NTUs |
|---|---|---|---|---|---|---|---|
| 03/09/23 | MW-24 | 1.5 | 6.69 | 20.18 | 5.69 | -379 | 1.7 |
| 05/03/23 | MW-24 | 0.75 | 7.16 | 20.27 | 5,019.7 | -489.7 | 0.11 |
| 08/30/23 | MW-24 | 1.25 | 6.88 | 21.49 | 5.36 | -459.4 | 0 |
| 11/30/23 | MW-24 | 0.75 | 7.42 | 20.02 | 0.13 | -387.1 | 0.61 |

Analytical benzene data for up to the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "NoTrend" in monitor well MW-24. Analytical toluene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-24. Analytical ethylbenzene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Decreasing" in monitor well MW-24. Analytical xylene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was "Increasing" in monitor well MW-24.

Please reference Tables 7 through 10 for benzene, toluene, ethylbenzene, and xylene Constituent Trend Analysis, respectively. Analytical results of MNA constituent samples will be summarized in the Monitored Natural Attenuation Results Summary Section of this Report.

**Please note, due to the limitations of the GSI Mann-Kendall Toolkit, constituents exhibiting concentrations less than the laboratory RL are depicted on the GSI Mann-Kendall Toolkit for Constituent Trend Analysis spreadsheet at the laboratory RL.**

**Monitor well MW-25** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 0.00902 mg/L during the 4th quarter to 0.310 mg/L during the 2nd quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during the 1st and 2nd quarters of the reporting period. Toluene concentrations ranged from less than the applicable laboratory RL during the 1st, 3rd, and 4th quarters to 0.00114 mg/L during the 2nd quarter. Toluene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Ethylbenzene and xylene concentrations were less than the applicable laboratory RL and the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. PAH analysis was not required on samples from MW-25 during the 4th quarter sampling event.

**Monitor well MW-26** is sampled on a quarterly schedule. Benzene concentrations ranged from less than the applicable laboratory RL during the 4th quarter to 0.0347 mg/L during the 1st quarter of the reporting period. Benzene concentrations were above the NMOCD regulatory guidelines during the 1st and 2nd quarters of the reporting period. Toluene concentrations ranged from less than the applicable laboratory RL during the 1st, 2nd, and 4th quarters to 0.00127 mg/L in the 2nd quarter. Toluene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from less than the applicable laboratory RL during the 1st, 2nd, and 4th quarters to 0.0174 mg/L in the 3rd quarter. Ethylbenzene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Xylene concentrations ranged from less than the applicable laboratory RL during the 1st, 2nd, and 4th quarters to 0.00942 mg/L in the 3rd quarter. Xylene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. PAH analysis was not required on samples from MW-26 during the 4th quarter sampling event.

**Monitor well MW-27** is sampled on a semi-annual schedule and the analytical results indicated BTEX constituent concentrations were below the applicable laboratory RL and the NMOCD regulatory guidelines during the 2nd and 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below NMOCD regulatory guidelines since the 2nd quarter of 2004. PAH analysis was not required on samples from MW-27 during the 4th quarter sampling event.

**Monitor well MW-28** is sampled on an annual schedule and the analytical results indicated BTEX constituent concentrations were less than the applicable laboratory RL and the NMOCD regulatory guideline during the 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below NMOCD regulatory guidelines since the 2nd quarter

of 2006. PAH analysis was not required on samples from MW-28 during the 4th quarter sampling event.

**Monitor well MW-30** is sampled on a semi-annual schedule and the analytical results indicated BTEX constituent concentrations were below the applicable laboratory RL and the NMOCD regulatory guidelines during the 2nd and 4th quarter sampling event. The analytical results indicated BTEX constituent concentrations have been below NMOCD regulatory guidelines since the 2nd quarter of 2002. PAH analysis was not required on samples from MW-30 during the 4th quarter sampling event.

**Recovery well RW-1** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 0.371 mg/L during the 2nd quarter to 0.642 mg/L during the 3rd quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Toluene concentrations ranged from 0.00747 mg/L during the 4th quarter to 0.0150 mg/L during the 1st quarter. Toluene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from 0.0556 mg/L during the 4th quarter to 0.111 mg/L during the 3rd quarter of 2023. Ethylbenzene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Xylene concentrations ranged from 0.1503 mg/L during the 4th quarter to 0.2204 mg/L during the 1st quarter of 2023. Xylene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period.

PAH analysis during the 4th quarter sampling event indicated elevated concentrations above NMWQCC Drinking Water Standards for fluoranthene (0.0011 mg/L), fluorene (0.028 mg/L), phenanthrene (0.048 mg/L) and naphthalene (0.535 mg/L).

**Recovery well RW-2** is sampled on a quarterly schedule and the analytical results indicated benzene concentrations ranged from 0.00786 mg/L during the 1st quarter to 0.346 mg/L during the 3rd quarter of 2023. Benzene concentrations were above the NMOCD regulatory guidelines during the 2nd, 3rd, and 4th quarters of the reporting period. Toluene concentrations ranged from less than the applicable laboratory RL during the 1st quarter to 0.00163 mg/L during the 3rd quarter. Toluene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Ethylbenzene concentrations ranged from 0.00377 mg/L during the 1st quarter to 0.0578 mg/L during the 3rd quarter of 2023. Ethylbenzene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period. Xylene concentrations ranged from 0.00200 mg/L during the 1st quarter to 0.03416 mg/L during the 3rd quarter of 2023. Xylene concentrations were below the NMOCD regulatory guidelines during all four (4) quarters of the reporting period.

Please note, recovery well RW-2 was selected as MNA parameter well and is located at the "cross-gradient of plume" location. Groundwater samples collected during the 4th quarter were obtained using low-flow sampling techniques. The table below list the stabilization levels for the water quality parameters during the reporting period for recovery well RW-2.

| Sample Date | Sample Location | pH (SU) ±10% | Temp C ±10% | Conductivity (u-mhos/cm) ±10% | ORP (mV) ±10% | DO mg/L ±10% | Turbidity (NTUs) ±10% or < 5 NTUs |
|---|---|---|---|---|---|---|---|
| 03/09/23 | RW-2 | 1.50 | 6.84 | 20.60 | 14.5 | -342 | 0.79 |
| 05/03/23 | RW-2 | 0.75 | 7.14 | 20.99 | 12,985 | -453.3 | 0.02 |
| 08/30/23 | RW-2 | 1.25 | 6.92 | 22.74 | 11.85 | -451.4 | 20.74 |
| 11/30/23 | RW-2 | 1.00 | 7.45 | 20.26 | 0.16 | -328.8 | 0.83 |

Analytical benzene data for up to the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was “Decreasing” in recovery well RW-2. Analytical toluene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was “Decreasing” in recovery well RW-2. Analytical ethylbenzene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was “Decreasing” in recovery well RW-2. Analytical xylene data for the previous ten (10) years was entered into the GSI-MKT, which indicated the Concentration Trend was “Decreasing” in recovery well RW-2.

Please reference Tables 7 through 10 for benzene, toluene, ethylbenzene, and xylene Constituent Trend Analysis, respectively. Analytical results of MNA constituent samples will be summarized in the Monitored Natural Attenuation Results Summary Section of this Report.

**Please note, due to the limitations of the GSI Mann-Kendall Toolkit, constituents exhibiting concentrations less than the laboratory RL are depicted on the GSI Mann-Kendall Toolkit for Constituent Trend Analysis spreadsheet at the laboratory RL.**

Laboratory analytical results were compared to the NMOCD regulatory limits based on the New Mexico groundwater guidelines found in Section 20.6.2.3103 of the New Mexico Administrative Code.

## MONITORED NATURAL ATTENUATION RESULTS SUMMARY

The New Mexico Administrative Code (NMAC) 20.5.13 has defined Monitored Natural Attenuation as “a methodology for remediation that relies upon a variety of naturally occurring chemical, physical, and biological processes to achieve target concentrations in a manner that is equally as protective of public health, safety, and welfare, and the environment as other methods and is accompanied by a program of monitoring to document the process and results of the above-mentioned processes.”

Following a release, bacteria and archaea begin to degrade petroleum plumes by oxidizing hydrocarbons. In order for this biodegradation to occur, reducers such as oxygen, nitrate, manganese$^{2+}$, iron$^{3+}$, sulfate, and carbon dioxide must be present. These reactions, termed oxidation-reduction, or “REDOX” reactions, provide bacteria and archaea varying amounts of energy.

The microbial population will utilize the most energetically favorable reaction available and subsequently move to less favorable reactions as electron acceptors are consumed. This process is generally termed the "REDOX Ladder", which is depicted in the figure below.

**Common Hydrocarbon REDOX Reactions in Groundwater**

| Reaction | Process | Energy |
|---|---|---|
| Aerobic Oxidation | $CH_2O + O_2 \rightarrow CO_2 + H_2O$ | -120 Kcal/mol |
| Denitrification | $5CH_2O + 3NO_3 + 4H^+ \rightarrow CO_2 + 7H_2O + 2N_2$ | -114 Kcal/mol |
| Manganese Reduction | $CH_2O + 2MnO_2 + 4H^+ \rightarrow CO_2 + 3H_2O + 2Mn^{2+}$ | -81 Kcal/mol |
| Iron Reduction | $CH_2O + 4Fe(OH)_3 + 8H^+ \rightarrow CO_2 + 11H_2O + 4Fe^{2+}$ | -28 Kcal/mol |
| Sulfate Reduction | $2CH_2O + SO_4^{2-} + H^+ \rightarrow 2CO_2 + 2H_2O + HS^-$ | -25 Kcal/mol |
| Methanogenesis | $2CH_2O \rightarrow CH_3COOH \rightarrow CH_4 + CO_2$ | -22 Kcal/mol |

The most energetically favorable electron acceptors tend to get consumed first and plumes tend to be limited in them toward the plume center while having excess of the other electron acceptors toward the periphery. For this reason, the groundwater geochemistry of hydrocarbon plumes tends to be characterized by concentric three-dimensional regions each dominated by one of the reactions listed above. The largest source of electron donors is typically light non-aqueous phase liquids (LNAPLs); therefore, the center of the concentric regions tends to be at the location of LNAPL. Please note, LNAPL and PSH are used interchangeably in this report.

The lateral and vertical location as well as the morphology of each region can be determined using the concentration of the electron acceptors, electron donors, and the field-measured parameters such as ORP, pH, and DO.

Dissolved-phase hydrocarbon plumes begin to spread out within the subsurface along the direction of groundwater flow (controlled by advection), perpendicular to groundwater flow (controlled by diffusion), and vertically (controlled by infiltration and advection) following the release. LNAPL, when present, tends to be smeared within the soil vertically and along the direction of groundwater flow, however due to higher viscosity, will travel more slowly than groundwater. For these reasons, the plume shape, COC concentrations, and biogeochemistry change with time.
To determine the morphology of each biodegradation region, six (6) monitor wells were sampled. These wells generally included one (1) well upgradient of the plume (MW-1), one (1) well upgradient within the plume (MW-6), one (1) well near the center of the plume (MW-2), one (1) well downgradient within the plume (MW-4), one (1) well downgradient of the plume (MW-24), and one (1) well cross-gradient of the plume center (RW-2).

The five (5) monitor wells (MW-1, MW-6, MW-2, MW-4, MW-24), and one (1) recovery well (RW-2) were sampled for concentrations of BTEX using Method EPA 8021B, Total Organic Carbon (TOC) using Method EPA 415.1, Dissolved Methane Gas using RSK-175, Dissolved Ethane Gas using RSK-175, Dissolved Ethene Gas using RSK-175, Dissolved Iron (filtered) using Method EPA 6010B, Dissolved Manganese (filtered) using Method EPA 6010B, Anion Nitrate and Sulfate by Method EPA 300.0, and Chemical Oxygen Demand (COD) by 8000.

**Please note, due to the limitations of the GSI Mann-Kendall Toolkit, constituents exhibiting concentrations less than the laboratory RL are depicted on the GSI Mann-Kendall Toolkit for Constituent Trend Analysis spreadsheet at the laboratory RL.**

For the 1st quarter the analytical results for concentrations of benzene ranged from less than the applicable laboratory RL for monitor well MW-1 to 4.58 mg/L for monitor well MW-24.

For the 2nd quarter the analytical results for concentrations of benzene ranged from less than the applicable laboratory RL for monitor well MW-1 to 5.22 mg/L for monitor well MW-24.

For the 3rd quarter the analytical results for concentrations of benzene ranged from less than the applicable laboratory RL for monitor well MW-1 to 3.81 mg/L for monitor well MW-24.

For the 4th quarter the analytical results for concentrations of benzene ranged from less than the applicable laboratory RL for monitor well MW-1 to 6.14 mg/L for monitor well MW-24.

Please reference Table 7 for GSI-MKT benzene results. Analytical benzene data for the previous ten (10) years was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows “Stable”, “Decreasing”, “Decreasing”, “Increasing”, “No Trend”, and “Decreasing”.

For the 1st quarter the analytical results for concentrations of toluene ranged from less than the applicable laboratory RL for monitor wells MW-1, MW-2, and recovery well RW-2 to 0.00459 mg/L for monitor well MW-4.

For the 2nd quarter the analytical results for concentrations of toluene ranged from less than the applicable laboratory RL for monitor wells MW-1 and MW-2 to 0.00530 mg/L for monitor well MW-24.

For the 3rd quarter the analytical results for concentrations of toluene ranged from less than the applicable laboratory RL for monitor wells MW-1 and MW-2 to 0.00665 mg/L for monitor well MW-24.

For the 4th quarter the analytical results for concentrations of toluene ranged from less than the applicable laboratory RL for monitor wells MW-1 and MW-2 to 0.00614 mg/L for monitor well MW-24.

Please reference Table 8 for GSI-MKT toluene results. Analytical toluene data for the previous ten (10) years was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows "No Trend", "Decreasing", "Decreasing", "Decreasing", "Decreasing", and "Decreasing".

For the 1st quarter the analytical results for concentrations of ethylbenzene ranged from less than the applicable laboratory RL for monitor wells MW-1 and MW-2 to 0.379 mg/L for monitor well MW-24.

For the 2nd quarter the analytical results for concentrations of ethylbenzene ranged from less than the applicable laboratory RL for monitor wells MW-1, MW6, MW-2 to 0.372 mg/L for monitor well MW-24.

For the 3rd quarter the analytical results for concentrations of ethylbenzene ranged from less than the applicable laboratory RL for monitor wells MW-1, MW6, MW-2 to 0.306 mg/L for monitor well MW-24.

For the 4th quarter the analytical results for concentrations of ethylbenzene ranged from less than the applicable laboratory RL for monitor wells MW-1 and MW-2 to 0.339 mg/L for monitor well MW-24.

Please reference Table 9 for GSI-MKT ethylbenzene results. Analytical ethylbenzene data for the previous ten (10) years was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows "Stable", "Decreasing", "Decreasing", "Decreasing", "Decreasing", and "Decreasing".

For the 1st quarter the analytical results for concentrations of xylene ranged from less than the applicable laboratory RL for monitor wells MW-1 and MW-2 to 0.17555 mg/L for monitor well MW-24.

For the 2nd quarter the analytical results for concentrations of xylene ranged from less than the applicable laboratory RL for monitor wells MW-1 and MW-2 to 0.200 mg/L for monitor well MW-24.

For the 3rd quarter the analytical results for concentrations of xylene ranged from less than the applicable laboratory RL for monitor wells MW-1, MW-6, and MW-2 to 0.306 mg/L for monitor well MW-24.

For the 4th quarter the analytical results for concentrations of xylene ranged from less than the applicable laboratory RL for monitor wells MW-1, MW-6, and MW-2 to 0.19029 mg/L for monitor well MW-24.

Please reference Table 10 for GSI-MKT xylene results. Analytical xylene data for the previous ten (10) years was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows "No Trend", "No Trend", "Decreasing", "Decreasing", "Increasing", and "Decreasing".

For the 1st quarter the analytical results for concentrations of TOC ranged from 13.3 mg/L for monitor well MW-2 to 115 mg/L for monitor well MW-4.

For the 2nd quarter the analytical results for concentrations of TOC ranged from 13.0 mg/L for monitor well MW-2 to 105 mg/L for monitor well MW-4.

For the 3rd quarter the analytical results for concentrations of TOC ranged from 20.5 mg/L for monitor well MW-1 to 106 mg/L for monitor well MW-4.

For the 4th quarter the analytical results for concentrations of TOC ranged from below the applicable laboratory RL for recovery well RW-2 to 99.0 mg/L for monitor well MW-4.

Please reference Table 11 for GSI-MKT TOC results. Analytical TOC data for the previous nine (9) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows "No Trend", "No Trend", "No Trend", "Decreasing", "Stable", and "No Trend".

For the 1st quarter the analytical results for concentrations of Dissolved Methane ranged from 0.00142 mg/L for monitor well MW-1 to 1.02 mg/L for monitor well MW-4.

For the 2nd quarter the analytical results for concentrations of Dissolved Methane ranged from 0.00105 mg/L for monitor well MW-1 to 1.42 mg/L for monitor well MW-24.

For the 3rd quarter the analytical results for concentrations of Dissolved Methane ranged from 0.000772 mg/L for monitor well MW-1 to 0.862 mg/L for monitor well MW-24.

For the 4th quarter the analytical results for concentrations of Dissolved Methane ranged from 0.000982 mg/L for monitor well MW-1 to 0.727 mg/L for monitor well MW-24.

Please reference Table 12 for GSI-MKT Dissolved Methane results. Analytical TOC data for the previous nine (9) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows "Decreasing", "Stable", "Decreasing", "Decreasing", "No Trend", and "No Trend".

For the 1st quarter the analytical results for concentrations of Dissolved Ethane ranged from less than the applicable laboratory RL for monitor wells MW-1 and MW-6 to 0.00521 mg/L for monitor well MW-24.

For the 2nd quarter the analytical results for concentrations of Dissolved Ethane ranged from less than the applicable laboratory RL for monitor well MW-1 to 0.00766 mg/L for monitor well MW-24.

For the 3rd quarter the analytical results for concentrations of Dissolved Ethane ranged from less than the applicable laboratory RL for monitor wells MW-1, MW-6, and MW-2 to 0.00652 mg/L for monitor well MW-24.

For the 4th quarter he analytical results for concentrations of Dissolved Ethane ranged from less than the applicable laboratory RL for monitor wells MW-1, MW-6, and MW-4 to 0.00826 mg/L for monitor well MW-24.

Please reference Table 13 for GSI-MKT Dissolved Ethane results. Analytical Dissolved Ethane data for the previous nine (9) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows “No Trend”, “No Trend”, “Stable”, “Stable”, “Probably Increasing”, and “No Trend”.

For the 1st quarter the analytical results for concentrations of Dissolved Ethene were less than the applicable laboratory RL for monitor wells MW-1, MW-6, MW-2, MW-4, and MW-24 and recovery well RW-2.

For the 2nd quarter the analytical results for concentrations of Dissolved Ethene ranged from less than the applicable laboratory RL for monitor well MW-6 to 0.00692 mg/L for monitor well MW-24.

For the 3rd quarter the analytical results for concentrations of Dissolved Ethene were less than the applicable laboratory RL for monitor wells MW-1, MW-6, MW-2, MW-4, and MW-24 and recovery well RW-2.

For the 4th quarter the analytical results for concentrations of Dissolved Ethene were less than the applicable laboratory RL for monitor wells MW-1, MW-6, MW-2, MW-4, and MW-24 and recovery well RW-2.

Please reference Table 14 for GSI-MKT Dissolved Ethene results. Analytical Dissolved Ethene data for the previous nine (9) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows “Stable”, “Probably Decreasing”, “Stable”, “Probably Decreasing”, “No Trend”, and “Decreasing”.

For the 1st quarter the analytical results for concentrations of Dissolved Iron (filtered) were less than the appliable laboratory RL for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2

For the 2nd quarter the analytical results for concentrations of Dissolved Iron (filtered) were less than the appliable laboratory RL for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2

For the 3rd quarter the analytical results for concentrations of Dissolved Iron (filtered) were less than the appliable laboratory RL for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2

For the 4th quarter the analytical results for concentrations of Dissolved Iron (filtered) were less than the appliable laboratory RL for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2

Please reference Table 15 for GSI-MKT Dissolved Iron (filtered) results. Analytical Dissolved Iron data for the previous nine (9) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows “No Trend”, “Probably Increasing”, “No Trend”, “Probably Increasing”, “Probably Increasing”, and “No Trend”.

For the 1st quarter the analytical results for concentrations of Dissolved Manganese (filtered) ranged from below the applicable laboratory RL for monitor well MW-4 to 0.0461 mg/L for recovery well RW-2.

For the 2nd quarter the analytical results for concentrations of Dissolved Manganese (filtered) ranged from less than the appliable laboratory RL for monitor wells MW-4 and MW-24 to 0.0577 mg/L for recovery well RW-2.

For the 3rd quarter the analytical results for concentrations of Dissolved Manganese (filtered) ranged from less than the appliable laboratory RL for monitor wells MW-4 and MW-24 to 0.0502 mg/L for monitor well MW-2.

The analytical results for concentrations of Dissolved Manganese (filtered) ranged from less than the appliable laboratory RL for monitor well MW-24 to 0.361 mg/L for monitor well MW-2.

Please reference Table 16 for GSI-MKT Dissolved Manganese (filtered) results. Analytical Dissolved Manganese data for the previous five (5) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows “Stable”, “No Trend”, “No Trend”, “No Trend”, “No Trend”, and “Stable”.

For the 1st quarter the analytical results for concentrations of Nitrate ranged from less than the appliable laboratory RL for monitor wells MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 to 1.22 mg/L for monitor well MW-1.

For the 2nd quarter the analytical results for concentrations of Nitrate ranged from less than the appliable laboratory RL for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2.

For the 3rd quarter the analytical results for concentrations of Nitrate ranged from less than the appliable laboratory RL for monitor wells MW-6, MW-2, and MW-24 to 8.39 mg/L for recovery well RW-2.

For the 4th quarter the analytical results for concentrations of Nitrate ranged from less than the appliable laboratory RL for monitor wells MW-2, MW-4, MW-22, and recovery well RW-2 to 3.11 mg/L for monitor well MW-1.

Please reference Table 17 for GSI-MKT Nitrate results. Analytical Nitrate data for the previous nine (9) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows “Stable”, “Stable”, “No Trend”, “No Trend”, “No Trend”, and “No Trend”.

For the 1st quarter the analytical results for concentrations of Sulfate ranged from 859 mg/L monitor well MW-24 to 9820 mg/L for monitor well MW-1.

For the 2nd quarter the analytical results for concentrations of Sulfate ranged from 1040 mg/L monitor well MW-24 to 6180 mg/L for monitor well MW-6.

For the 3rd quarter the analytical results for concentrations of Sulfate ranged from 771 mg/L monitor well MW-24 to 4730 mg/L for monitor well MW-6.

For the 4th quarter the analytical results for concentrations of Sulfate ranged from 894 mg/L monitor well MW-24 to 4530 mg/L for monitor well MW-6.

Please reference Table 18 for GSI-MKT Sulfate results. Analytical Sulfate data for the previous nine (9) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows “Stable”, “Stable”, “No Trend”, “Increasing”, “No Trend”, and “Stable”.

For the 1st quarter the analytical results for concentrations of COD ranged 55.0 mg/L for monitor well MW-2 to 760 mg/L for recovery well RW-2.

For the 2nd quarter the analytical results for concentrations of COD ranged 180 mg/L for monitor well MW-2 to 770 mg/L for monitor well MW-1.

For the 3rd quarter the analytical results for concentrations of COD ranged 51.0 mg/L for monitor well MW-2 to 406 mg/L for monitor well MW-24.

For the 4th quarter the analytical results for concentrations of COD ranged 3.00 mg/L for monitor well MW-2 to 760 mg/L for monitor well MW-24.

Please reference Table 19 for GSI-MKT COD results. Analytical COD data for the previous nine (9) quarters was entered into the GSI Mann-Kendall Toolkit (GSI-MKT) for monitor wells MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2. The GSI-MKT indicated the Concentration Trends for MW-1, MW-6, MW-2, MW-4, MW-24, and recovery well RW-2 were as follows "No Trend", "Stable", "No Trend", "Probably Increasing", "No Trend", and "No Trend".

**SUMMARY**

This report presents the results of monitoring activities for the 2023 annual monitoring period. Currently, there are twenty-seven (27) groundwater monitor wells (MW-1 through MW-30, excluding MW-13, MW-19, and MW-29, which have been plugged and abandoned) and two (2) PSH recovery wells (RW-1 and RW-2) onsite. Manual over-pumping of wells exhibiting elevated hydrocarbon concentrations occurs on a monthly schedule.

The most recent Groundwater Gradient Map, Figure 2D, indicated a general gradient of 0.0055 feet/foot in a southeast direction as measured between monitor wells MW-5 and MW-4. Groundwater Gradient Maps generated during the 1st, 2nd, and 3rd quarters of the reporting period indicated a gradient ranging from 0.0054 feet/foot to 0.0062 feet/foot in a southeast direction. The corrected groundwater elevations ranged between 3,464.49 to 3,472.67 feet above mean sea level, in monitor well MW-27 on August 29, 2023, and in monitor well MW-1 on May 3, 2023, respectively.

Measurable thicknesses of PSH ranging from 0.39 feet to 1.00 feet were detected in monitor well MW-5 during the 2023 reporting period. Measurable thicknesses of PSH ranging from 0.63 feet to 2.35 feet was detected in monitor well MW-7 during the 2023 reporting period. Measurable thicknesses of PSH ranging from 0.15 feet to 0.50 feet were detected in recovery well RW-2 during the reporting period. The maximum PSH thickness of all wells containing PSH was 2.35 feet and was recorded on August 30, 2023, in monitor well MW-7 and is shown on Table 1. The average thickness of PSH in monitor and recovery wells exhibiting PSH was less than 1.14 feet during the reporting period. Approximately 29.6 gallons (0.70 barrels) of PSH was recovered from the Site during the 2023 reporting period. A total of approximately 1,451.84 gallons (34.56 barrels) of PSH has been recovered since project inception.

Review of the laboratory analytical results indicated fifteen (15) monitor wells exhibited BTEX constituent concentrations below the NMOCD regulatory guideline during the 4th quarter 2023 sampling event. Analytical results of groundwater samples collected indicated PAH concentrations appear to be fluctuating in the sampled monitor and recovery wells.

## ANTICIPATED ACTIONS

Quarterly monitoring and groundwater sampling will continue in 2023. Manual over-pumping of selected monitor and recovery wells will occur monthly and will be adjusted according to site conditions. An Annual Monitoring Report will be submitted to the NMOCD before April 1, 2024.

Based on the results of the PAH analysis over the past several years, further PAH analysis will be conducted only on those monitor and recovery wells (MW-4 through MW-7, MW-10, MW-17, MW-18, and RW-1 and RW-2) which have historically exhibited elevated constituents near or above the NMWQCC standards.

Low-flow sampling of MNA parameters will be conducted on monitor wells MW-1, MW-6, MW-2, MW-4, and MW-24 and recovery well RW-2 during each quarterly sampling event. Unforeseen circumstances may require modification of this sampling event.

## LIMITATIONS

TRC has prepared this 2023 Annual Monitoring Report to the best of its ability. No other warranty, expressed or implied, is made or intended.

TRC has examined and relied upon documents referenced in the report and has relied on oral statements made by certain individuals. TRC has not conducted an independent examination of the facts contained in referenced materials and statements. We have presumed the genuineness of the documents and that the information provided in documents or statements is true and accurate. TRC has prepared this report, in a professional manner, using the degree of skill and care exercised by similar environmental consultants. TRC also notes that the facts and conditions referenced in this report may change over time and the conclusions and recommendations set forth herein are applicable only to the facts and conditions as described at the time of this report. This report has been prepared for the benefit of Plains. The information contained in this report, including all exhibits and attachments, may not be used by any other party without the express consent of TRC and/or Plains.

**DISTRIBUTION**

Copy 1
Nelson Velez
Environmental Specialist-Advanced
New Mexico Oil Conservation Division
1000 Rio Brazos Road
Aztec, New Mexico 87410

Copy 2:
Camille Bryant
Plains Marketing, L.P.
1106 Griffith Drive
Midland, TX 79706
cjbryant@paalp.com

Copy 3:
Jeff Dann
Plains Marketing, L.P.
333 Clay Street
Suite 1600
Houston, TX 77002
jpdann@paalp.com

Copy 4:
TRC Environmental Corporation
10 Desta Drive, Suite 130E
Midland, TX 79705
cdstanley@trccompanies.com

**District I**
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
**District II**
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
**District III**
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
**District IV**
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

# State of New Mexico
# Energy, Minerals and Natural Resources
# Oil Conservation Division
# 1220 S. St Francis Dr.
# Santa Fe, NM 87505

CONDITIONS

Action 351134

## CONDITIONS

| Operator: | OGRID: |
|---|---|
| PLAINS MARKETING L.P.<br>333 Clay Street Suite 1900<br>Houston, TX 77002 | 34053 |
| | Action Number:<br>351134 |
| | Action Type:<br>[UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT) |

**CONDITIONS**

| Created By | Condition | Condition Date |
|---|---|---|
| michael.buchanan | Review of the 2023 Annual Monitoring Report for TNM 97-18, Plains Marketing L.P.: content satisfactory 1. Continue to conduct quarterly groundwater monitoring as scheduled. 2. Continue manual over-pumping of select monitoring wells and recovery wells on a monthly basis, and adjust accordingly. 3. Submit the 2024 annual report to OCD via e-permitting online by April 1, 2025. | 7/1/2024 |