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2024 Annual Groundwater Monitoring Report

Former Brickland Refinery

Sunland Park, New Mexico

April 1, 2025

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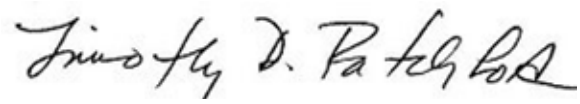

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Executive Summary

This 2024 Annual Groundwater Monitoring Report documents the results of four groundwater monitoring events conducted at the former Brickland Refinery in Sunland Park, New Mexico (site). The 2024 quarterly groundwater monitoring events were conducted in February (February 6-7), June (June 4-5), September (September 10), and December (December 10). This report contains summaries of groundwater elevation and analytical data from the 2024 groundwater monitoring events and historical records.

This monitoring program was conducted in accordance with the Groundwater Monitoring Plan included as Section 3.5 of the Stage 2 Abatement Plan approved by Mr. Bill Olson of the New Mexico Oil Conservation Division (NMOCD) in a letter dated December 17, 1998, and revised in 2006. A request was sent to NMOCD in a letter dated November 7, 2014, to modify the existing sampling performed at the site. The request was approved by Mr. Glenn von Gonten in correspondence dated April 24, 2015, and the Addendum to Abatement Plan AP-001 for the former Brickland Refinery was submitted to NMOCD on June 3, 2015. The modification to the plan requires quarterly sampling for designated wells.

In accordance with the Stage 2 Abatement Plan, quarterly sampling events include water-level and -product thickness measurements in all monitoring wells and analysis of benzene for all sampled wells. In email correspondence dated November 15, 2023, the Oil Conservation Division approved the removal of polycyclic aromatic hydrocarbons (PAHs) from the Abatement Plan as a monitoring parameter for Monitoring Well MW-8. Analysis of groundwater for PAHs was eliminated before the fourth quarter sampling in 2023.

During the 2024 February and June monitoring events, the following samples were collected:

- Five off-site well samples (MW-3S, MW-3D, MW-6S, MW-6D, and MW-9S).
- Five on-site well samples (MW-5, MW-8, MW-10, MW-11, and MW-17).

In an email correspondence dated June 28, 2024, the NMOCD gave approval to suspend sampling and analysis for benzene (beginning during the September 2024 sampling event) in the following monitoring wells:

- MW-3S
- MW-3D
- MW-6S
- MW-6D
- MW-9S
- MW-10
- MW-11
- MW-17.

Onsite Monitoring Wells MW-5 and MW-8 were the only wells sampled in September and December 2024.

The laboratory-reported benzene concentrations for sample collected from MW-5 in June 2024 was above the maximum contaminant level (MCL) of 10 micrograms per liter (µg/L) established in the Stage 2 Abatement Plan.

Historically, there appears to be a relationship between the magnitude for benzene detections reported at MW-5 and MW-8 and the seasonal river stage for the Rio Grande during the June/September sampling events. The 2024 hydrographs show water levels in all site monitoring wells rise concurrently with the elevated river stage, when water is released from Elephant Butte Dam (upstream from Sunland Park near Truth or Consequences,

New Mexico) to the Rio Grande. Historically, the detections of benzene at Monitoring Wells MW-5 and MW-8 seasonally increase at the same time as the rise in water levels. Benzene concentrations at Monitoring Wells MW-5 and MW-8 followed this trend during the 2024 sampling events. The benzene concentrations at both monitoring wells were highest in June (MW-5) and September (MW-8).

Potentiometric groundwater elevation maps are not provided for the September and December 2024 sampling events because only two groundwater monitoring wells were gauged and sampled. The limited number of data points does not provide sufficient resolution to accurately interpret groundwater flow. Historically, the hydraulic gradient beneath the former Brickland Refinery varies slightly across the site in response to river stages and trends to the southeast, parallel to the river. In February and June 2024, the gradient was approximately 0.0025 and 0.0013 foot per foot, respectively. The groundwater flow direction was generally to the southeast, similar to historic trends.

During the February, June, September, and December 2024 sampling events, none of the wells contained measurable amounts of light non-aqueous phase liquid (LNAPL).

Based on the results of ongoing monitoring, the following actions are recommended:

- Continue groundwater monitoring of benzene at Monitoring Wells MW-5 and MW-8.
- Continue evaluations of the relationship between river stages, elevated water-level measurements, and seasonal increases in concentrations of benzene at Monitoring Wells MW-5 and MW-8.

1 Introduction

1.1 Background

The former Brickland Refinery (site) is located in Sunland Park, New Mexico, and consists of approximately 33 acres situated along the west bank of the Rio Grande (Figure 1). Huntsman International LLC (Huntsman) currently owns the site. From 1933 to 1958, the site was operated by previous owners as a petroleum refinery, producing both gasoline and jet fuel. The site was closed and the plant dismantled by the previous owners in 1958. Between 1964 and 1989, the site was leased by the previous owners to various parties to service trucks, conduct automobile salvage operations, graze livestock, and store used bricks.

Petroleum hydrocarbons have been reported in soil and groundwater at the site since the sampling program was initiated in December 1993. The distribution of petroleum hydrocarbons was investigated, and these investigations provided the basis for the Stage 2 Abatement Plan approved by Mr. Bill Olson of the New Mexico Oil Conservation Division (NMOCD) on December 17, 1998. The Stage 2 Abatement Plan provides the methods for abating contamination of groundwater and soil in compliance with New Mexico Water Quality Control Commission (NMWQCC) regulations on prevention and abatement of water pollution (20 New Mexico Administrative Code 6.2, Subpart IV) and NMOCD requirements to protect public health and the environment with respect to wastes from the refinement of crude oil (Section 70 2 12.8 [22] New Mexico Statute Annotated 1978).

The sampling protocol was modified in 2006, and modifications were implemented during the June 2006 monitoring event. A request to further modify sampling performed at the site was sent to NMOCD in a letter dated November 7, 2014. The request was approved by Mr. Glenn von Gonten in correspondence dated April 24, 2015, and the Addendum to Abatement Plan AP-001 for the former Brickland Refinery was submitted to NMOCD on June 3, 2015. The revised protocol is in general accordance with applicable NMOCD, New Mexico Environment Department, and U.S. Environmental Protection Agency (USEPA) regulations, procedures, and guidelines.

Huntsman maintained a stand-alone light non-aqueous phase liquid (LNAPL) recovery system at the site (at MW-10) as part of the Stage 2 Abatement Plan. The system was installed in December 1998 and shut down in June 2008 because no free-phase product was removed from MW-10 in 2006, 2007, or 2008.

In email correspondence dated November 15, 2023, the Oil Conservation Division approved the removal of polycyclic aromatic hydrocarbons (PAHs) from the Abatement Plan as a monitoring parameter for Monitoring Well MW-8. Analysis of groundwater for PAHs was eliminated before the fourth quarter sampling in 2023.

The current groundwater monitoring program conducted as part of Abatement Plan AP-001 includes:

- Collection of water levels and groundwater samples on a quarterly basis at the locations of five off-site monitoring wells (MW-3S, MW-3D, MW-6S, MW-6D, and MW-9S) and five on-site wells (MW-5, MW-8, MW-10, MW-11, and MW-17).
- Analysis of groundwater for benzene at all monitoring well locations.
- Monitoring for LNAPL at all monitoring wells.
- Extraction of LNAPL at Recovery Well MW-10 (when present).
- Submittal of an annual groundwater monitoring report.

In an email correspondence dated June 28, 2024, the NMOCD gave approval to suspend sampling and analysis for benzene (beginning during the September 2024 sampling event) in the following monitoring wells:

- MW-3S
- MW-3D
- MW-6S
- MW-6D
- MW-9S
- MW-10
- MW-11
- MW-17.

These monitoring wells have demonstrated at least eight consecutive quarters below the MCL of 10 µg/L) established in the Stage 2 Abatement Plan. Quarterly sampling at monitoring wells MW-5 and MW-8 will continue.

The site layout and monitoring well locations are shown on Figure 2.

1.2 Scope of Services

Arcadis performed quarterly groundwater monitoring at the site in February, June, September, and December 2024. Table 1 provides a summary of the groundwater sampling methods, purging methods, and laboratory analyses that were performed during the quarterly sampling events. The following activities were included during quarterly monitoring, as required by the Groundwater Monitoring Plan and 2015 Addendum to Stage 2 Abatement Plan as approved by NMOCD:

- Depth-to-groundwater measurements were recorded for five on-site monitoring wells and five off-site monitoring wells during the February and June monitoring events. Following approval to suspend sampling at eight of these wells, only two wells were gauged in September and December. Historical groundwater elevations for the monitoring wells are provided in Table 2, and groundwater elevation contour maps for the 2024 monitoring events are depicted on Figures 3 and 4. Potentiometric groundwater elevation maps are not provided for the September and December 2024 sampling events because only two groundwater monitoring wells were gauged and sampled. The limited number of data points does not provide sufficient resolution to accurately interpret groundwater flow.
- Groundwater sampling was conducted in February, June, September, and December 2024. Five off-site monitoring wells (MW-3S, MW-3D, MW-6S, MW-6D, and MW-9S) and five on-site wells (MW-5, MW-8, MW-10, MW-11, and MW-17) were sampled in February and June. Approval to suspend sampling at select wells (MW-3S, MW-3D, MW-6S, MW-6D, MW-9S, MW-10, and MW-11, and MW-17) was received after the June sampling event to suspend sampling at select wells, only Monitoring Wells MW-5 and MW-8 were sampled in September and December 2024.
- Analytical testing included benzene for all wells sampled (using USEPA Test Method 8260C) during the February, June, September, and December 2024 events. The analytical results are shown in Table 3.
- All sampled monitoring wells were monitored for the presence of LNAPL, and a summary of the LNAPL thicknesses is graphed on Figure 7 and provided in Table 4.

Extraction system operations and maintenance reports were not prepared because the extraction system was shut down in June 2008 due to an absence of LNAPL in Recovery Well MW-10.

2 Groundwater Elevation, Hydraulic Gradient, and Flow Direction

The hydraulic gradient beneath the former Brickland Refinery varies slightly across the site. This variability is in part a response to river-stage fluctuations. Potentiometric groundwater elevation maps are not provided for the September and December 2024 sampling events because only two groundwater monitoring wells were gauged and sampled. The limited number of data points does not provide sufficient resolution to accurately interpret groundwater flow. In February and June 2024, the gradient was approximately 0.0025 and 0.0013 foot per foot, respectively. The groundwater flow direction was generally to the southeast, parallel to the river.

Historical groundwater elevations for the monitoring wells are provided in Table 2. Water levels are not listed for the well points because the well points were specifically designed to detect LNAPL at a discrete depth and the screened intervals do not correlate with the monitoring well screens. Groundwater elevation contour maps for the February and June 2024 monitoring events are depicted on Figures 3 and 4, respectively.

Groundwater levels in the monitoring wells are influenced by the stage of the Rio Grande, which borders the site. Due to observed seasonal fluctuations in the river, water levels in the monitoring wells may vary as much as 2 feet over the course of a year. Monitoring of groundwater elevations since June 2003 indicates a consistent pattern of higher water elevations in the wells and the river during summer sampling events and lower water elevations during winter sampling events.

3 LNAPL Product Thickness and Removal

3.1 LNAPL Product Thickness

The potential occurrence of LNAPL in the site's monitoring wells was evaluated visually during gauging of water levels and with an interface probe. Measurable thicknesses of LNAPL were not found in any wells during the four 2024 monitoring events. Recent and historical measurements dating back to June 2003 are graphed on Figure 5 and listed in Table 4. LNAPL thickness maps were not prepared for this report because none of the wells contained measurable amounts of LNAPL during the four events.

3.2 LNAPL Removal

Historically, approximately 235 gallons of LNAPL have been removed from MW-10 since December 1998, when the product recovery system was installed. LNAPL yields were no longer recovered in measurable amounts during 2006 and 2007, and the recovery system was shut down/disconnected in June 2008. Subsequently, no LNAPL was removed from MW-10 in 2008, 2009, 2010, or 2011. In 2012, manual LNAPL removal was initiated for MW-10 in response to a measurable thickness present in MW-10 as of December 2011. During the February and June 2024 sampling events, no product thickness was observed in MW-10.

4 Sample Collection and Laboratory Analytical Testing Procedures

4.1 Decontamination for Fluid-Level Measurements

The interface probe was decontaminated prior to each use and between each well to prevent the introduction of external contamination or artifacts into a well. A wash and double-rinse decontamination procedure was used. The procedure consisted of washing the probe with Liquinox, a mild, non-phosphate detergent, and then rinsing twice with water.

4.2 Calibration of Multi-Probe Water Analyzer

The multi-probe analyzer was calibrated by Geotech for each sampling event prior to use at the site. Each calibration was carried out in accordance with the equipment manufacturer's procedures and recommendations.

4.3 Well Purging and Field Parameter Measurements

The monitoring wells were purged using low-flow/low-stress techniques prior to sampling. Low-flow purging involves removing small volumes of groundwater at very low pumping rates until certain field parameters have stabilized. Field parameter measurements were recorded while each well was purged through the multi-probe flow cell. The groundwater temperature, pH, specific conductance, dissolved oxygen, oxidation reduction (redox) potential, and turbidity were documented on the Groundwater Sampling Logs provided in Appendix A. Purging of each well was continued until three consecutive readings for three field parameters (dissolved oxygen, redox potential, and turbidity) stabilized within 10 percent of one another. When stabilization was achieved, well purging was discontinued and the well was sampled. The total volume of water purged prior to sample collection was recorded on the Groundwater Sampling Log for each well. The purged water was containerized for disposal.

Approximately 1 to 2 gallons of water were removed from each well prior to sampling. Field data collected during the purging of each well are provided in Appendix A. Groundwater odor, color, and other physically apparent characteristics were documented. Monitoring well integrity was also documented (see the Daily Field Reports provided in Appendix A).

During the February, June, September, and December 2024 sampling events, all wells sampled were purged with peristaltic pumps. All tubing used with the peristaltic pumps was dedicated and/or replaced at each well. A combined total of approximately 20 gallons of water was purged from the sampled monitoring wells during the February and June monitoring events and approximately four gallons during the September and December monitoring events. Rhino Environmental Services is handling the collection of purged water from these monitoring events for subsequent nonhazardous disposal at an approved facility.

4.4 Groundwater Sample Collection

All samples were labeled with the sampling location, date, time, and testing requirements on self-adhering labels provided by the laboratory. The groundwater samples were analyzed by USEPA Method 8260C for benzene in

the February, June, September, and December 2024 monitoring events. Three 40-milliliter (mL) unpreserved glass vials were used as sample containers for volatile organic compounds. Water was collected from the well via tubing directly into the glass vial until a convex meniscus formed above the lip of the bottle. Once capped, the vial was checked for air bubbles (headspace) by turning it upside down, tapping the cap of the inverted bottle, and visually inspecting the bottle contents. No bubbles were observed in the vials shipped to the laboratory.

4.5 Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC program includes collection of field blanks, equipment blanks, and duplicate samples. The water samples collected during the monitoring events were placed in ice-filled coolers immediately after collection and shipped to ALS Environmental in Houston, Texas, for analysis. In each event, chain of-custody forms documenting sample identification numbers, the required analysis for each sample, collection times, and delivery times to the laboratories were completed for each set of samples. Copies of chain-of-custody forms are provided in Appendix B. Descriptions of the QA/QC samples and evaluation of QA/QC results for 2024 are presented below.

4.5.1 Field Blanks

Field blanks were used to determine potential absorption of volatile organics from ambient air into the water samples. The blanks for volatile organics were collected by filling three 40-mL glass vials with distilled water at the time of sampling. Field blanks were analyzed for benzene during the February, June, September, and December 2024 sampling events. None of the constituents were detected in the field blanks collected during the four sampling events.

4.5.2 Equipment Blanks

Equipment blanks were collected on non-dedicated or new sampling equipment. During the February, June, September, and December 2024 sampling events, equipment blanks were collected from the water-level indicator. Immediately following decontamination, equipment blanks were collected by pouring distilled water over the equipment and then filling three 40-mL glass vials with water from the equipment. Equipment blanks were analyzed for benzene during the February, June, September, and December 2024 sampling events. Benzene was not detected in the equipment blanks collected during the four sampling events.

4.5.3 Duplicate Samples

Two duplicate samples were collected during the February and June 2024 monitoring events, and one duplicate sample was collected during the September and December 2024 monitoring events. Duplicate samples were collected from Monitoring Wells MW-3D (February and June) and MW-8 (February, June, September, and December). Analytical results for benzene in the duplicate sample were consistent with the parent samples.

5 Groundwater Analytical Results

5.1 Benzene

According to the Stage 2 Abatement Plan, benzene concentrations are measured quarterly during the February, June, September, and December sampling events. Benzene was reported in concentrations above the Stage 2 Abatement Plan MCL of 10 µg/L in samples collected from Monitoring Well MW-5 in the June 2024 event. Laboratory results for benzene analyses are shown in Table 3, and copies of the laboratory reports are provided in Appendix B.

5.2 Trend Analyses and Seasonal Concentration Increases

A graph showing trends for detected concentrations of benzene is provided as Figure 8. Measurements for stages in the Rio Grande from IBWC were used to evaluate the relationship between high river stages, water-level elevations in Site monitoring wells, and detections of benzene. These hydrographs are provided as Figures 7 and 8.

Historically, there appears to be a relationship between the magnitude for benzene detections reported at MW-5 and MW-8 and the seasonal river stage for the Rio Grande during the June/September sampling events. Figure 7 shows the relationship between elevated seasonal river stages and the water-level elevations measured in the monitoring wells. The hydrographs evaluated during 2024 show that water levels in all Site monitoring wells rise concurrently with the elevated river stage, which results during June/September when water is released from Elephant Butte Dam (upstream from Sunland Park near Truth or Consequences, New Mexico) to the Rio Grande.

The detections of benzene at Monitoring Wells MW-5 and MW-8 seasonally increase at the same time as the rise in water levels. As shown on Figure 8, it appears that the benzene concentration at Monitoring Wells MW-5 and MW-8 followed this trend. The benzene concentrations at both monitoring wells were highest in June (MW-5) September (MW-8).

Overall, it appears that detections of benzene at Monitoring Wells MW-5 and MW-8 seasonally increase due to the rise in water levels into vadose zone sediments, where residual concentrations are present. Evaluations of this relationship will continue during future sampling events.

6 Remediation Performance

6.1 Bioremediation Pilot Testing

Absorbent socks were used during 2011 and the first half of 2012 as a pilot test to evaluate bioremediation by enhancing natural attenuation. The absorbent socks use a patented calcium peroxide (45 to 70 percent composition) and calcium hydroxide (10 to 20 percent composition) solid granular material to react with water to release oxygen slowly, which stimulates aerobic biodegradation of groundwater contaminants. During the June 2012 sampling event, the “O-Sox” were removed from MW-5 and MW-8 and have not been replaced. Based upon these conditions, it appears that the absorbent socks used for pilot testing have addressed conditions at MW-5 and MW-8.

6.2 Product Recovery

During the February, June, September, and December 2024 sampling events, no measurable amount of LNAPL was observed in MW-10 or in any of the other sampled monitoring wells.

7 Conclusions

Overall, the reported concentrations in groundwater appear to be stable or decreasing. During the 2024 reporting period, benzene concentrations from Monitoring Well MW-5 exceeded the MCL established in the Stage 2 Abatement Plan only during the June 2024 sampling event. Review of laboratory results shows general consistency through time in benzene concentrations in MW-5 and MW-8. This stable/decreasing trend will be verified with future sampling events.

Historically, there appears to be a relationship between the magnitude for benzene detections reported at MW-5 and MW-8 and the seasonal river stage for the Rio Grande during the June/September sampling event. The hydrographs evaluated during 2024 show that water levels in all Site monitoring wells rise concurrently with the elevated river stage, which results during June or September when water is released from Elephant Butte Dam (upstream from Sunland Park near Truth or Consequences, New Mexico) to the Rio Grande. Historically, the detections of benzene at Monitoring Wells MW-5 and MW-8 seasonally increase at the same time as the rise in water levels. During 2024, it appears that the benzene concentration at Monitoring Wells MW-5 and MW-8 followed this trend. The benzene concentrations at both monitoring wells were highest in June and September.

During the February, June, September, and December 2024 sampling events, no measurable amount of LNAPL was observed in Monitoring Well MW-10 or in any of the other monitoring wells.

8 Recommendations

Based upon data collected during the 2024 sampling program, the following recommendations are proposed for the remediation system and monitoring operations at the former Brickland Refinery:

- Continue groundwater monitoring of benzene at Monitoring Wells MW-5 and MW-8.
- Continue evaluations of the relationship between river stages, elevated water-level measurements, and seasonal increases in concentrations of benzene at Monitoring Wells MW-5 and MW-8.

Tables

Figures

Appendix A

Field Data

Appendix B

Laboratory Analytical Reports

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CONDITIONS

Operator: Huntsman Advanced Materials LLC 10003 Woodloch Forest Drive The Woodlands, TX 77380	OGRID: 330766
	Action Number: 445061
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

CONDITIONS

Created By	Condition	Condition Date
michael.buchanan	Review of the 2024 Annual Groundwater report for Former Brickland Refinery: content satisfactory. Continue to conduct groundwater monitoring for benzene at Monitoring Wells MW-5 and MW-8. ? Continue evaluations of the relationship between river stages, elevated water-level measurements, and seasonal increases in concentrations of benzene at Monitoring Wells MW-5 and MW-8. Submit the 2025 Annual Report to OCD not later than April 1, 2026.	4/25/2025