



# Stage 2 Abatement Plan

**Darr Angell No. 2**

**Lea County, New Mexico**

**NMOCD AP-007**

**Incident ID #: nAPP2108852096**

Plains All American

January 14, 2026

→ **The Power of Commitment**

# Contents

<b>1.</b>	<b>Introduction</b>	<b>1</b>
<b>2.</b>	<b>Site History</b>	<b>1</b>
<b>3.</b>	<b>Current Site Conditions</b>	<b>2</b>
<b>4.</b>	<b>Development and Assessment of Abatement Options</b>	<b>3</b>
4.1	Remedial Drivers	4
4.2	Abatement Options	5
4.2.1	Multi-Phase Extraction / Dual-Phase Extraction	6
4.2.1.1	Applicability for LNAPL Treatment	6
4.2.1.2	Applicability for Groundwater Treatment	6
4.2.2	Biosparging and Bioventing	6
4.2.2.1	Applicability for LNAPL Treatment	7
4.2.2.2	Applicability for Groundwater Treatment	7
4.2.3	Passive Recovery: Absorbent Socks	7
4.2.3.1	Applicability for LNAPL Treatment	7
4.2.3.2	Applicability for Groundwater Treatment	7
4.2.4	Monitored Natural Attenuation and Natural Source Zone Depletion	7
4.2.4.1	Applicability for LNAPL Treatment	8
4.2.4.2	Applicability for Groundwater Treatment	8
<b>5.</b>	<b>Description of Preferred Abatement Option</b>	<b>8</b>
<b>6.</b>	<b>Modification of Monitoring Program</b>	<b>9</b>
6.1	Monitoring and Sampling Frequency	9
<b>7.</b>	<b>Additional Investigations</b>	<b>9</b>
<b>8.</b>	<b>Site Maintenance Activities</b>	<b>10</b>
<b>9.</b>	<b>Abatement Schedule</b>	<b>10</b>
<b>10.</b>	<b>Public Notice Proposal</b>	<b>11</b>
<b>11.</b>	<b>Conclusion</b>	<b>11</b>
<b>12.</b>	<b>Scope and Limitations</b>	<b>11</b>

## Figure index

Figure 1	Site Location Map
Figure 2	Site Details Map
Figure 3	Potentiometric Surface Map (May 2025)
Figure 4	COC Concentrations in Groundwater (May 2025)
Figure 5	Proposed Well Locations

## Table index

Table 1	Summary of Fluid Level Measurements - May 2025
Table 2	Evaluation of Abatement Options

## Appendices

Appendix A	Release Notification and Corrective Action, Form C-141
Appendix B	LNAPL Transmissivity Memorandum
Appendix C	Natural Source Zone Depletion Assessment
Appendix D	ITRC, 2018 - LNAPL-3 Site Management, Section 3.3.5
Appendix E	Public Notice

# 1. Introduction

This *Stage 2 Abatement Plan (AP)* presents the remedial approach proposed by GHD Services Inc. (GHD) for the Plains Marketing, L.P. (Plains) Darr Angell No. 2 release Site (Site) in compliance with the New Mexico Oil Conservation Division (NMOCD) response on September 24, 2025, to Application ID: 498428. This report is submitted pursuant to 19.15.30 New Mexico Administrative Code (NMAC) and supersedes the initial AP submitted for the Site in September 2002.

The Site is located approximately 11.9 miles northeast of Lovington and in the SW ¼, SE ¼ Section 11, Township 15 South, Range 37 East; and NW ¼, NE ¼, Section 14, Township 15 South, Range 37 East in Lea County, New Mexico. The coordinates of this Site are 33.0242° N and 103.1668° W. The location of the Site is shown on Figure 1. A detailed map of the Site is provided on Figure 2. The property affected by the release is private property currently managed by Plains. The Site is regulated by the NMOCD under Abatement Permit 007 and is associated with incident number nAPP2108852096. This report summarizes:

- Site History
- Current Site Conditions
- Development and Assessment of Abatement Options
- Modification of Monitoring Program
- Additional Investigations
- Site Maintenance Activities
- Assessment and Abatement Schedule
- Public Notification Proposal
- Conclusion

# 2. Site History

A crude oil release occurred on July 29, 1999, from an 8-inch Enron Oil Trading and Transportation (EOTT) pipeline. The cause of the release was due to external pipeline corrosion. July 29, 1999, an Initial Release Notification and Corrective Action Form C-141 was submitted to the NMOCD and the release was assigned AP No. AP-007. A copy of the Release Notification and Corrective Action Form C-141 is attached as Appendix A.

Initial remediation activities began in August 1999 and consisted of 40 soil borings installed within and around the area of surface staining. In April and May 2000, a contractor for EOTT excavated the impacted area. Excavation activity resumed in April and May 2001 with additional removal of impacted soil. Between April 2000 and December 2002, ten monitoring wells (MW-1 through MW-10) and seven recovery wells (RW-1 through RW-7) were drilled and installed to delineate the extent of groundwater contamination and light non-aqueous phase liquid (LNAPL) and to monitor the concentrations of constituents of concern (COCs). On March 11, 2002, partial backfilling of the open excavation was conducted subsequent to NMOCD approval of a backfill request.

Assessment activities were conducted by previous consultants prior to May 2, 2011, when Conestoga-Rovers & Associates, Inc. (CRA, now known as GHD) began providing Site groundwater project management and remediation services. Total dissolved solids (TDS) and chloride concentrations in groundwater were evaluated in 2000 and were confirmed below applicable screening criteria. These analytes were therefore removed as COCs for this release.

In October 2014, GHD provided oversight of the installation of one monitoring well (MW-4R) and four recovery wells (RW-7R, RW-8, RW-9, and RW-10) to further delineate the extent of LNAPL and COCs in groundwater. In

February 2017, GHD provided oversight of the installation of one monitoring well (MW-12) and two recovery wells (RW-11 and RW-12) to further delineate the extent of LNAPL and COCs in groundwater. In February 2020, GHD provided oversight of the plugging and abandonment (P&A) of nine monitoring wells (MW-1, MW-2, MW-3, MW-6, MW-7, MW-8, MW-9, MW-10, and MW-11) and one recovery well (RW-4) and the installation of seven new monitoring wells (MW-3R, MW-6R, MW-7R, MW-8R, MW-9R, MW-10R, and MW-13) and three recovery wells (RW-4R, RW-13, and RW-14) to further delineate the extent of LNAPL and COCs in groundwater. All Site monitoring and recovery wells were installed by a licensed New Mexico well driller with NMOCD approval.

Abatement activities to reduce the amount of LNAPL (liquid and vapor) in the subsurface have been implemented at the Site since 2005. A trailer-mounted mobile dual-phase extraction (MDPE) unit was installed and began operating at the Site in October 2012. The system included four (4) AP4 bottom loading pumps, a vapor-liquid separator, an air compressor, a vacuum extraction manifold, and an above-ground tank for storage of extracted LNAPL and groundwater. A MDPE remediation system continues to be used at the Site to abate LNAPL and related groundwater impacts and the pumps are moved between wells based on LNAPL thickness. In 2024 the remediation system operated for 165 days and recovered approximately 1,200 gallons of LNAPL and approximately 60,000 gallons of groundwater. The pumps have been deployed at the following locations in the last 4 years (2022 to 2025): RW-4R, RW-10, RW-13, and RW-14. LNAPL abatement has been conducted periodically in the remaining wells with measurable LNAPL using a hand bailer or monsoon pump. Enhanced fluid recovery (EFR) was implemented for wells with measurable LNAPL and that were not serviced by the remediation system in 2019 and 2020 using a vacuum truck and a drop hose. A total of 33,077 gallons of LNAPL have been recovered from the subsurface of the Site since 2005.

Wells at the Site have been gauged for water levels and the presence of LNAPL at a frequency ranging from a monthly to a quarterly basis from January 2021 to November 2024. The transition to semi-annual monitoring was approved by NMOCD on July 24, 2024, for 2025. The dissolved-phase COCs at the Site are benzene, toluene, ethylbenzene, and total xylenes (BTEX). In previous years, groundwater samples were analyzed for polycyclic aromatic hydrocarbons (PAH) on an annual basis from monitoring or recovery wells that did not previously meet the criteria of two consecutive years of PAH compounds being below the New Mexico Water Quality Control Commission (NMWQCC) Human Health Standards (HHS) and below 0.001 milligrams per Liter (mg/L) for PAH compounds with no NMWQCC standard, as required by the NMOCD. Due to prior analytical results meeting criteria of two consecutive years with concentrations less than NMWQCC Human Health Standard (HHS) for PAH compounds, groundwater samples were not collected for analysis of PAH compounds in 2024.

TDS and chloride concentrations in groundwater were evaluated in the summer of 2000 and were confirmed below applicable screening criteria. These analytes were therefore removed as COCs for the release at this Site.

A detailed map of the Site with monitoring and recovery well locations depicted is provided on Figure 2. Groundwater samples were collected from wells where LNAPL was not present and analyzed for BTEX. Analytical results are compared with the NMWQCC HHS.

### 3. Current Site Conditions

The Site currently has a network of twenty-three monitoring and recovery wells, which were monitored semi-annually in 2025 to evaluate the concentrations of COCs in impacted groundwater and to delineate the extent of LNAPL. Depth to groundwater is gauged, and the elevation of the potentiometric surface from May 2025, is presented on Figure 3. Depth to groundwater measurements are provided in Table 1. Groundwater flow across the Site predominantly exhibits an eastward hydraulic gradient of approximately 0.001 foot per linear foot (ft/ft), with groundwater flow direction predominantly to the southeast.

Water levels at this Site have been decreasing at a rate of approximately 0.8 foot per year. In 2025, three out of the twenty-three monitoring and recovery wells were dry. Water column height, as measured in May 2025, is indicated for each monitoring well in Table 1.

The area of LNAPL impacts in 2025 included eleven recovery wells with detected LNAPL (RW-4R, RW-5, RW-6, RW-7R, RW-8, RW-9, RW-10, RW-11, RW-12, RW-13, and RW-14). The thicknesses of LNAPL measured in May 2025, ranged from <0.1 ft to 7.2 ft and are shown in Table 1 and on Figure 4.

Dissolved phase BTEX impacts are associated with released LNAPL and have historically been detected at monitoring wells MW-3/3R, MW-4R, MW-8, MW-9, MW-11, and MW-12, with exceedances of the HHS at three monitoring wells (MW-3, MW-4R, and MW-12). In the last five years (2021 to 2025) there was one exceedance of benzene at MW-4R (May 2023; 0.00731 mg/L of benzene). At downgradient monitoring well MW-12, BTEX was non-detect or at very low concentrations from installation in 2017 to 2020. Benzene exceeded the criterion from 2020 to 2021, was below the criterion from 2022 to 2024, and in recent events has again been greater than the HHS (May 2024 to November 2025). Due to these elevated benzene concentrations at this downgradient well, the area of impact at the Site is not delineated. A summary of BTEX data from the May 2025 sampling event is provided on Figure 4.

Current LNAPL abatement activities at the Site consist of a trailer-mounted automated MDPE system operating four total-fluid recovery pumps installed in RW-4R, RW-10, RW-13, and RW-14. Weekly operation and maintenance (O&M) activities include inspection of the wellheads and flowlines, adjustment of pump depths, gauging recovered fluid levels in the LNAPL storage tank, and general housekeeping to ensure efficient system operation.

LNAPL transmissivity ( $T_n$ ) testing was conducted in June and October 2025, on three recovery wells (RW-7R, RW-11 and RW-14) to evaluate current Site conditions; MPDE pumps were removed from wells a week prior to testing to allow Site conditions time to equilibrate. Testing was performed pursuant to the methodology contained in American Society for Testing and Materials (ASTM) International Standard E2856-13, *Standard Guide for Estimation of LNAPL Transmissivity* (May 2013) using the baildown technique at select wells with recent static/equilibrium in-well LNAPL thickness of at least 0.5 feet (ft). Data from the recent transmissivity testing has been evaluated and conclusions have been included as part of the abatement option assessment discussed in this AP. In comparison to the now widely accepted de minimis LNAPL recoverability guideline value suggested by the Interstate Technology & Regulatory Council (ITRC, 2009 and 2018) (0.8 square feet per day [ft<sup>2</sup>/day] or 0.07 square meter per day [m<sup>2</sup>/day])<sup>1</sup>, the LNAPL in the vicinity of recovery wells RW-7R, RW-11 and RW-14 is in a de minimis mobility/recoverability condition. A de minimis  $T_n$  condition is widely accepted as a practical endpoint to LNAPL recovery where LNAPL has been recovered to the maximum extent practicable and LNAPL that remains will largely exist as immobile/unrecoverable residual. The complete LNAPL transmissivity memorandum is provided in Appendix B.

## 4. Development and Assessment of Abatement Options

Understanding the Site concerns along with the goals and objectives of different remedial options is the basis for the determination of an effective and appropriate remedial strategy for the Site. The development and assessment of abatement options was a multistep process involving the following:

- Review of Site conditions (current and historical) and abatement activities previously implemented at the Site.
- Determination of remaining Site-specific concerns (remedial drivers) (Table 4.1; included below).
- Identification of appropriate abatement options based on those drivers (Table 2).
- An initial review of those options with respect to Site conditions to screen out options not implementable or that would be unsuccessful at this Site (Table 2).
- A detailed discussion of the remaining remedial options to determine the preferred option(s) capable of addressing Site concerns (included below).

<sup>1</sup> ITRC (Interstate Technology & Regulatory Council). 2018. *Light Non-Aqueous Phase Liquid (LNAPL) Site Management: LCSM Evolution, Decision Process, and Remedial Technologies*. ITRC Document No. LNAPL-3. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPL Update Team. Link: [LNAPL-3 Guidance](#)

This process was based on guidance provided by ITRC, as their guidance documents are recognized as the industry standard. ITRC LNAPL remediation technology guidance is provided in the following link: [LNAPL-3 Guidance](https://lnapl-3.itrcweb.org/) (<https://lnapl-3.itrcweb.org/>).

## 4.1 Remedial Drivers

The first step in remediation is to review and determine the issue at the Site that is driving the need for abatement. Determination of remedial drivers for this Site followed the methodology proposed by ITRC (2018) in categorizing potential remedial drivers as associated with (1) saturation reduction (relating to LNAPL movement), (2) compositional change (relating to potential exposures/risks), or (3) other (non-technical drivers flowing from regulatory requirements or other stakeholder priorities). The determination of remedial drivers/abatement options was facilitated by the decision-making matrix shown below as Table 4.1 (from FCSAP, 2020<sup>2</sup> and CRC CARE, 2020<sup>3</sup>). This approach ensures a standardized process resulting in the recommendation of sustainable, science- and risk-based LNAPL management strategies that will be effective in achieving Site goals.

The decision-making matrix lays out the eight possible scenarios that may be encountered at an LNAPL Site with respect to potential compositional or saturation-based concerns/remedial drivers. Remedial drivers/concerns at this Site were determined using discussions of the Site history and current Site conditions (part of the LNAPL Site conceptual model) and the following questions:

- Are there compositional risks (i.e., dissolved or vapor-phase risks)? Yes, there are currently downgradient exceedances of benzene in groundwater and currently the dissolved phase plume is not delineated.
- Is LNAPL unstable or migrating? No, the LNAPL body is not migrating or expanding (i.e., mobile LNAPL has not been observed in new wells).
- Is there mobile LNAPL within a stable LNAPL body? Yes, mobile LNAPL is present in Site wells, but within a stable LNAPL body.
- Is LNAPL recoverable? Possibly in some areas, but not practicable to recover in all areas. The current MDPE system recovered approximately 1,198 gallons of LNAPL in 2024 while operating on four wells (RW-4R, RW-10, RW-13, and RW-14). However, LNAPL transmissivity testing indicated a de minimis LNAPL condition in one of those wells (RW-14) along with two other Site wells (RW-7R and RW-11); thus, LNAPL recovery would not be expected to provide a technical benefit in the area of those three wells.

All possible combinations of the conditions listed above are presented on the left side of Table 4.1. The right side of the Table 4.1 is based on ITRC LNAPL-3 guidance and indicates the appropriate LNAPL management/remediation required for each type of Site. For Sites with compositional concerns and mobile LNAPL but no other concerns, the applicable NAPL Site management scenario is Scenario 3. For Sites with compositional concerns and mobile LNAPL that is potentially recoverable, the applicable NAPL Site management scenario is Scenario 2. These are indicated in Table 4.1 below.

<sup>2</sup> Federal Contaminated Sites Action Plan *Guidance Document on the Management of LNAPL on Federal Contaminated Sites*. March 2020. [link to 22020.0-FCSAP-LNAPL guidance-Covers-EN](#)

<sup>3</sup> CRC CARE. 2020. *The role of natural source zone depletion in the management of light non-aqueous phase liquid (LNAPL) contaminated Sites*. CRC CARE Technical Report no. 46. CRC for Contamination Assessment and Remediation of the Environment, Newcastle, Australia. [link to CRC CARE 2020 document](#)

(A) Possible LNAPL site concerns/technical remedial drivers					(B) Potential LNAPL site management options		
Scenario ID Number	Compositional risk? (dissolved or vapor-phase risk)  <b>Key Indicators:</b> exceedance of risk-based criteria and complete or potentially complete	LNAPL body migrating or expanding?  <b>Key Indicators:</b> progressive expansion in extent of LNAPL in wells and/or expanding dissolved plume	Mobile LNAPL within stable LNAPL body?  <b>Key Indicators:</b> LNAPL observed in wells with no evidence of LNAPL migration or expansion	LNAPL recovery considered practicable?  <b>Key Indicators:</b> LNAPL transmissivity de minimis criterion exceedance ( $T_n > 0.8 \text{ ft}^2/\text{day}$ )	Active compositional change techniques and/or controls	Active saturation reduction (LNAPL mass recovery) techniques providing a technical benefit and/or containment	Saturation reduction (LNAPL mass recovery) to meet a Regulatory Requirement
1	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Yes	No	Yes	Possibly for some wells	Yes	Evaluate potential benefit	Yes
3	Yes	No	Yes	No	Yes	No	Yes
4	Yes	No	No	No	Yes	No	No
5	No	Yes	Yes	Yes	No	Yes	Yes
6	No	No	Yes	Yes	No	Evaluate potential benefit	Yes
7	No	No	Yes	No	No	No	Yes
8	No	No	No	No	No	No	No
<b>Site Specific Results</b>	Yes - indicates Scenarios 1-4	No - rules out #1, leaves Scenarios 2-4	Yes - rules out #4, leaves Scenarios 2&3	Possibly for some wells; No for some wells - still leaves Scenarios 2&3	Management Options for Scenario 2 and/or 3 apply to this Site.		

Notes: The technically appropriate remedial strategy (B) will be defined by the site-specific scenario concerns (A).

Side B of Table 4.1 indicates Site management options that correspond to Sites of Type 2 and 3. Compositional change and/or controls are applicable to this Site as there are exceedances of benzene in the well downgradient from the LNAPL area. With regards to saturation-based concerns, transmissivity testing indicates that the LNAPL in the area of the three wells tested is not practicably recoverable, but not all wells have been tested. Active saturation reduction (mass recovery) may still be providing some technical benefit to the Site and be an appropriate abatement option, but additional testing and system evaluation will assist with that determination. Saturation reduction such as passive recovery to meet regulatory requirements may be needed in some locations.

## 4.2 Abatement Options

ITRC LNAPL-3 discusses and categorizes 21 different remedial technologies based on whether they provide a compositional change (e.g., via biodegradation), an LNAPL saturation reduction (e.g., mass removal), or containment (e.g., physical barrier). The selection of abatement options for the Darr Angell #2 Site (Table 2) was undertaken based on the remedial drivers for the Site (LNAPL removal from wells and dissolved phase VOCs exceeding the HHS in the downgradient well) and abatement options employed at the Site in 2024 and 2025. After an initial screening process comparing Site-specific evaluation factors (technology objective, advantages, disadvantages, effectiveness, and implementability) against selected technologies, the following abatement options were retained for additional evaluation based on their applicability to the Site: multi-phase extraction (MPE) / dual-phase extraction (DPE), biosparge/bioventing, absorbent socks, and monitored natural attenuation (MNA) with natural source zone depletion (NSZD).

Other abatement options that were considered were not carried forward because the initial screening process indicated that they would not be effective at this Site and/or their implementability at the Site was low. The options discussed in this section are those that have been in use at the Site recently or are likely to be effective at meeting the remediation goals for the Site.

## 4.2.1 Multi-Phase Extraction / Dual-Phase Extraction

MPE / DPE involve simultaneous recovery of two or more fluids (groundwater and LNAPL) and/or vapor. Pumps are deployed in wells for fluid and/or vapor recovery in different configurations based on-Site characteristics and remedial goals. In general, drawdown induced by the pumping of groundwater may result in increased LNAPL recovery as more LNAPL may mobilize to the well. When LNAPL mass is removed from the subsurface in both the liquid and vapor phases, LNAPL saturation is reduced through recovery efforts and LNAPL mass is reduced through volatilization (i.e., a compositional change in the LNAPL). This abatement measure is more effective in geological materials with higher permeabilities. Pumps may be installed as permanent installations for continuous pumping or mobile units may be used for occasional extraction.

Currently LNAPL abatement activities at the Site consist of a trailer-mounted automated mobile DPE system operating four total-fluid recovery pumps. Weekly O&M activities include inspection of the wellheads and flowlines, adjustment of pump depths, gauging recovered fluid levels in the LNAPL storage tank, and general housekeeping to ensure efficient system operation.

### 4.2.1.1 Applicability for LNAPL Treatment

In 2024, the MPE remediation system operated for 165 days with approximately 1,198 gallons of LNAPL and approximately 60,034 gallons of groundwater recovered from the subsurface via the four recovery wells (RW-4R, RW-10, RW-13, and RW-14) as measured in the on-Site AST.

In 2025, LNAPL transmissivity testing was conducted to evaluate the efficacy of this type of active recovery on three recovery wells (RW-7R, RW-11 and RW-14), one of which is in use as an MPE well (RW-14). The transmissivity test results are summarized in Section 3 and provided in Appendix B. The results indicate the LNAPL in the vicinity of all three wells is in a de minimis mobility/recoverability condition. A de minimis  $T_n$  condition is widely accepted as a practical endpoint to LNAPL recovery where LNAPL has been recovered to the maximum extent practicable and LNAPL that remains will largely exist as immobile/unrecoverable residual.

Since MPE is already in use at the Site, continued operation is recommended until effectiveness and practicability can be evaluated for current Site conditions. The system evaluation will determine whether additional transmissivity testing is recommended for other wells that have sufficient LNAPL present, will determine if MPE is an effective abatement option and, if so, determine optimal placement of pumps.

### 4.2.1.2 Applicability for Groundwater Treatment

Since MPE provides compositional change to LNAPL when vacuum enhancement is added to capture vapor along with LNAPL fluid mass recovery, this option treats both impacted groundwater and remaining LNAPL (residual and mobile fractions). Given that dissolved-phase COCs are an issue in a downgradient well, this abatement option is appropriate to consider and may provide benefit to the downgradient area of the Site.

## 4.2.2 Biosparging and Bioventing

Biosparging and bioventing use the addition of air into the subsurface to stimulate aerobic biodegradation of LNAPL. These in-situ methods for NSZD enhancement can be performed in both the saturated (biosparging) and the unsaturated (bioventing) zones and focus on in-situ destruction of LNAPL compounds. The process is similar to air sparging and soil vapor extraction (AS/SVE) except the injection rates of air/oxygen are slower. All aerobically biodegradable compounds can be treated by bioventing/biosparging, and they are applicable to Sites that have high concentrations of contaminants present, including free phase product.

Bioventing introduces air into the unsaturated zone, but volatilization tends to be minimized in the interest of promoting biodegradation. This can reduce the need for treatment of extracted vapors. Wells may be used for injection of air and/or extraction of vapors. If employed, vapor extraction typically occurs from a central location, and oxygen in the subsurface is supplemented by addition of air in the unsaturated zone through well points located around the

perimeter of the area to be treated. Mass removal may enhance the efficacy of this abatement option if vapor extraction is implemented, however removal amounts are limited.

In biosparging, air/oxygen is injected below the water table to promote biodegradation in the saturated zone. This active remedy increases the aerobic biodegradation of the dissolved constituents of LNAPL, as well as LNAPL adsorbed to soils or trapped in pore spaces within the capillary fringe or below the water table.

Biosparging and bioventing are well-understood technologies that have been applied at many Sites. Treatment times may be medium to long (3 to 10 years), if conditions are optimal. Low permeable soils and heavier LNAPL may require more time.

#### **4.2.2.1 Applicability for LNAPL Treatment**

Site geology must be permeable to air flow for this remedy to be effective, and this may be a limiting factor in the application of this technology at the Site. Layers of caliche and cemented sand could be barriers to injected air; however, they are likely to preferentially affect vertical migration of air and vapor as the layering is primarily horizontal. The horizontal permeability of the subsurface may be adequate for the remedy.

#### **4.2.2.2 Applicability for Groundwater Treatment**

Biosparging targets the dissolved phase COCs to stimulate biodegradation in groundwater. For this to be effective where exceedances are noted, biosparging would need to be implemented in the area of MW-12. Given that dissolved-phase impacts at the Site are limited to one well and additional downgradient wells are likely to be installed, biosparging is not recommended at this time.

### **4.2.3 Passive Recovery: Absorbent Socks**

Passive LNAPL recovery is the collection of mobile LNAPL as it migrates into a well under natural gradients, typically via the placement of absorptive equipment. Absorbent socks are passive skimming devices that are installed in a well at the water table and preferentially absorb oily-phase liquids. Passive LNAPL recovery occurs continuously after sock placement and removes mobile mass from the subsurface. Regular monitoring is required to inspect the socks and replace them, as needed. The socks are manually removed and inspected to determine if a sufficient amount of oil has been absorbed into the sock to require replacement.

#### **4.2.3.1 Applicability for LNAPL Treatment**

This abatement option targets mobile LNAPL present in monitoring or recovery wells. Although active recovery methods are currently implemented at the Site, those methods are not recommended at some LNAPL wells based on the results of the recent transmissivity testing indicating mobile LNAPL is in a de minimis mobility/recovery condition, yet measurable LNAPL remains. This passive LNAPL recovery method may require a long time period but is a practical and effective abatement option to meet the remedial goals of the program (regulatory requirement to remove LNAPL) when active LNAPL recovery has reached an endpoint at a specific well.

#### **4.2.3.2 Applicability for Groundwater Treatment**

This abatement option targets only LNAPL present in monitoring and recovery wells. Absorbent socks would not be deployed in MW-12, where dissolved phase impacts exist without measurable LNAPL.

### **4.2.4 Monitored Natural Attenuation and Natural Source Zone Depletion**

Natural attenuation is the term used to refer to all the naturally occurring processes that control the fate of contaminants in soil and groundwater, and the recognition that these processes can act to naturally contain and remediate such contamination. Natural attenuation processes are those that effectively reduce contaminant mass and

contaminant concentrations in soil and groundwater. MNA generally refers to the remedy of petroleum constituents in the dissolved phase. The natural attenuation remedy applicable to oily-phase impacts is NSZD, which is an LNAPL phase remedy.

MNA is a remedial approach that relies on natural subsurface mechanisms that are classified as either destructive or non-destructive. In certain circumstances, MNA can be sufficiently protective of human health and the environment. Biodegradation is the most important in-situ destructive mechanism, while non-destructive mechanisms include sorption, dispersion, dilution, and volatilization. However, MNA has its inherent limitations and can be slow, making the time frame for completion relatively long.

The case for MNA is presented using a weight-of-evidence approach to demonstrate the occurrence of attenuation processes. Steady state or receding plume conditions over distance and time is the key line of evidence for MNA. Other lines of evidence to support MNA include geochemical conditions (e.g., redox conditions, degradation products, metabolic end products, presence of substrate), and direct microbial evidence. MNA is subject to many uncontrollable natural processes and Site conditions, which make it slow and sometimes inadequate. Site conditions such as nutrient concentration, redox potential, and pH can be manipulated to enhance MNA and speed up the degradation rates of the Site contaminants.

NSZD is a remedial approach that relies on natural mechanisms to reduce the mass of LNAPL in the subsurface. The primary mechanisms are volatilization, dissolution, absorption, and biodegradation. Fuel hydrocarbons can be readily biodegraded by bacteria in the subsurface under both aerobic and anaerobic conditions. LNAPL in the subsurface can be difficult to recover via active recovery, and so a large portion will remain in the ground as immobile residual LNAPL. NSZD is often the remedy applied to this unrecoverable residual LNAPL.

NSZD has its inherent limitations and can be slow, making the time frame for completion relatively long. The rate that NSZD is reducing LNAPL mass can be quantified and compared against the effectiveness of active remedial measures. At the point which NSZD rates approach the removal rate of active remedial measures, a transition to NSZD could be made as the final remedy for the Site. A summary of the technical background on NSZD, including an overview of assessment methodologies, is provided in Appendix C.

#### **4.2.4.1 Applicability for LNAPL Treatment**

Once LNAPL becomes unrecoverable using active abatement methods or passive mass removal methods, then NSZD can be applied as the remedy for the residual LNAPL in the subsurface. NSZD can provide a polishing step when other recovery methods have been exhausted or are no longer providing measurable improvements. Additionally, estimated NSZD rates provide one line of evidence that a recovery system has reached a practicable endpoint.

#### **4.2.4.2 Applicability for Groundwater Treatment**

An evaluation of MNA has not been completed, as BTEX concentrations are above HHS levels at only one Site well and the area of impact is not delineated. However, reductions in LNAPL mass due to NSZD will accordingly reduce contributions to the dissolved phase via biodegradation of BTEX compounds present in LNAPL as well as in the dissolved phase.

New monitoring wells will delineate the downgradient benzene impacts. Further evaluation will determine if MNA could be an appropriate abatement option in the downgradient portion of the Site.

## **5. Description of Preferred Abatement Option**

The preferred abatement option is a combination of continued MPE remediation system operation (pending a system re-evaluation), passive recovery of LNAPL using absorbent socks in all non-system wells with detectable LNAPL at the Site, and NSZD.

The MPE remediation system will continue operation and will be evaluated as described in Section 7. Upon review, and in accordance with the new information from additional wells installed at the Site, the system will be optimized, or another appropriate abatement option will be considered (e.g., bioventing, socks). For wells with LNAPL but not serviced by the MPE remediation system, a passive mass removal option will be employed. Absorbent socks will be deployed and checked and/or replaced as needed on a quarterly basis.

NSZD is retained as an option when active or passive LNAPL recovery options are no longer providing added value.

## 6. Modification of Monitoring Program

The annual monitoring program will return to quarterly gauging of all twenty-three monitoring and recovery wells at the Site, as requested by NMOCD. When installed, the new monitoring and recovery wells will be added to the monitoring program. Wells will be gauged for water level and product thickness. Groundwater samples will be collected from monitoring and recovery wells with no product present and analyzed for BTEX, and pH will be reported as part of the field parameters. Historical sampling activities conducted in the summer of 2000 confirmed TDS and chloride concentrations in groundwater were below applicable screening levels. As such, TDS and chloride have been screened out as potential COCs associated with this release and will not be analyzed as part of this monitoring program. Progress letter reports summarizing the quarterly monitoring activities will be provided to NMOCD on a quarterly basis. Reporting of the results to the NMOCD will continue on an annual basis.

### 6.1 Monitoring and Sampling Frequency

Groundwater monitoring and sampling will be conducted on a quarterly and annual basis in accordance with Site conditions and NMOCD requirements. The following monitoring and recovery wells will be included in the quarterly groundwater monitoring and sampling program: MW-3R, MW-4R, MW-12, and recovery wells RW-1 through RW-14. The following monitoring wells will be included in the annual groundwater monitoring and sampling program: MW-6R, MW-7R, MW-8R, MW-9R, MW-10R, and MW-13.

The monitoring and sampling program may be modified in the future in accordance with Site conditions, regulatory requirements, or if the operator determines adjustments are necessary to optimize the monitoring program, with NMOCD concurrence.

## 7. Additional Investigations

Additional wells are needed to provide delineation of the downgradient impacts at the Site. Three new downgradient wells are proposed and are shown on Figure 5. A well is proposed north of MW-12 to ensure that any potential impacts migrating further than former monitoring well MW-11 are identified. MW-11 was in service from 2011 to 2019 and had exceedances of benzene from 2013 to 2016. Two additional downgradient monitoring wells are proposed southeast of MW-11 and MW-12 to delineate the extent of dissolved phase groundwater impacts.

Two replacement recovery wells are proposed to ensure adequate characterization of the LNAPL area and are shown on Figure 5. These new wells will provide additional information on the extent of the LNAPL area.

MPE system performance will be re-evaluated to determine effectiveness of LNAPL recovery based on current Site conditions. Existing LNAPL recovery data will be evaluated using techniques such as plotting cumulative recovery over time, recovery rate over time, and decline curve analysis. The potential benefit of additional transmissivity evaluations will also be determined and testing completed if deemed necessary. The results of these evaluations along with new information from additional wells installed at the Site and the results of the NSZD assessment

(see below) will determine if MPE will continue to be the abatement option at the Site, and if so in which wells the pumps should be deployed.

An NSZD assessment is proposed for this Site to refine the LNAPL conceptual Site model (LCSM). The intent of the assessment is to confirm that LNAPL biodegradation activity is occurring and may be a viable basis for the long-term management of residual LNAPL. The rate that NSZD is reducing LNAPL mass can be quantified and compared against the effectiveness of active remedial measures. The confirmation of NSZD activity and estimation of rates can be accomplished by either measuring by-products of the reactions involved in NSZD (e.g., CO<sub>2</sub> production or O<sub>2</sub> depletion rates, heat flux) or by looking directly at LNAPL compositional changes over time. The most used methods focus on the by-products of the biodegradation reactions, which are the focus of the NSZD monitoring program at the Site. The basic approach would include semi-annual testing via the biogenic heat method and the soil gas gradient method to determine current biodegradation rates and any potential seasonal variability. These methods involve collecting temperature profiles and soil gas profiles, respectively, in the headspace of existing wells. Additional details are provided in Appendix C.

If additional wells go dry, they will be replaced with deeper wells on an as-needed basis.

## 8. Site Maintenance Activities

Following successful remediation of the LNAPL presence in wells, all monitoring and recovery wells will be P&A in accordance with standards set forth by the NMOSE.

## 9. Abatement Schedule

Following approval of this AP by NMOCD to address the remaining LNAPL at the Site, the selected abatement option will be implemented at the Site. Quarterly progress reports will be submitted starting the quarter after the approval of this AP.

Upon approval of the AP, permits and approvals will be obtained as needed for the installation of the new wells. The wells will be installed when the required approvals are in place.

MPE is currently being implemented at four recovery wells (RW-4R, RW-10, RW-13, and RW-14). Following approval of the AP, the remediation system will be re-evaluated, socks will be installed in non-system wells with measurable LNAPL, and the NSZD assessment will be conducted.

Upon evaluation of the recovery system, a determination will be made whether additional LNAPL transmissivity testing is deemed necessary, if changes are required to the remediation system, or abatement options for the Site will be re-evaluated. If abatement option changes are deemed necessary, NMOCD approval will be sought prior to any changes.

Assuming approval of the AP in early 2026, these initial activities will be started/coordinated before the end of the first quarter of 2026. These activities will all be completed and results analyzed throughout 2026. Any potential modifications to the proposed remediation methods will be submitted to NMOCD for review by the end of the second quarter of 2027. If approvals are delayed, the implementation of the abatement options and additional activities will be delayed accordingly.

As per NMOCD requirement, groundwater samples will be collected from wells once there is no longer measurable LNAPL. However, these results will be reviewed with caution as it is a very common occurrence at LNAPL Sites for LNAPL microdroplets to impact such samples even when there is no measurable LNAPL in the well during sampling. Based on current ITRC LNAPL-3 guidance, a groundwater analytical result indicating a benzene concentration at or above 1-5 mg/L from an LNAPL source is an indication of LNAPL in the groundwater sample (see Appendix D,

LNAPL-3 Section 3.5.5 and Table 3-2). If this occurs, the groundwater analytical results should be considered contaminated by LNAPL/biased high and will not provide a true dissolved-phase concentration for determining groundwater quality at the Site. Groundwater quality in the wells around the LNAPL wells is a better indicator of groundwater quality at the Site.

The new wells downgradient of current impacts will provide additional information on the extent of the plume. Downgradient wells will continue to be monitored for the potential for dissolved phase impacts until such time as LNAPL is removed to the maximum extent practicable and is no longer a concern at the Site.

## 10. Public Notice Proposal

A public notice for this Stage 2 Abatement Plan has been drafted in accordance with 19.15.30.15 NMAC.

Surface owners of record within one mile of the perimeter of the geographic area where the standards and requirements set forth in 19.15.30.9 NMAC are exceeded will be provided written notice of this Stage 2 AP prior to issuance of public notice. The applicable county commission, city officials, and persons identified by the director who have requested notification will be notified by mail. The New Mexico trustee for natural resources and any other applicable local, state, or federal governmental agencies, as identified by the director, will be notified by certified mail. Copies of the written notice and proof of notice will be furnished to the division.

Within 15 days after the division determines this Stage 2 AP is administratively complete, public notice will be issued in a division-approved form in a newspaper of general circulation in Lea County and in a newspaper of general circulation within the State of New Mexico. The public notice will include the information required by 19.15.30.15(B) NMAC, as approved by the director.

A public notice is included as Appendix E.

## 11. Conclusion

Previously implemented, aggressive LNAPL abatement programs have removed a large volume of LNAPL from the subsurface at this Site. The presence of LNAPL remaining in wells is the primary driver for this abatement program, as LNAPL removal is required until there is no reasonably measured LNAPL remaining in wells (20.6.2.3103 A.3 NMAC). The selected active recovery method (MPE) is currently operating at the Site; continued operation will depend on the system performance evaluation and NMOCD approval. Active recovery will begin to be combined with passive recovery (absorbent socks) as an effective and practical means of recovering a portion of the remaining in-well LNAPL where LNAPL thicknesses are minimal or LNAPL transmissivity testing indicates the LNAPL is effectively immobile and the potentially recoverable fraction limited to LNAPL locally pooled around those wells. Information from new monitoring and recovery wells will help to guide the abatement program.

Following the approval of this AP, GHD will implement the preferred abatement option at the Site and the associated monitoring program.

## 12. Scope and Limitations

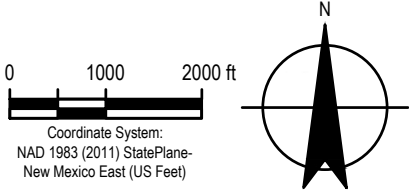
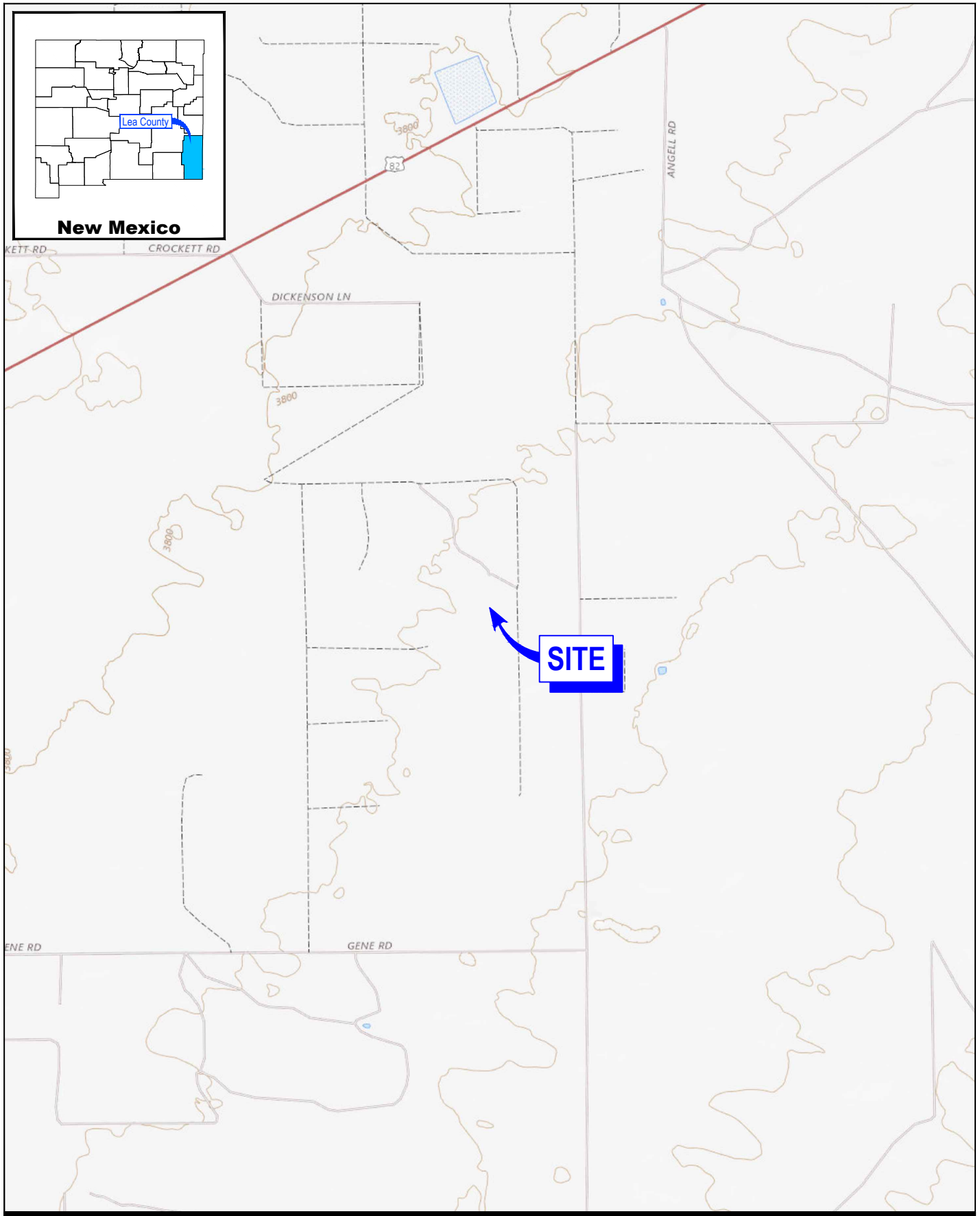
*This report: has been prepared by GHD for Plains All American and may only be used and relied on by Plains All American for the purpose agreed between GHD and Plains All American*

*GHD otherwise disclaims responsibility to any person other than Plains All American arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.*



Coordinate System:  
 NAD 1983 (2011) StatePlane-  
 New Mexico East (US Feet)

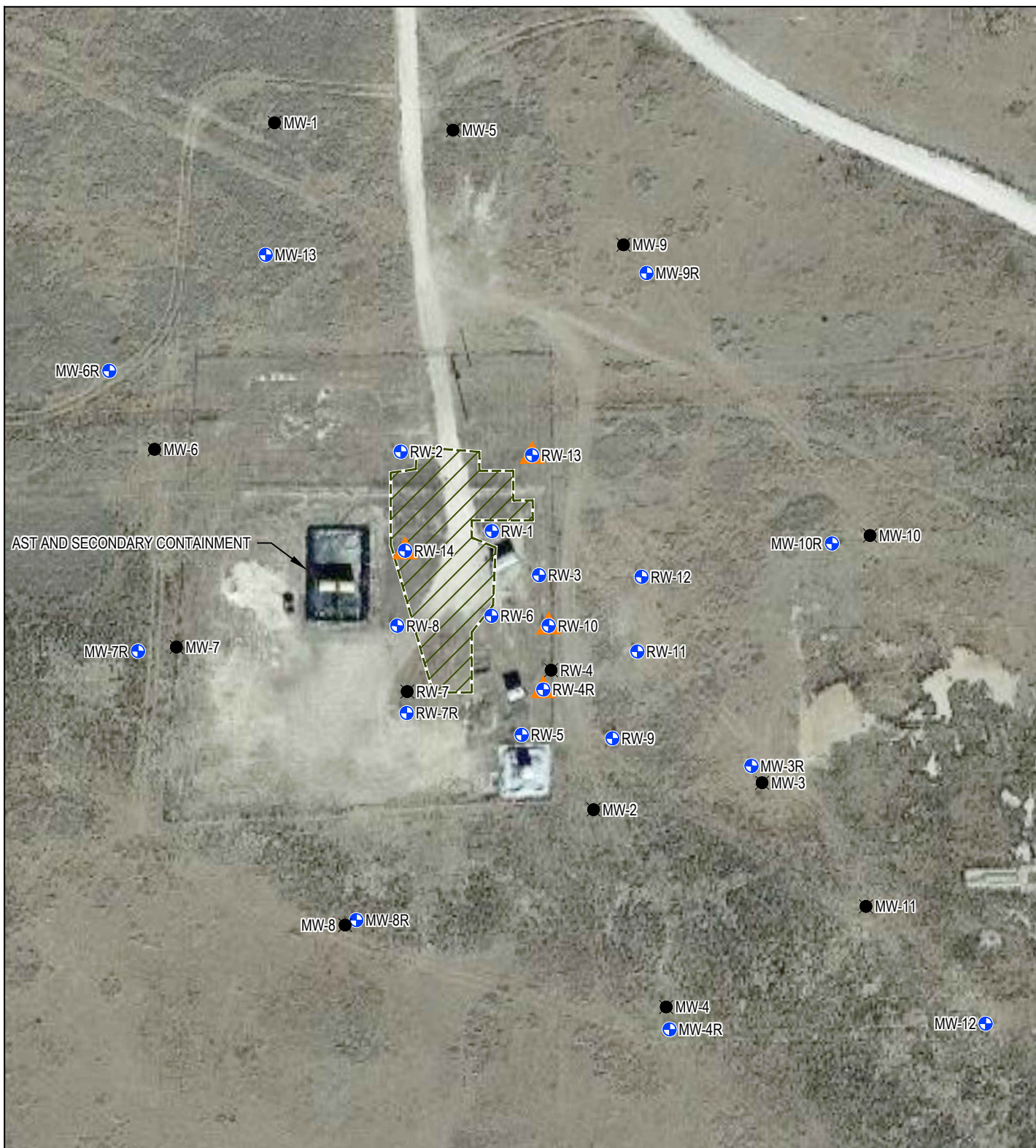


PLAINS ALL AMERICAN PIPELINE, L.P.  
 LEA COUNTY, NEW MEXICO  
 DARR ANGELL #2  
 NMOCD AP-007

Project No. 12604523  
 Date June 2025

**SITE LOCATION MAP**

**FIGURE 1**



**LEGEND**

- MONITORING WELL LOCATION
- PLUGGED AND ABANDONED MONITORING WELL
- RECOVERY WELL EQUIPPED WITH REMEDIATION PUMP
- APPROXIMATE FORMER EXCAVATION LIMITS

0 50 100 ft

Coordinate System:  
NAD 1983 (2011) StatePlane-  
New Mexico East (US Feet)



PLAINS ALL AMERICAN PIPELINE, L.P.  
LEA COUNTY, NEW MEXICO  
DARR ANGELL #2  
NMOCD AP-007

**SITE DETAILS MAP**

Project No. 12604523  
Date June 2025

**FIGURE 2**



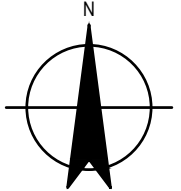
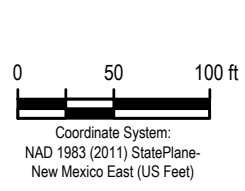
AST AND SECONDARY CONTAINMENT

**LEGEND**

- MONITORING WELL LOCATION
- PLUGGED AND ABANDONED MONITORING WELL
- RECOVERY WELL EQUIPPED WITH REMEDIATION PUMP
- APPROXIMATE FORMER EXCAVATION LIMITS
- GROUNDWATER POTENTIOMETRIC CONTOUR (INTERVAL = 0.20 FT)
- (3717.30) GROUNDWATER ELEVATION (FT AMSL)
- DIRECTION OF GROUNDWATER FLOW

**NOTES:**

1. GAUGING DATA COLLECTED ON MAY 14, 2025.
2. RW-4R, RW-5, RW-6, RW-8, RW-9, RW-10, AND RW-14 WERE NOT USED TO CONSTRUCT CONTOURS.

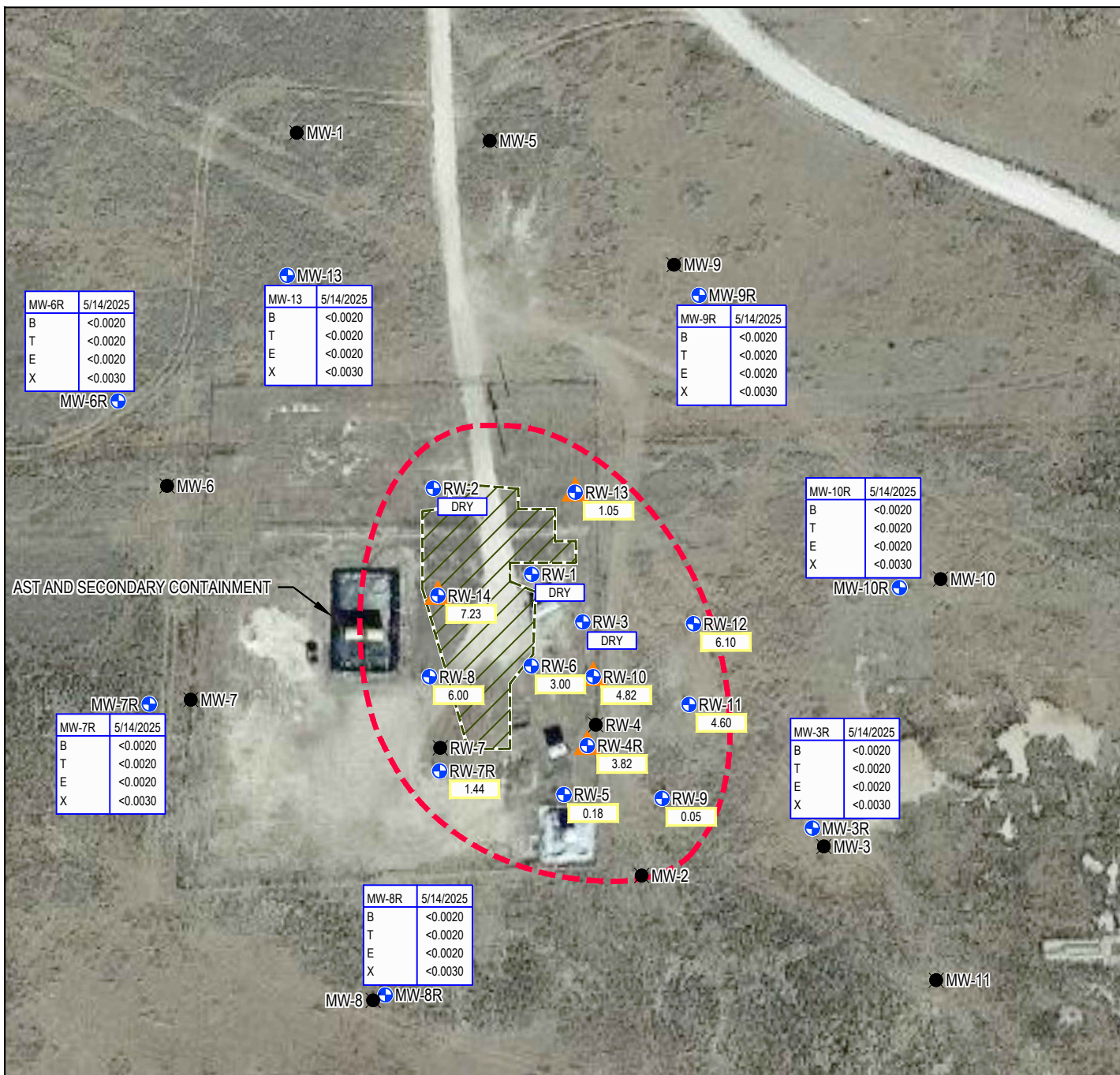


PLAINS ALL AMERICAN PIPELINE, L.P.  
 LEA COUNTY, NEW MEXICO  
 DARR ANGELL #2  
 NMOCD AP-007

**POTENTIOMETRIC SURFACE MAP  
 (MAY 2025)**

Project No. 12604523  
 Date June 2025

**FIGURE 3**



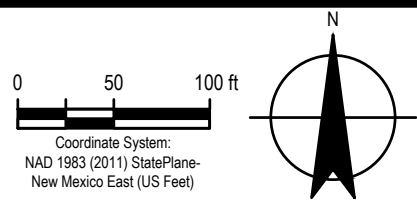
**LEGEND**

- MONITORING WELL LOCATION
- PLUGGED AND ABANDONED MONITORING WELL
- RECOVERY WELL EQUIPPED WITH REMEDIATION PUMP
- APPROXIMATE FORMER EXCAVATION LIMITS
- LNAPL THICKNESS (FT) - MAY 14, 2025
- APPROXIMATE LNAPL PLUME AREA

SAMPLE LOCATION	MW-8R	02/08/2024	DATE SAMPLED
BENZENE	B	<0.000500	RESULT (mg/L)
TOLUENE	T	<0.00100	
ETHYLBENZENE	E	<0.000500	
XYLENES	X	<0.00150	

**NOTES:**

- GROUNDWATER SAMPLES COLLECTED ON MAY 14, 2025.
- BOLD INDICATES LABORATORY DETECTION.
- YELLOW SHADED CELLS INDICATE NMWQCC CRITERIA EXCEEDANCE.

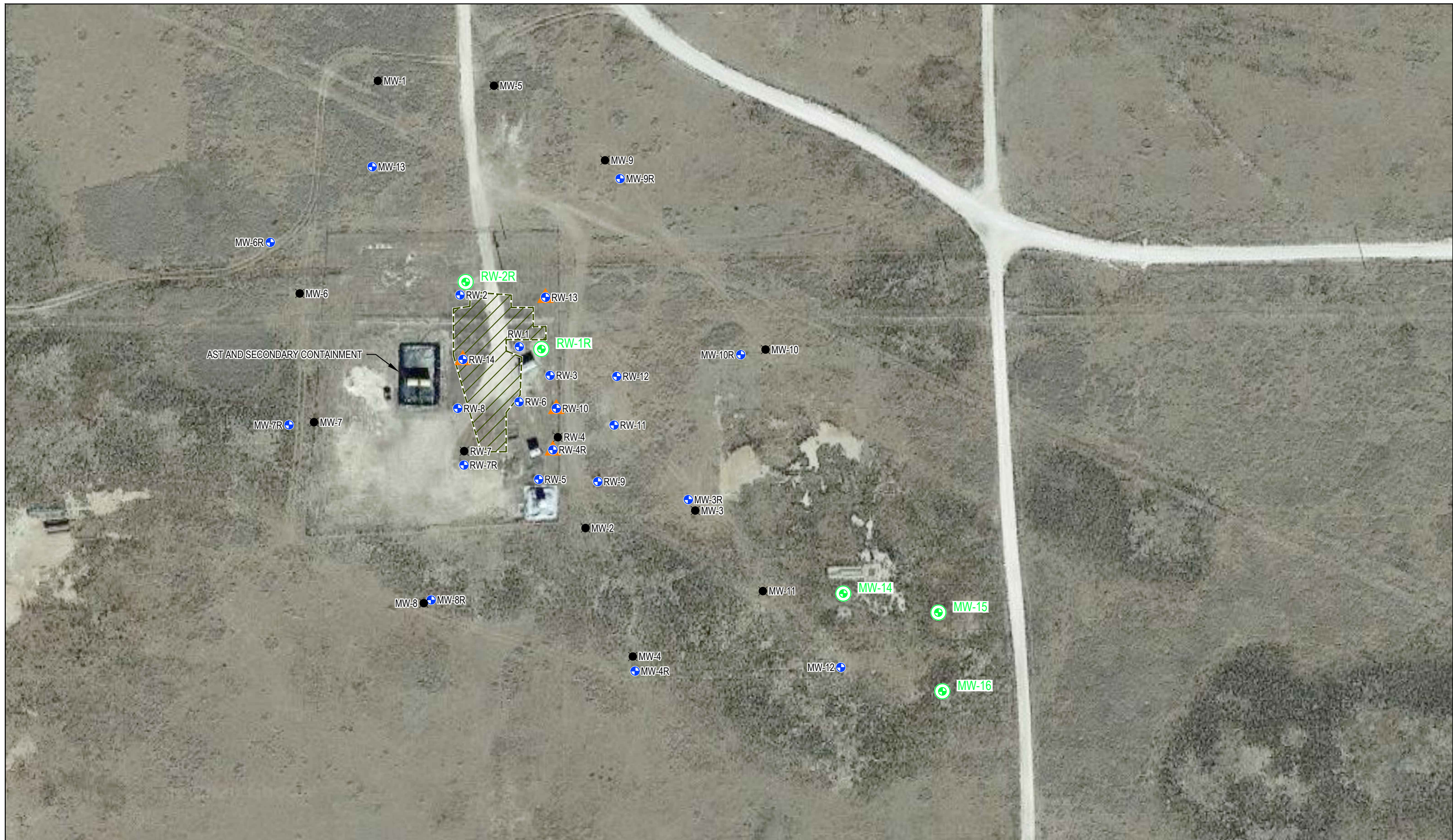


PLAINS ALL AMERICAN PIPELINE, L.P.  
LEA COUNTY, NEW MEXICO  
DARR ANGELL #2  
NMOCD AP-007

Project No. 12604523  
Date December 2025

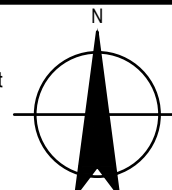
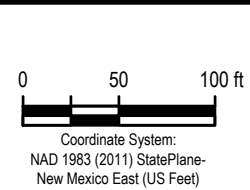
**COC CONCENTRATIONS IN GROUNDWATER (MAY 2025)**

**FIGURE 4**



**LEGEND**

- MONITORING WELL LOCATION
- PLUGGED AND ABANDONED MONITORING WELL
- RECOVERY WELL EQUIPPED WITH REMEDIATION PUMP
- APPROXIMATE FORMER EXCAVATION LIMITS
- PROPOSED MONITORING WELL LOCATION



PLAINS ALL AMERICAN PIPELINE, L.P.  
LEA COUNTY, NEW MEXICO  
DARR ANGELL #2  
NMCD AP-007

Project No. 12604523  
Date December 2025

**PROPOSED WELL LOCATIONS**

**FIGURE 5**

Data Source: Microsoft Product Screen shot(s) Reprinted with permission from Microsoft Corporation  
Lat/Long: 33.0242° North, 103.1668° West

Table 1

**Summary of Fluid Level Measurements - May 2025**  
**Plains Marketing, L.P.**  
**Darr Angell #2**  
**Lea County, New Mexico**  
**NMOCD AP-007**

Monitoring Well ID	Measurement Date	Reference Elevation <sup>1</sup> (ft amsl)	Depth to Groundwater (ft btor)	Depth to LNAPL (ft btor)	Thickness of LNAPL (ft)	Corrected Groundwater Elevation (ft amsl)	Total Depth of Well <sup>2</sup> (ft btor)	Water column height (ft)	Notes
MW-3R	5/14/2025	3789.51	72.37	--	--	3717.14	89.15	16.78	
MW-4R	5/14/2025	3789.17	71.98	--	--	3717.19	89.77	17.79	
MW-6R	5/14/2025	3789.79	71.92	--	--	3717.87	89.48	17.56	
MW-7R	5/14/2025	3790.51	72.89	--	--	3717.62	88.00	15.11	
MW-8R	5/14/2025	3788.75	71.45	--	--	3717.30	89.42	17.97	
MW-9R	5/14/2025	3789.02	71.48	--	--	3717.54	89.65	18.17	
MW-10R	5/14/2025	3788.90	71.67	--	--	3717.23	88.89	17.22	
MW-12	5/14/2025	3789.64	72.73	--	--	3716.91	85.77	13.04	
MW-13	5/14/2025	3789.70	71.92	--	--	3717.78	89.15	17.23	
RW-1	5/14/2025	3789.85	--	--	--	--	68.05	--	Dry
RW-2	5/14/2025	3790.24	--	--	--	--	68.44	--	Dry
RW-3	5/14/2025	3790.24	--	--	--	--	68.72	--	Dry
RW-4R	5/14/2025	3789.19	75.20	71.38	3.82	3717.08	--	--	LNAPL
RW-5	5/14/2025	3789.81	71.60	71.42	0.18	3718.36	--	--	LNAPL
RW-6	5/14/2025	3789.56	74.00	71.00	3.00	3717.99	--	--	LNAPL
RW-7R	5/14/2025	3789.90	73.66	72.22	1.44	3717.41	--	--	LNAPL
RW-8	5/14/2025	3790.01	77.15	71.15	6.00	3717.72	--	--	LNAPL
RW-9	5/14/2025	3790.00	72.60	72.55	0.05	3717.44	--	--	LNAPL
RW-10	5/14/2025	3789.56	76.15	71.33	4.82	3717.31	--	--	LNAPL
RW-11	5/14/2025	3789.77	76.15	71.55	4.60	3717.35	--	--	LNAPL
RW-12	5/14/2025	3789.78	77.30	71.20	6.10	3717.42	--	--	LNAPL
RW-13	5/14/2025	3788.61	72.00	70.95	1.05	3717.46	--	--	LNAPL
RW-14	5/14/2025	3788.59	77.05	69.82	7.23	3717.40	--	--	LNAPL

## Notes:

- 1 - Reference Elevation: top of riser
- 2 - As measured in the field
- LNAPL - light non-aqueous phase liquid
- ft amsl - feet above mean sea level
- ft btor - feet below top of riser

**Table 2**  
**Evaluation of Abatement Options**  
**Plains Marketing, L.P.**  
**Darr Angell #2**  
**Lea County, New Mexico**  
**NMOCD AP-007**

Remedial Goals: Recover LNAPL from wells; Reduce dissolved-phase concentrations to below HHS levels			Initial Screening Evaluation Criteria					Retain for Additional Screening?	Additional Screening Criteria			Retain for Further Evaluation in Abatement Plan (AP)?
Option No.	Remedial Option	Description	Technology Objective (compositional, saturation, or control)	Advantages	Disadvantages	Effectiveness Towards Remedial Goal	Implementability for Site		Green / Sustainable Level	Assumptions	Cost Effectiveness	
1	Multi-Phase Extraction (MPE)  Mobile Dual Phase Extraction (MDPE)	NAPL and groundwater are removed through the use of one or two dedicated pumps (NAPL mass recovery). Vacuum enhancement is added to recover vapors (NAPL phase change).	- Saturation reduction / Mass recovery - Compositional change (secondary)	<ul style="list-style-type: none"> <li>Proven hydraulic and vapor control.</li> <li>Vacuum-enhanced fluid recovery technologies create an inward pressure gradient and enhances fluid recovery rates in lower permeability formations.</li> </ul>	<ul style="list-style-type: none"> <li>Requires long-term 24/7 operation for best results</li> <li>Multiple fluid streams to treat/dispose (water, LNAPL and vapor)</li> </ul>	Low to Medium - MPE hydraulic recovery drives LNAPL saturation towards residual saturation. Site LNAPL transmissivity testing indicates LNAPL is already at residual levels at some wells; additional LNAPL recovery may or may not provide a technical benefit at other wells. Effective for dissolved phase when vacuum enhancement included.	High - Trailer mounted system already implemented at the Site.	Yes - has been employed at the Site since 2012; may continue to be a viable option for LNAPL removal at some wells; effective for dissolved phase remediation when vacuum enhancement included; retained for additional screening.	Low - large environmental cost for continued operation	- Would continue as currently operated until system effectiveness is re-evaluated	A large dollar and environmental cost to recover additional LNAPL.	Yes - has been employed at the Site since 2012; may continue to be a viable option for LNAPL removal at some wells, effective for dissolved phase remediation when vacuum enhancement included; retained for further evaluation in AP.
2	In situ Enhanced Aerobic Biodegradation (ISEB) by Biosparging / Bioventing	In situ biodegradation (aerobic) is used to metabolize petroleum hydrocarbons into nonhazardous compounds by naturally occurring microorganisms. Air would be injected by biosparging below the water table and bioventing above the water table	- Compositional change - Limited mass reduction	<ul style="list-style-type: none"> <li>Effective for vadose zone impacts, dissolved phase impacts and for NAPL over time</li> <li>Works with the natural processes already present at the site.</li> <li>Low cost.</li> <li>May mobilize residual NAPL, but less likely than with ISCO</li> </ul>	<ul style="list-style-type: none"> <li>Requires electricity and the long term presence and operation of above ground infrastructure at the site</li> <li>It may not be possible to install biosparge wells in all impacted areas due to the presence of above and below ground structures</li> </ul>	Medium - Biodegradation of NAPL may take time	Medium - Some areas may not be accessible for treatment, requires installation of biosparge wells and electricity, unless using solar	Yes - a viable option for remediation of dissolved phase impacts and some LNAPL mass reduction, so retained for additional screening	Medium - requires installation of infrastructure and on-going electrical requirements but has been successful with solar power	- Needs a detailed design - Biosparge treatment of area where NAPL and sorbed mass has been detected - Installation of biosparge wells - Wells manifolded to an air compressor	A large dollar and environmental cost to enhance natural attenuation / biodegradation that has a fairly long time frame.	Yes - a viable option for remediation of dissolved phase impacts and some LNAPL mass reduction, so retained for further evaluation in AP
3	Oil-Only Absorbent Socks (Passive)	Oil-only absorbent socks are used for the passive removal of limited amounts of mobile, in-well LNAPL. Socks are replaced as they become saturated.	- Aesthetic - Saturation reduction / Mass recovery	<ul style="list-style-type: none"> <li>Effective at meeting a regulatory requirement when more aggressive LNAPL recovery/removal techniques are not applicable.</li> </ul>	<ul style="list-style-type: none"> <li>Not effective in recovering significant LNAPL</li> <li>Limited to the practicably recoverable mobile LNAPL fraction</li> <li>Not re-usable/on-going costs.</li> <li>Disposal must adhere to waste-handling regulations.</li> <li>Can be challenging to determine accurate LNAPL removal quantities for recovery decline curve analysis.</li> </ul>	High - Absorbent socks are highly effective at meeting a regulatory requirement of recovery/removal of small quantities of in-well LNAPL	High - No action required beyond installation in existing LNAPL well(s).	Yes - a viable option for LNAPL recovery in wells where active LNAPL recovery no longer practicable, so retained for next additional screening.	High - low effort and cost to implement and maintain; no new infrastructure needed	- Implementation will continue until LNAPL recovery has reached maximum extent practicable	Low cost level for meeting regulatory requirement of LNAPL recovery	Yes - a viable option for LNAPL recovery in wells where active LNAPL recovery no longer practicable, so retained for further evaluation in AP.
3	Natural Attenuation, a.k.a. Natural Source Zone Depletion (NSZD) and Monitored Natural Attenuation (MNA)	NAPL constituents are naturally depleted from the NAPL body over time by volatilization, dissolution, absorption, and degradation (NAPL phase-change remediation). Dissolved-phase constituents are also attenuated naturally via the same mechanisms.	- Compositional change - Mass loss	<ul style="list-style-type: none"> <li>Works on all LNAPL remaining at the site (mobile and residual fractions).</li> <li>Relevant to dissolved phase impacts (MNA)</li> <li>Low capital cost</li> <li>The assessment required prior to implementation is relatively low effort/cost compared to planning/ testing required for other technologies.</li> </ul>	<ul style="list-style-type: none"> <li>An assessment (low effort/cost) would be required prior to implementation.</li> <li>In general, can't be used at a site with migration issues due to potential liability from impacts. This does not apply for this Site.</li> </ul>	Medium - Natural source zone depletion would be slow, however this is the only feasible way to address immobile residual LNAPL remaining at the site. Relevant to dissolved phase impacts (MNA)	High - No action required beyond initial assessment.	Yes - a viable option for remediation of dissolved phase impacts and some LNAPL mass reduction; likely already happening, so retained for additional screening.  Can be combined with other options.	High - low effort and cost to implement and maintain; no new infrastructure needed	- A semi-annual natural attenuation study would be performed initially to evaluate NSZD activity and rates	Low cost level for added benefit	Yes - a viable option for remediation of dissolved phase and some LNAPL mass reduction; likely already happening, so retained for further evaluation in AP.  Can be combined with other options.

**Table 2**  
**Evaluation of Abatement Options**  
**Plains Marketing, L.P.**  
**Darr Angell #2**  
**Lea County, New Mexico**  
**NMOCD AP-007**

Remedial Goals: Recover LNAPL from wells; Reduce dissolved-phase concentrations to below HHS levels			Initial Screening Evaluation Criteria						Retain for Additional Screening?	Additional Screening Criteria		Retain for Further Evaluation in Abatement Plan (AP)?
Option No.	Remedial Option	Description	Technology Objective (compositional, saturation, or control)	Advantages	Disadvantages	Effectiveness Towards Remedial Goal	Implementability for Site	Green / Sustainable Level		Assumptions	Cost Effectiveness	
The technologies included below this point are not discussed in the Abatement Plan although they are saturation reduction technologies as they were not considered to be viable options in meeting the Site remedial goal after the initial screening.												
4	Steam Injection	Steam is injected into wells to heat the formation and LNAPL. This induces a pressure gradient that pushes ahead of the steam through the LNAPL zone (cold water front, hot water front, steam front). In the unsaturated zone, a steam and condensation front develops. The mobilized LNAPL and groundwater are recovered from extraction wells; volatilized LNAPL is collected via vapor extraction wells.	- Compositional change - Saturation reduction / Mass recovery - In situ destruction	<ul style="list-style-type: none"> <li>• Most suited for large, deep sites, where large well spacing and higher injection pressures can be used</li> <li>• Effective for all NAPL types</li> <li>• Effective in high permeability soils.</li> <li>• Short time frame.</li> </ul>	<ul style="list-style-type: none"> <li>• Water not available at the Site.</li> <li>• Energy intensive.</li> <li>• Requires strict vapor control and treatment.</li> <li>• May need an injection permit.</li> <li>• May need a permit to discharge vapor and treated groundwater.</li> </ul>	High - Proven technology for NAPL removal	Low - groundwater not available at the Site, high energy input required, LNAPL wells near pipeline	No - not likely to be successful and implementability difficult due to inability to use local water source	N/A - not retained			
5	Excavation (Several excavations have already been completed and were limited by hard caliche layers)	NAPL body is physically removed and properly treated or disposed (NAPL mass recovery).	- Saturation reduction / Mass recovery	<ul style="list-style-type: none"> <li>• 100% removal in excavated areas.</li> <li>• Short time frame for treatment</li> </ul>	<ul style="list-style-type: none"> <li>• Additional excavation would be limited by hard caliche layers that range in depth starting from 0 to 15 ft down to &gt;65 ft bgs..</li> <li>• Current depth to water table/in-well LNAPL is 70-80 ft bgs, so the impacted area is deep and not practically accessible for excavation.</li> </ul>	High - Proven technology; would remove 100% of any accessible LNAPL.	Low - due to Site stratigraphy and depth of remaining LNAPL	No - most feasible excavation has already been completed; hard to implement additional excavation due to stratigraphy and depth of LNAPL	N/A - not retained			

# **Appendices**

# Appendix A

## Release Notification and Corrective Action, Form C-141

OIL CONSERVATION DIVISION

2040 South Pacheco Street  
Santa Fe, New Mexico 87505  
(505) 827-7131

Submit 2 copies to  
Appropriate District  
Office in accordance  
with Rule 116 on  
back side of form

111 North First St  
Alamogordo, NM 88210  
District III - (505) 334-6170  
000 Eljo Brazos Road  
State, NM 87410  
District IV - (505) 827-7131

STATE BYRD LE. 1999-59

Release Notification and Corrective Action

OPERATOR

Initial Report  Final Report

NAME LOTT Energy Pipeline	Contact Lennah FROST
Address PO BOX 1660	Telephone No. 915/6843467
Facility Name	Facility Type Pipeline

Surface Owner State of New Mexico	Mineral Owner	Lease No.
--------------------------------------	---------------	-----------

LOCATION OF RELEASE

Well Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
L	32	19S	37E					Lea

NATURE OF RELEASE

Type of Release Crude oil	Volume of Release 260 bbl/s	Volume Recovered 200 bbl/s
Source of Release Crude oil pipeline	Date and Hour of Occurrence 7/8/99 1PM	Date and Hour of Discovery 7/8/99 1PM
Was Immediate Notice Given? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required	If YES, to Whom? Chris WILLIAMS	
By Whom? Lennah Frost	Date and Time 7/18/99 - 2:30P	
Was a Microcosm Reached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If YES, Volume Impinging the Microcosm	

Microcosm was impacted. Describe Fully (Attach Additional Sheets if Necessary)

Describe Cause of Problem and Remedial Action Taken (Attach Additional Sheets if Necessary)  
Internal Corrosion - Leak Clamped off will replace pipe ASAP

Describe Area Affected and Cleanup Action Taken (Attach Additional Sheets if Necessary)  
Will occurred in a previously remediated site. Will evaluate for cleanup this week

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOLD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOLD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that poses a threat to ground water, surface water, human health or the environment. In addition, NMOLD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: Lennah Frost	OIL CONSERVATION DIVISION	
Printed Name: Lennah Frost	Approved by District Supervisor:	Expiration Date:
SR. ENV. ENG	Approval Date:	Attached <input type="checkbox"/>
7-20-99	Conditions of Approval:	

# Appendix B

## LNAPL Transmissivity Memorandum

# Technical Memorandum

December 02, 2025

<b>To</b>	Karolanne Hudgens	<b>Contact No.</b>	(575) 200-5517
<b>Copy To</b>	Scott Foord, Adrianna Copeland	<b>Email</b>	karolanne.hudgens@plains.com
<b>From</b>	Joann Dyson, Marissa Labbé	<b>Project no.</b>	12604523-MEM-1 – SRS 1999-62
<b>Project</b>	Darr Angell #2, Lea County, New Mexico		
<b>Subject</b>	LNAPL Transmissivity Testing		

## 1. Introduction

This memorandum presents the results of an evaluation of light non-aqueous phase liquid (LNAPL) recoverability at the subject site. The quantification of LNAPL recoverability was accomplished via estimations of LNAPL transmissivity ( $T_n$ ), which provides a standardized science-based way to quantify the potential mobility and recoverability of LNAPL at a given site. Results can be compared against widely accepted de minimis criteria to assess whether LNAPL may be considered practically 'recoverable' such that hydraulic recovery may be feasible and/or provide some technical benefit in terms of mitigating migration potential via a tangible reduction in LNAPL saturation levels. Where  $T_n$  is found to be of de minimis magnitude, LNAPL is largely present at residual levels and hydraulically immobile/unrecoverable. Where this is the case, any LNAPL that can be recovered will not result in a meaningful reduction in LNAPL saturation levels and, therefore, will provide no technical benefit (since the LNAPL is already largely immobile).

## 2. Methodology

The testing was performed pursuant to the methodology contained in ASTM International (ASTM) Standard E2856-13 *Standard Guide for Estimation of LNAPL Transmissivity* (May 2021) using the baildown technique at RW-7R, RW-11 and RW-14. Wells were selected on the basis of areal coverage across the site and with varying LNAPL thickness levels to present a range of  $T_n$  estimates.

The LNAPL baildown test involved the removal of LNAPL from each well using a manual bailer. Care was taken to minimize the removal or drawdown of groundwater during this effort. Following the removal of the LNAPL, each well was monitored for LNAPL recharge using an oil-water interface probe. The LNAPL monitoring continued until the observed in-well LNAPL recharge (or lack thereof) provided sufficient information to estimate  $T_n$ . The LNAPL transmissivity was then estimated based on the observed LNAPL recharge rates and/or LNAPL drawdown recovery (depending on the analytical solution selected) using the American Petroleum Institute (API) Publication No. 4762 *LNAPL Transmissivity Workbook: Calculation of LNAPL Transmissivity from Baildown Test Data* (2016). The API workbook uses the field data from a baildown test to estimate LNAPL transmissivities using three different solutions for unconfined conditions: Bouwer & Rice; Cooper & Jacob; and Cooper-Bredehoeft-Papadopoulos. Since LNAPL removal times cannot be considered to be 'instantaneous' (i.e. removal time less than 1/100th of total test duration), the Bouwer & Rice solution is

most applicable and likely to provide the most reliable  $T_n$  estimate. The detailed field methodology and data treatment techniques associated with LNAPL transmissivity estimations are detailed in ASTM E2856-13 and API 4762. In the case of test wells exhibiting LNAPL recharge that is too fast or too slow to reliably quantify LNAPL transmissivity via these solutions, LNAPL transmissivity is estimated qualitatively based on observed LNAPL recharge rate (or lack thereof).

### 3. Results

The LNAPL baildown testing was performed in June 2025 and again in October 2025 to account for seasonal variability. The results of the  $T_n$  testing are summarized in Table 1 below with the detailed results provided in Attachment 1.

Table 1 LNAPL Transmissivity Results

Location ID	Test Date	Initial LNAPL Thickness (ft)	B&R Estimated LNAPL Transmissivity ( $T_n$ ) (ft <sup>2</sup> /day)	Recovery Practicable? (Yes/No)
RW-7R	4-Jun-2025	1.47	0.18	No
	21-Oct-2025	0.95	0.08	No
RW-11	5-Jun-2025	4.58	0.05	No
	23-Oct-2025	3.54	0.03	No
RW-14	4-Jun-2025	6.97	0.13	No
	22-Oct-2025	6.82	0.24	No

The results from the LNAPL baildown testing at locations RW-7R, RW-11 and RW-14 range from 0.03 – 0.24 square foot per day (ft<sup>2</sup>/day), which are below the commonly accepted de minimis  $T_n$  of approximately 0.8 ft<sup>2</sup>/day suggested by the Interstate Technology & Regulatory Council (ITRC, 2009 and 2018)<sup>1</sup>. It is noted that the data were filtered in order to facilitate the analysis, to remove well gauging measurements that were inconsistent with increasing LNAPL thickness during recharge.

### 4. Discussion

The evaluation of  $T_n$  represents a science-based metric that is primarily applied to assess the need for and potential benefit of LNAPL mass recovery efforts. The  $T_n$  metric is also often applied as a practical end-point to LNAPL mass recovery (i.e., de minimis LNAPL transmissivity equates to LNAPL recovered to the maximum extent practicable). Where  $T_n$  results are consistent with a de minimis magnitude of transmissivity as suggested by ITRC, LNAPL can be assumed to predominantly exist at residual saturation levels that are effectively immobile and unrecoverable. The results presented herein indicate that the LNAPL recoverability is already at or below a level that is widely considered to represent a practical end-point to LNAPL recovery (or LNAPL recovery to the maximum extent practicable). Therefore, these results support that the LNAPL remaining at these locations is predominantly immobile residual.

It is also noted that there is no correlation between starting LNAPL thickness and the ability to recover LNAPL evident in the results, which is the typical scenario at older LNAPL sites. This demonstrates on a site-specific basis why it is important to utilize a standardized science-based metric such as  $T_n$  to inform remedial

<sup>1</sup> *Evaluating LNAPL Remedial Technologies for Achieving Project Goals* (ITRC Publication No. LNAPL-2, December 2009); and *LNAPL Site Management: LCSM Evolution, Decision Process, and Remedial Technologies* (ITRC Publication No. LNAPL-3, 2018). <https://lnapl-3.itrcweb.org>

decision-making, especially as it pertains to LNAPL recovery efforts. Overall, the ability to sustain LNAPL recovery at a given well will often not correlate with the magnitude of equilibrium LNAPL thicknesses.

Regards,



**Joann Dyson**  
Environmental Specialist (NAPL sites)

+1 980 221 8044  
joann.dyson@ghd.com

JD/lS/1/S4

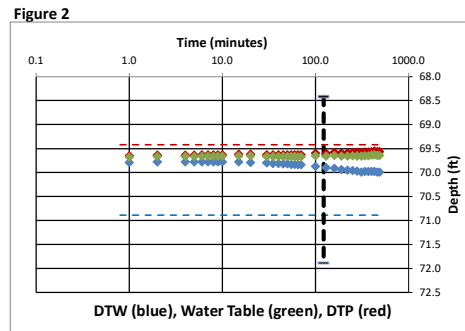
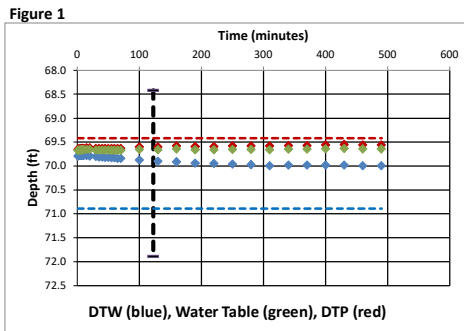
Encl.: Attachment 1 - API LNAPL Transmissivity Workbook

# Attachments

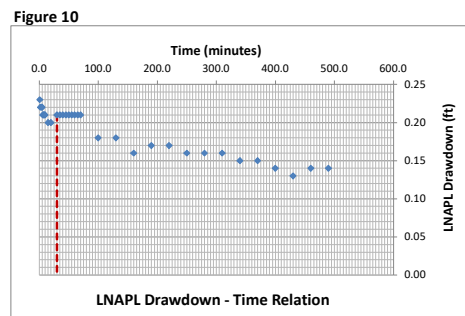
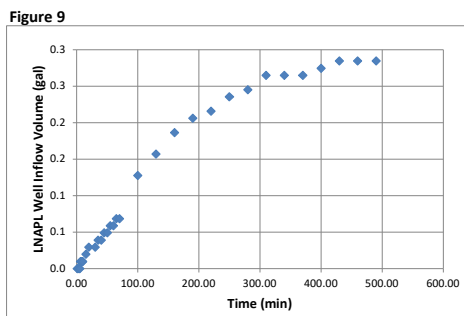
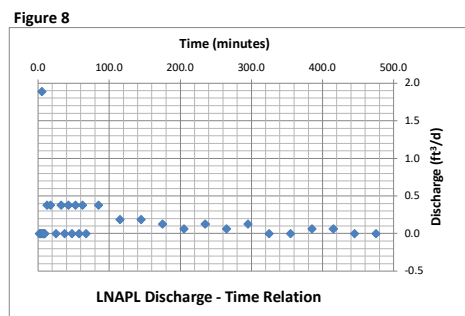
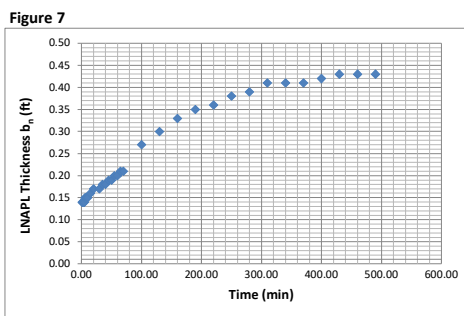
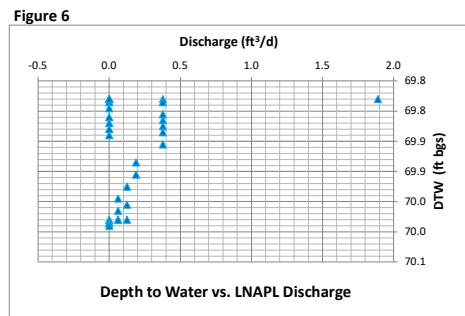
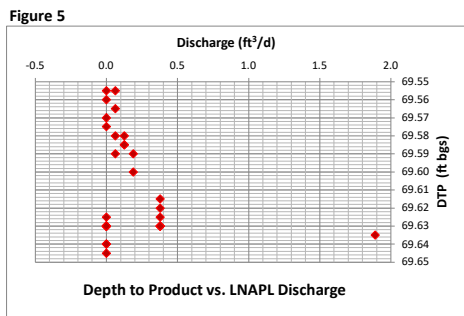
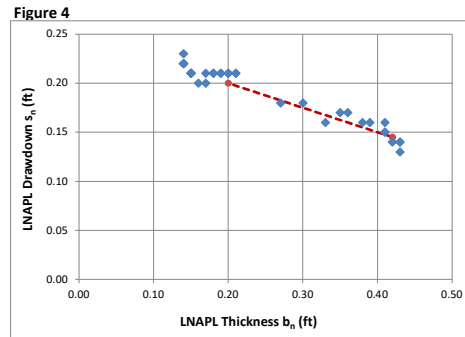
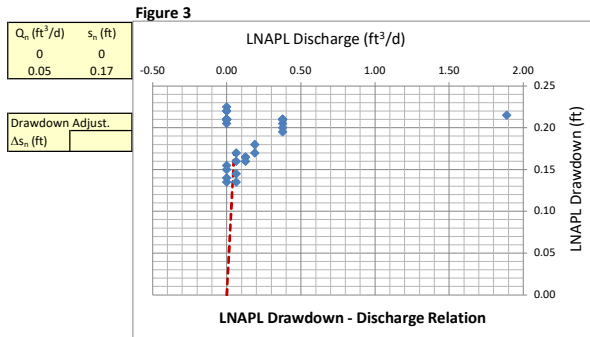
# Attachment 1

## API LNAPL Transmissivity Workbook





0.8	69.42	
490	69.42	
0.8	70.89	
490	70.89	
122.5	68.42	68.4
122.5	71.9	71.9



**Generalized Bouwer and Rice (1976)**

Well Designation:	RW-7R
Date:	4-Jun-25

$$T_n = \frac{r_e^2 \ln(R/r_e) \ln(s_n(t_1)/s_n(t))}{2(-J)(t-t_1)}$$

Enter early time cut-off for least-squares model fit

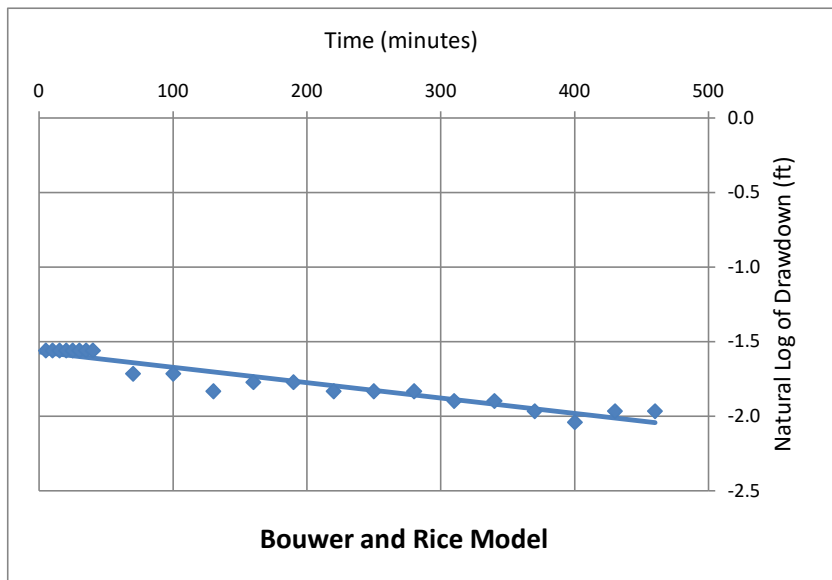
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Model Results:  +/-  ft<sup>2</sup>/d

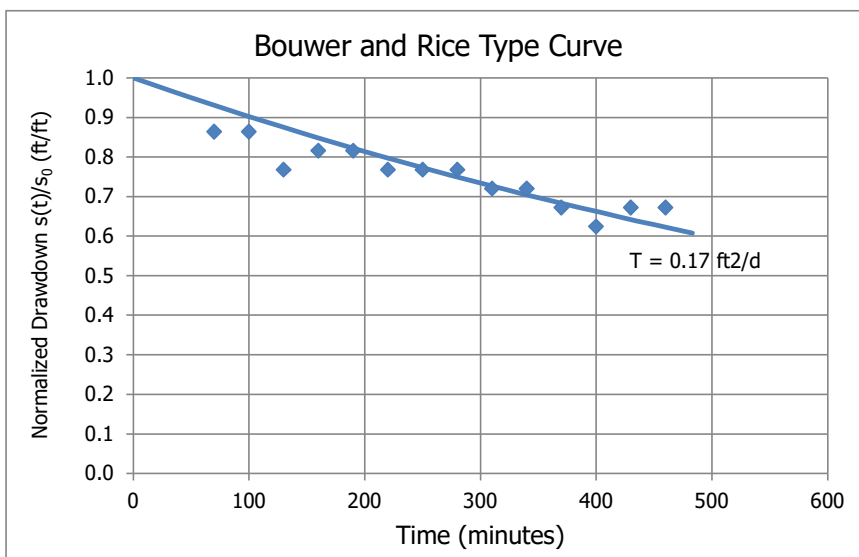
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R/r <sub>c</sub>	4.11

J-Ratio	-0.250
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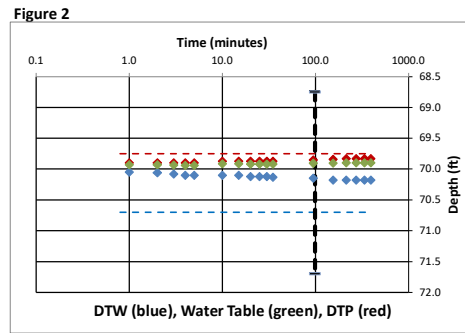
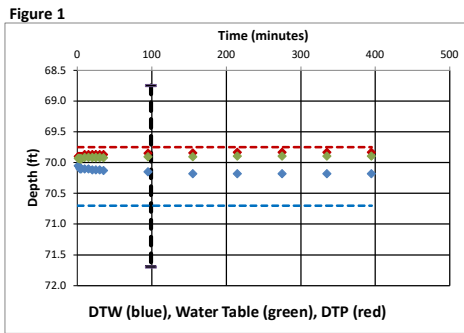
Coef. Of Variation	0.07
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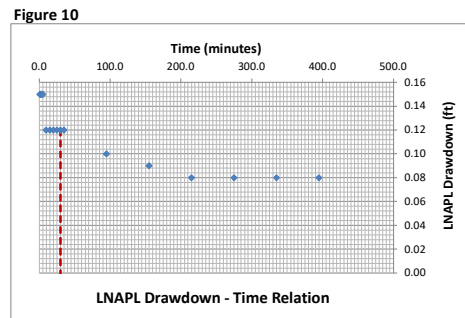
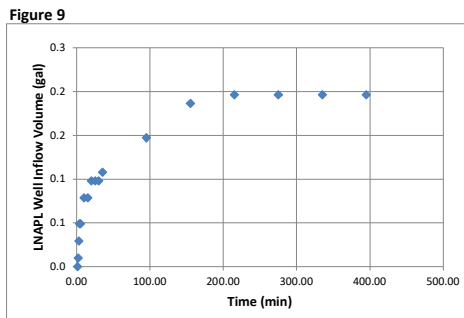
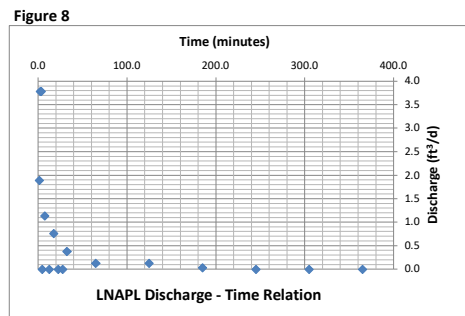
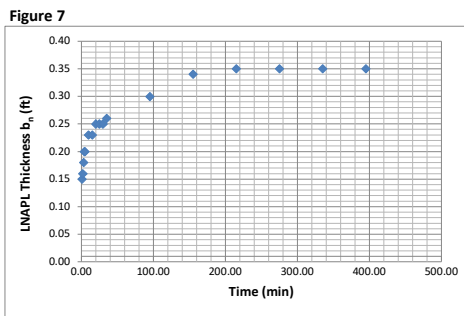
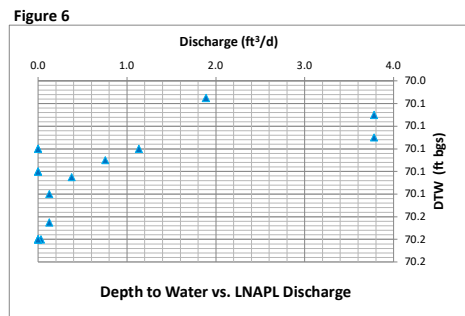
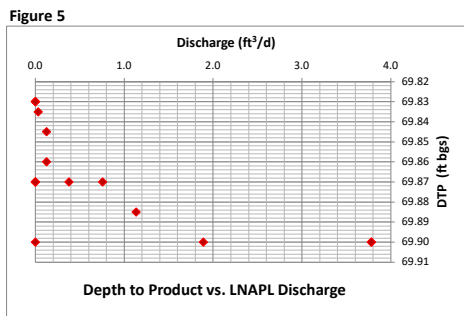
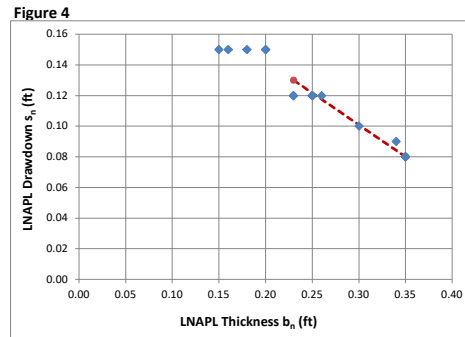
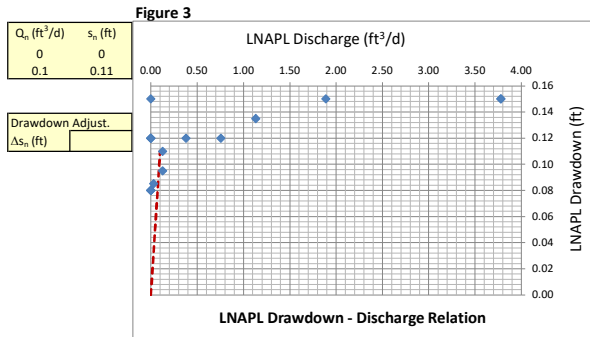
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0.8	69.75	
395	69.75	
0.8	70.7	
395	70.7	
98.8	68.75	68.8
98.8	71.7	71.7



**Generalized Bouwer and Rice (1976)**

Well Designation:	RW-7R
Date:	21-Oct-25

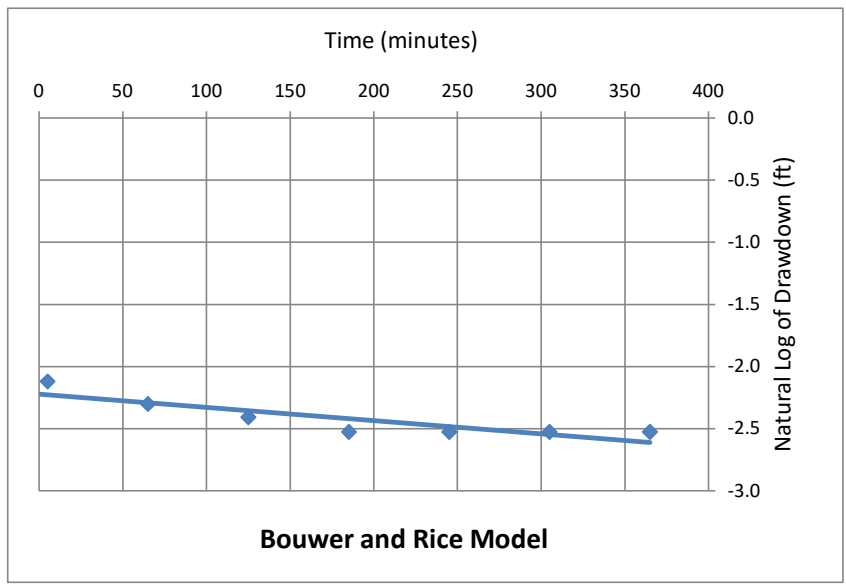
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Enter early time cut-off for least-squares model fit

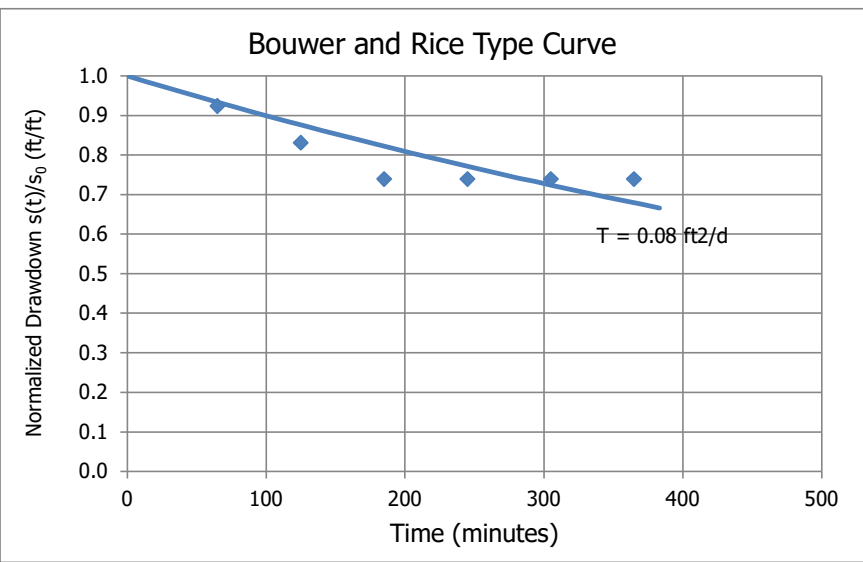
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Model Results:  +/-  ft<sup>2</sup>/d

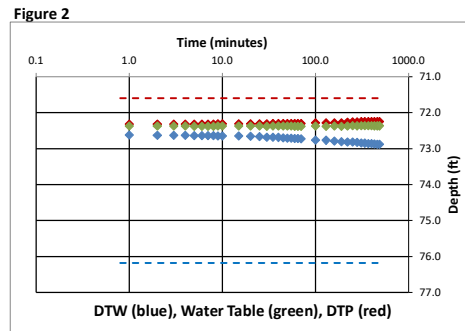
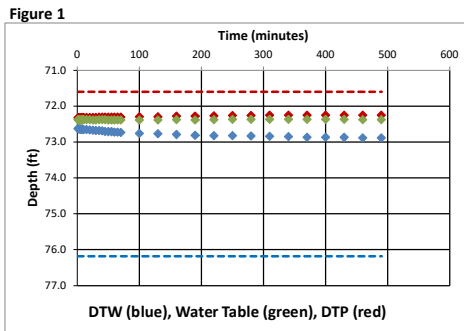
L <sub>e</sub> /r <sub>c</sub>	4.6
C	0.98
R/r <sub>c</sub>	2.94
J-Ratio	-0.417
Coef. Of Variation	0.25



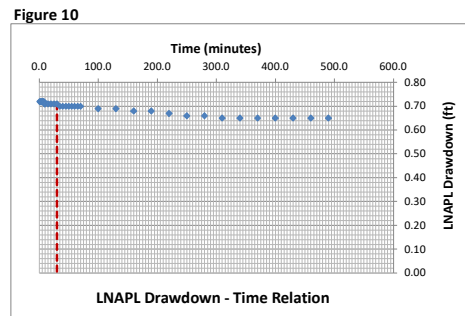
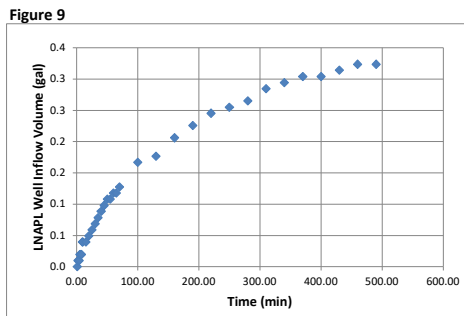
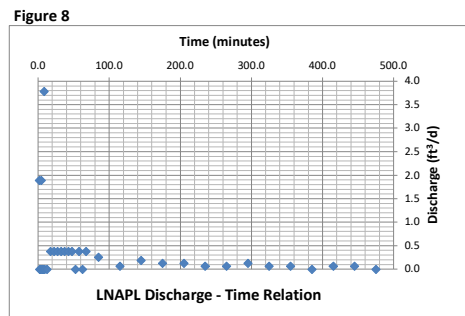
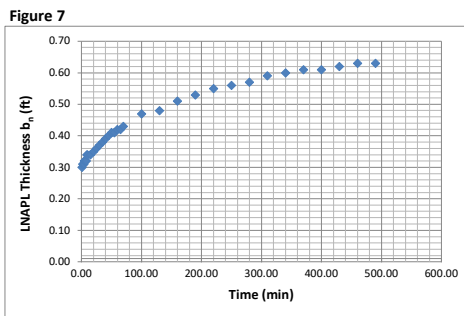
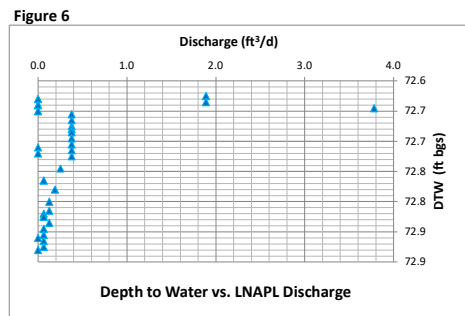
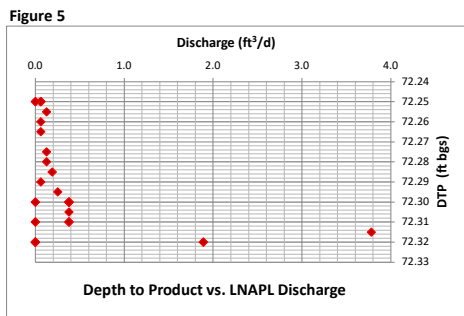
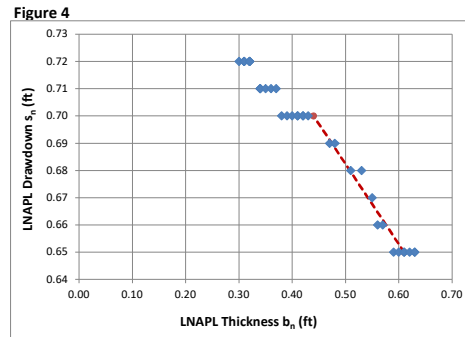
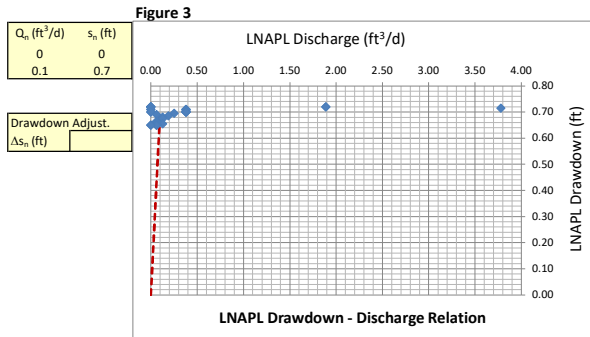
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490	71.60	
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490	76.18	
122.5	#N/A	70.6
122.5	#N/A	0.0



**Generalized Bouwer and Rice (1976)**

Well Designation:	RW-11
Date:	5-Jun-25

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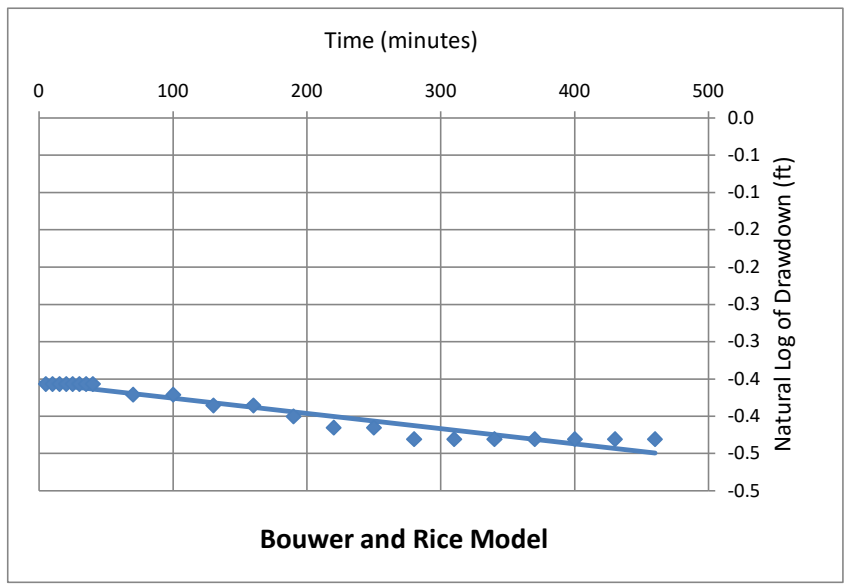
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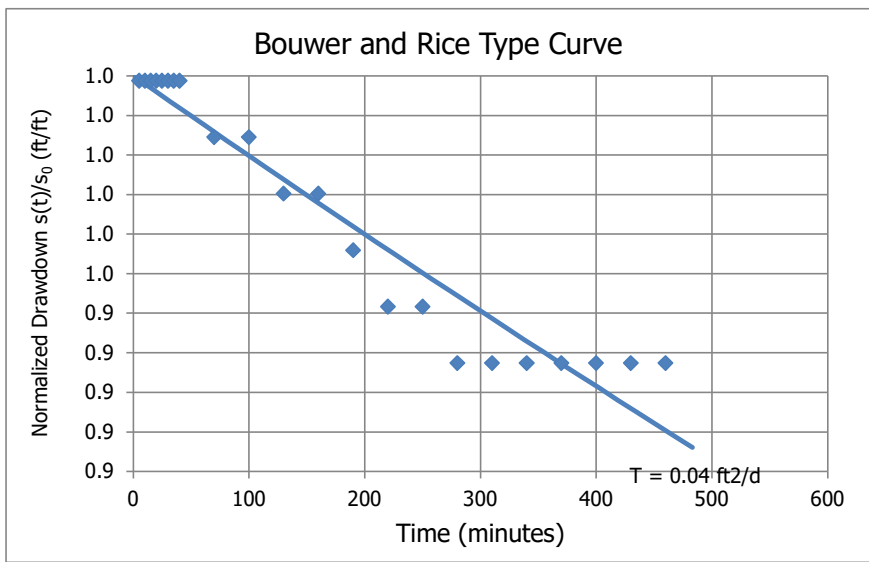
Model Results:  +/-  ft<sup>2</sup>/d

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J-Ratio	-0.294

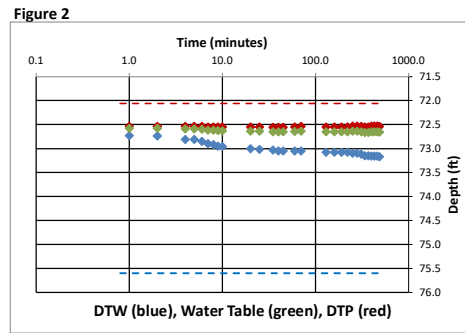
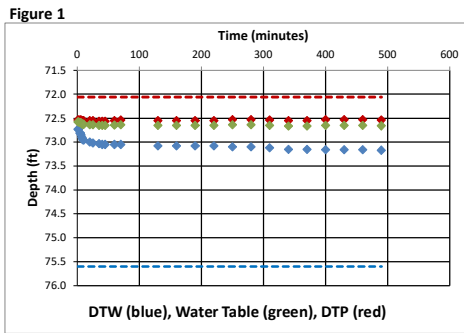
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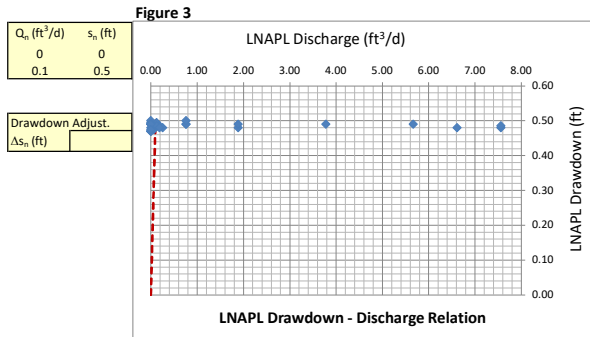
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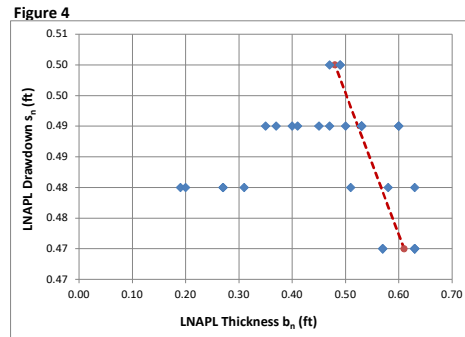


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490	75.6	
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122.5	#N/A	0.0



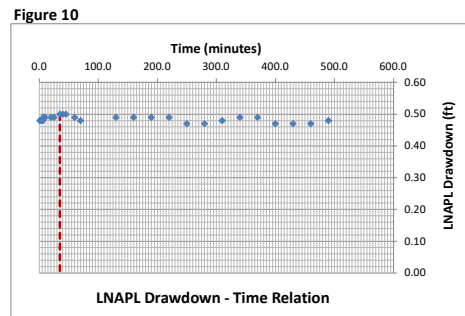
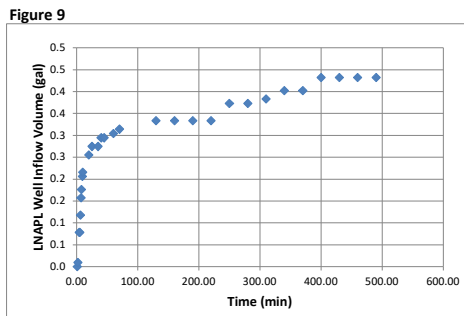
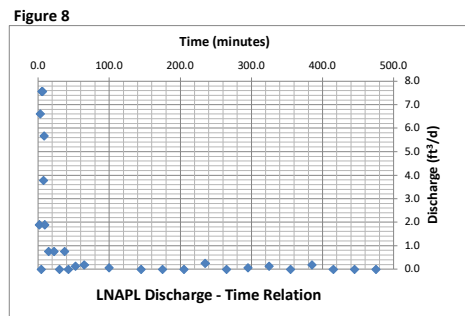
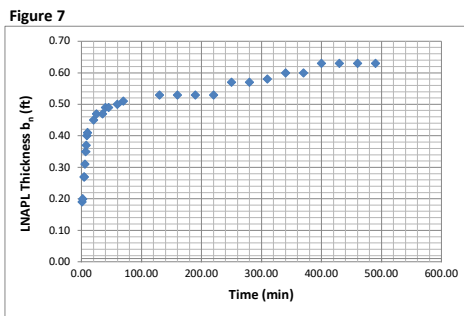
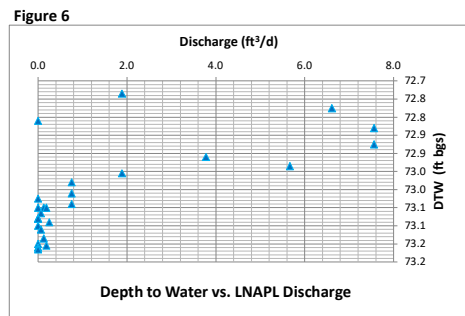
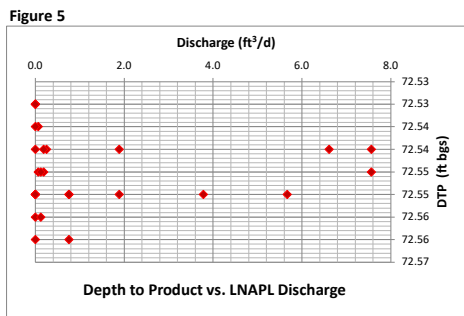
$Q_n$ (ft <sup>3</sup> /d)	$s_n$ (ft)
0	0
0.1	0.5

Drawdown Adjust.
$\Delta s_n$ (ft)



$b_n$	$s_n$
0.61	0.47
0.48	0.5

J-ratio	-0.231
---------	--------



$t$ (min)	$s_n$ (ft)
35	0.5
35	0

**Generalized Bouwer and Rice (1976)**

Well Designation:	RW-11
Date:	23-Oct-25

$$T_n = \frac{r_e^2 \ln(R/r_e) \ln(s_n(t_1)/s_n(t))}{2(-J)(t-t_1)}$$

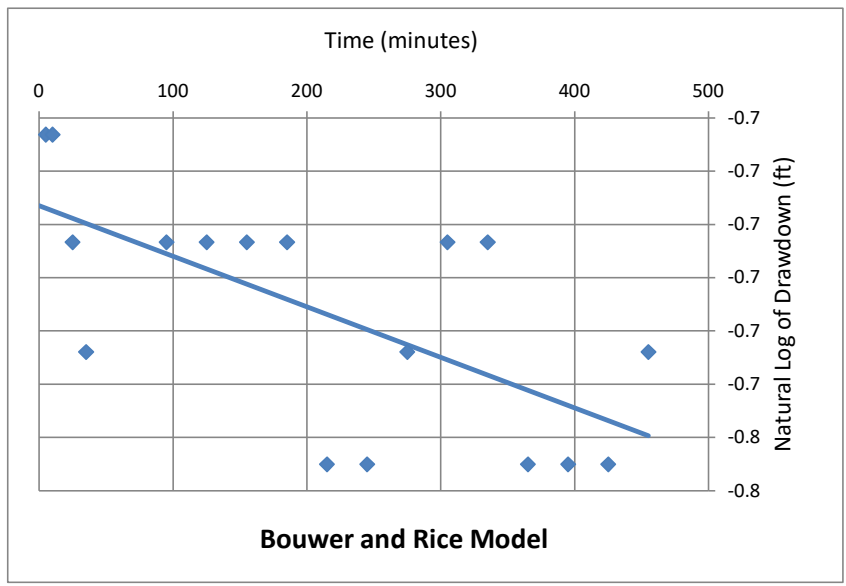
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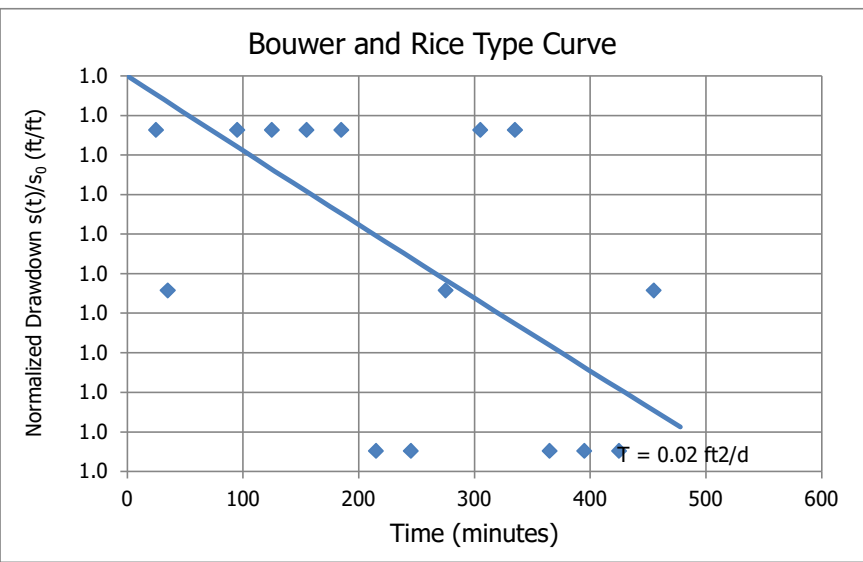
Model Results:  +/-  ft<sup>2</sup>/d

L <sub>e</sub> /r <sub>c</sub>	17.3
C	1.48
R/r <sub>c</sub>	8.34
J-Ratio	-0.231

Coef. Of Variation	0.30
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C coefficient calculated from Eq. 6.5(c) of Butler, The Design, Performance, and Analysis of Slug Tests, CRC Press, 2000.



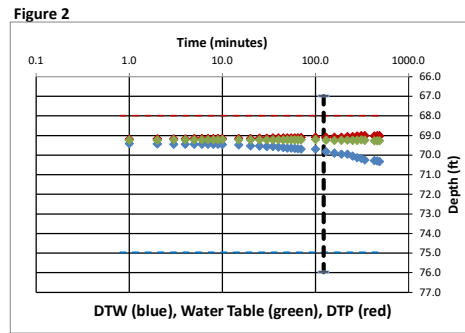
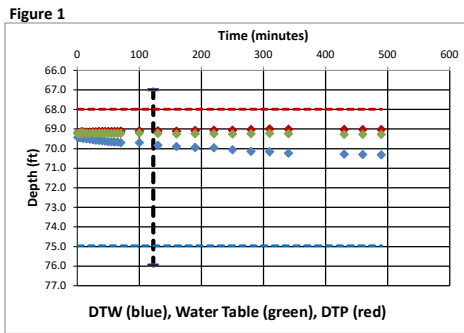
API LNAPL Transmissivity Workbook: RW-14 (June 2025)

Well Designation: RW-14 PAA Darr Angell #2
Date: 4-Jun-25 Assume: well radius

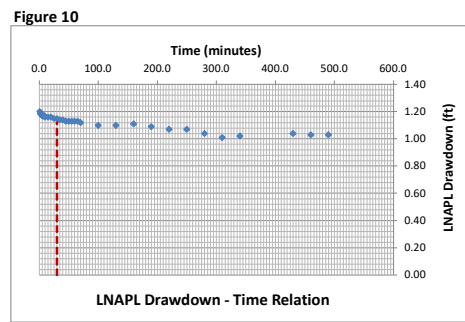
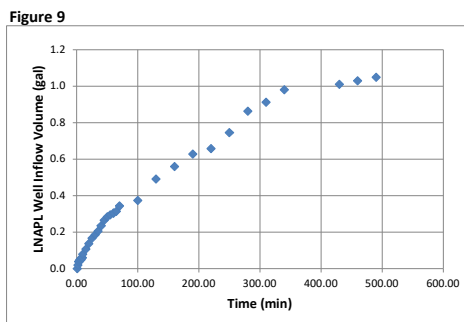
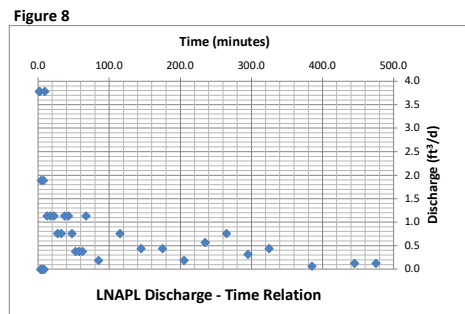
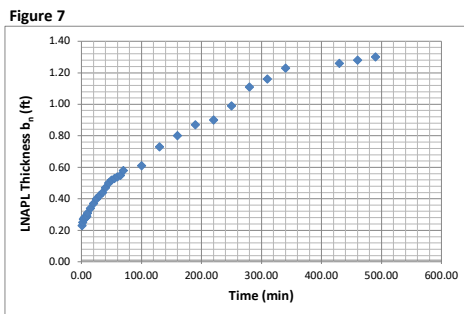
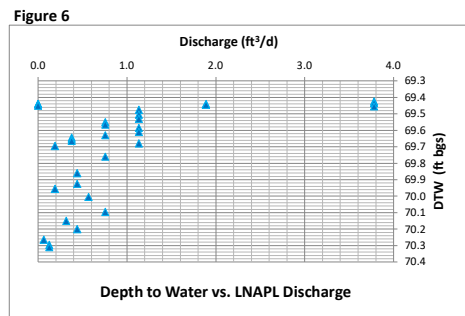
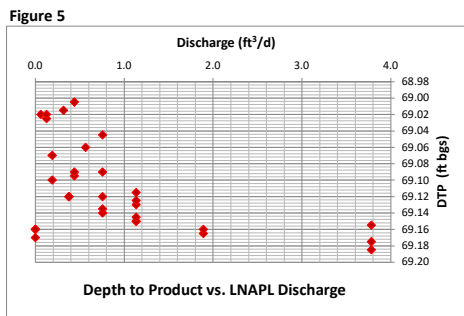
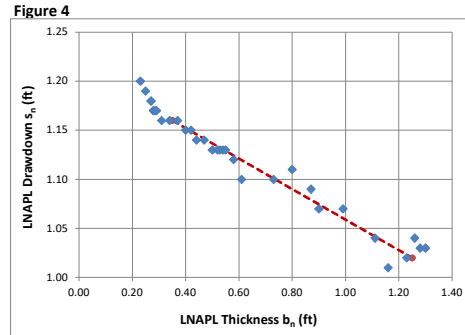
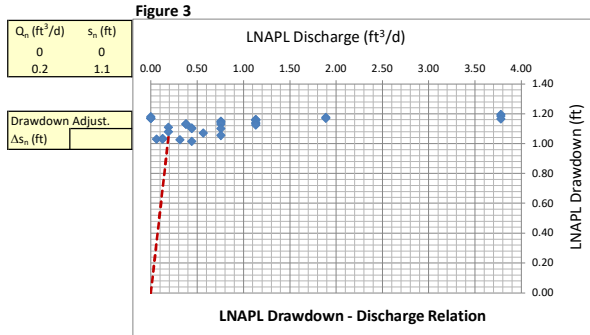
Table with 2 columns: Parameter (e.g., Ground Surface Elev, Top of Casing Elev, Well Casing Radius) and Value. Includes 'Enter These Data' and 'Drawdown Adjustment' sections.

Main data table with columns: Time (min), DTP (ft btoc), DTW (ft btoc), DTP (ft bgs), DTW (ft bgs), Water Table Depth (ft), LNAPL Drawdown (ft), Average Time (min), Discharge (ft³/d), Ss (ft), b1 (ft), re (ft), DTP (ft bgs), DTW (ft bgs), LNAPL Volume (gallons), Ave. re (ft). Contains multiple rows of data and many '#N/A' entries.

0.116



0.8	67.99	
490	67.99	
0.8	74.96	
490	74.96	
122.5	66.99	67.0
122.5	76.0	76.0



**Generalized Bouwer and Rice (1976)**

Well Designation:	RW-14
Date:	4-Jun-25

$$T_n = \frac{r_e^2 \ln(R/r_e) \ln(s_n(t_1)/s_n(t))}{2(-J)(t-t_1)}$$

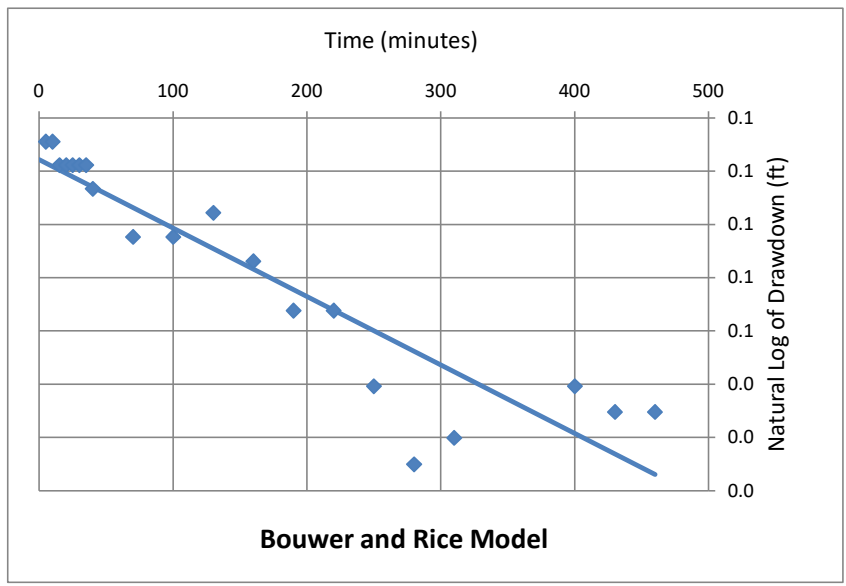
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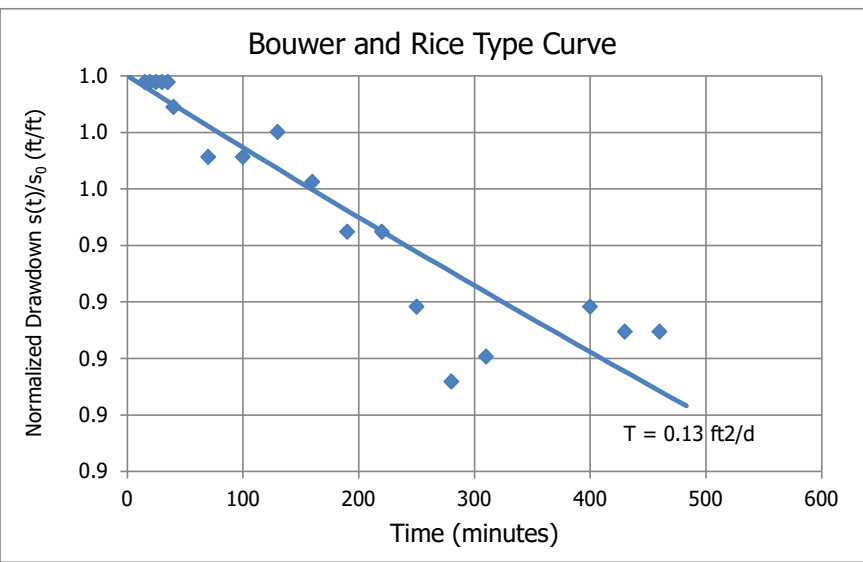
Model Results:  +/-  ft<sup>2</sup>/d

L <sub>e</sub> /r <sub>c</sub>	34.1
C	2.16
R/r <sub>c</sub>	14.41
J-Ratio	-0.156

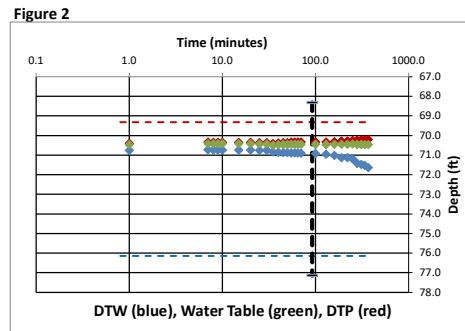
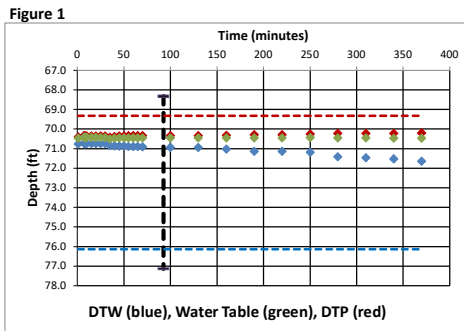
Coef. Of Variation	0.09
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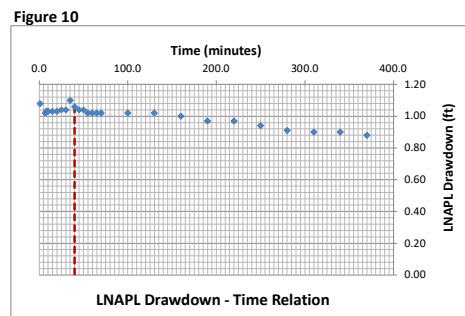
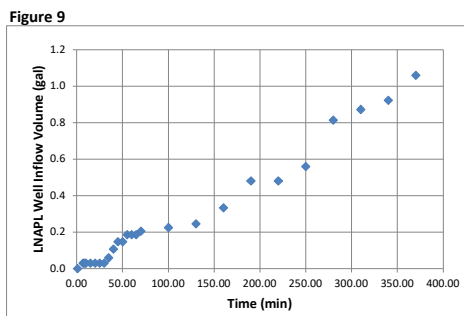
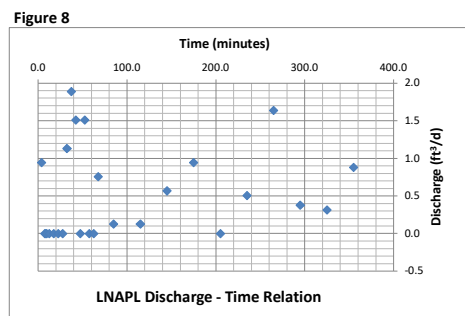
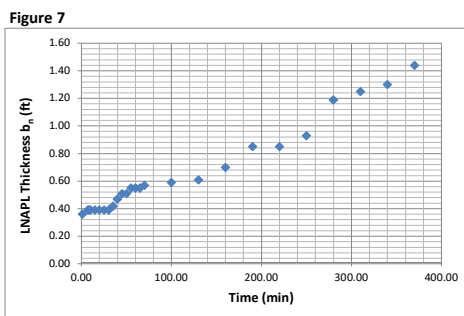
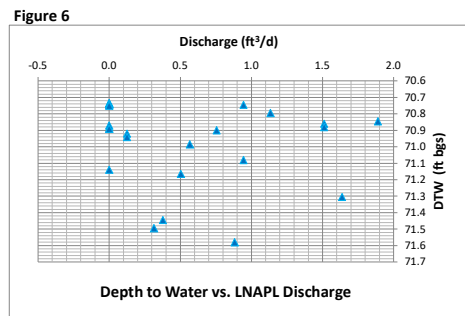
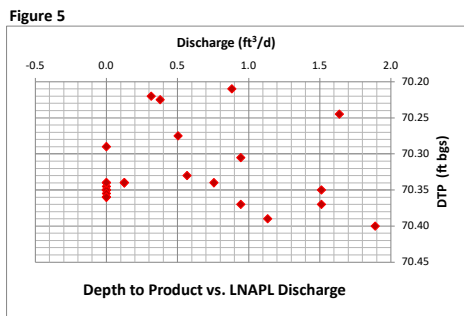
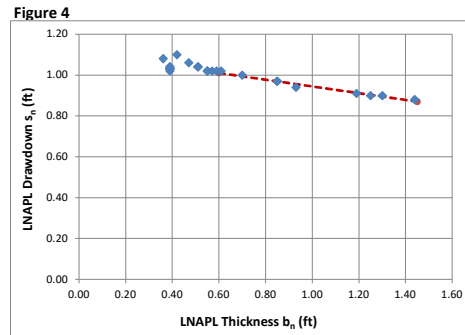
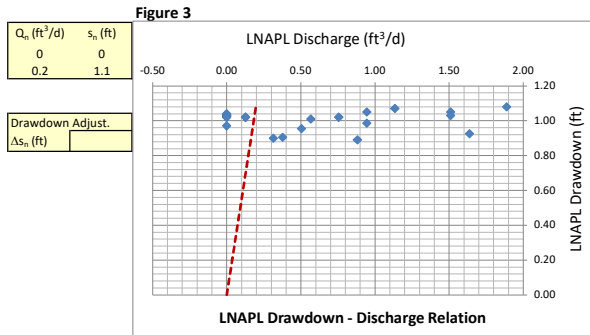
C coefficient calculated from Eq. 6.5(c) of Butler, The Design, Performance, and Analysis of Slug Tests, CRC Press, 2000.







0.8	69.32	
370	69.32	
0.8	76.14	
370	76.14	
92.5	68.32	68.3
92.5	77.1	77.1



**Generalized Bouwer and Rice (1976)**

Well Designation:	RW-14
Date:	22-Oct-25

$$T_n = \frac{r_e^2 \ln(R/r_e) \ln(s_n(t_1)/s_n(t))}{2(-J)(t-t_1)}$$

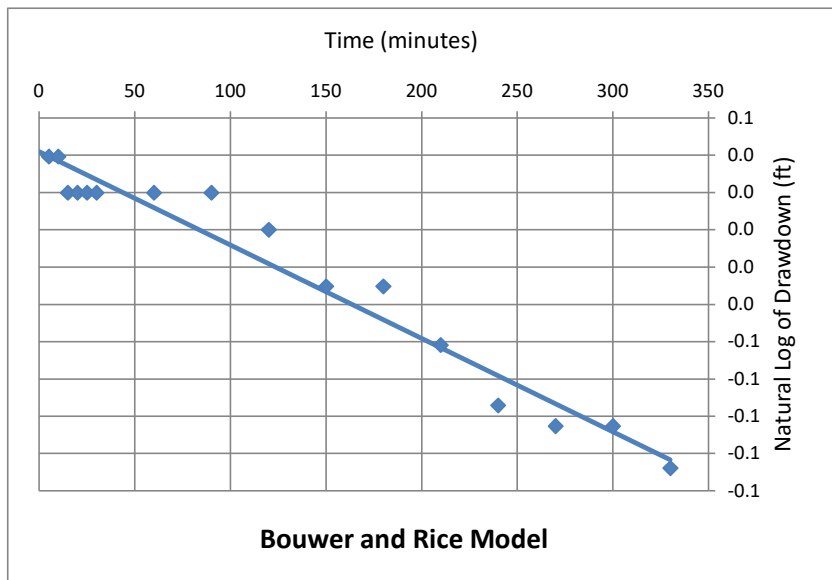
Enter early time cut-off for least-squares model fit

Time<sub>cut</sub>  <- Enter or change value here

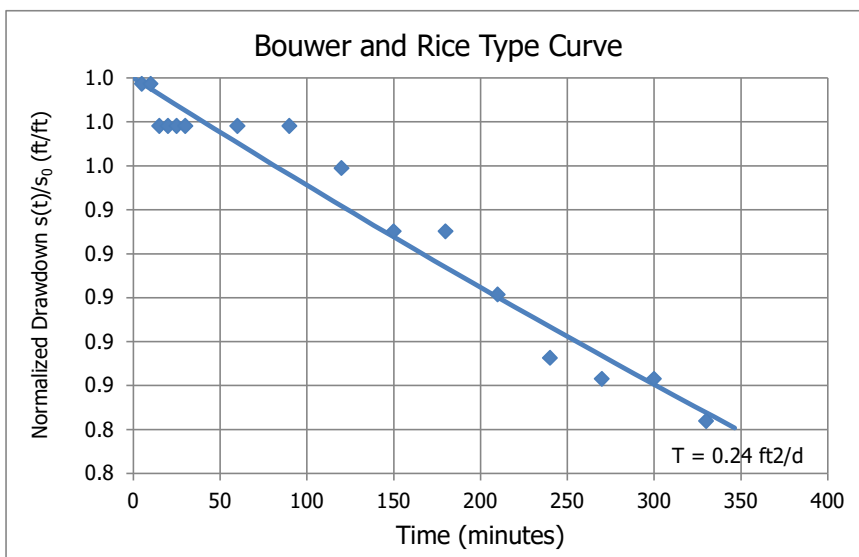
Model Results:  +/-  ft<sup>2</sup>/d

L <sub>e</sub> /r <sub>c</sub>	33.4
C	2.13
R/r <sub>c</sub>	14.16
J-Ratio	-0.165

Coef. Of Variation	0.06
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C coefficient calculated from Eq. 6.5(c) of Butler, The Design, Performance, and Analysis of Slug Tests, CRC Press, 2000.



# Appendix C

## Natural Source Zone Depletion Assessment

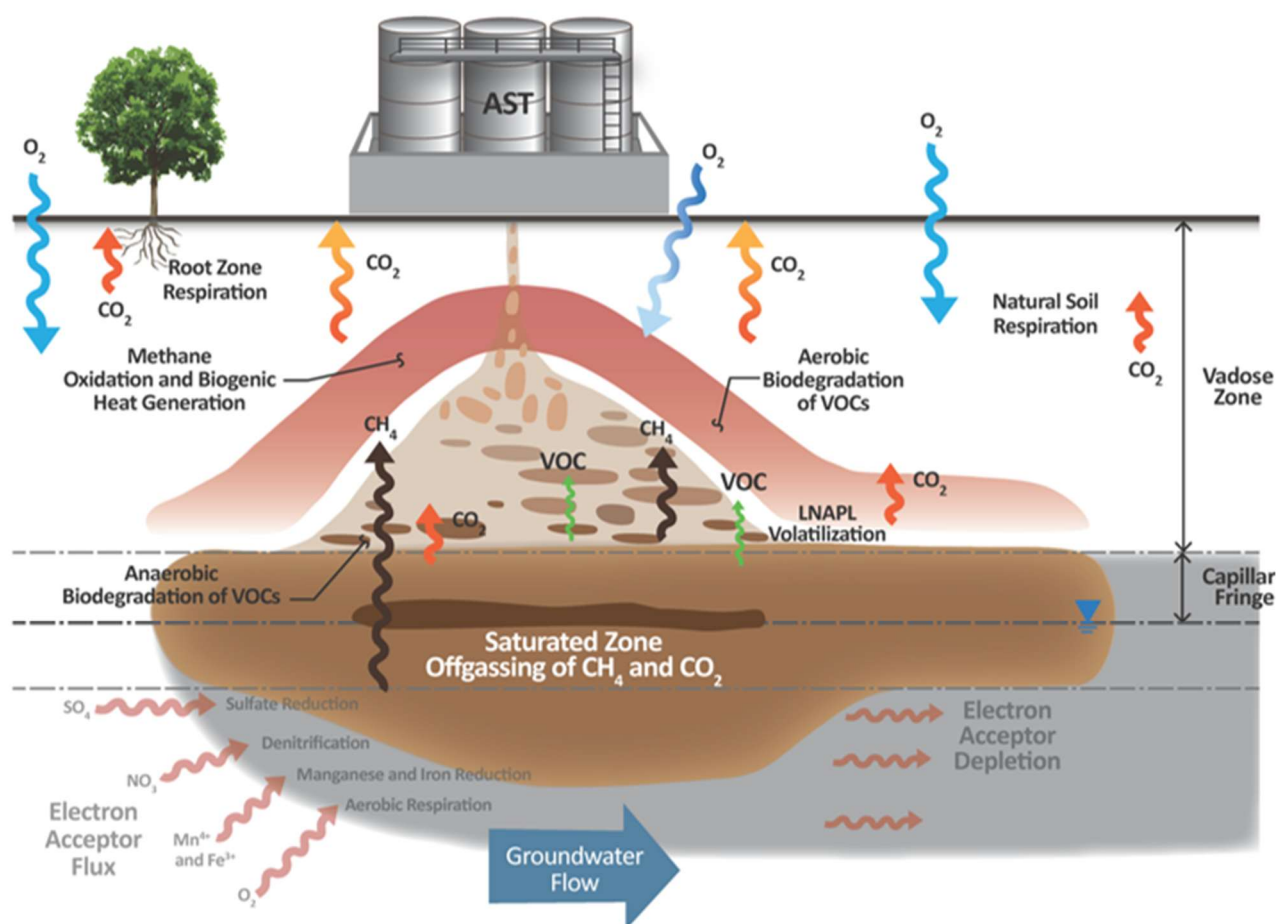
## Natural Source Zone Depletion Assessment

NSZD refers to the natural biodegradation of LNAPL, including both immobile residual and mobile fractions, which occurs through the combined action of natural processes to both change the composition of LNAPL and reduce LNAPL mass in the subsurface over time. Key NSZD processes include volatilization, dissolution, and biodegradation of dissolved and vapor phase constituents, as well as the direct microbial degradation of the LNAPL itself. These processes serve to reduce LNAPL mass, saturation, and mobility naturally over time. Additionally, NSZD is a ubiquitous natural process at LNAPL sites that contributes to progress toward remedial goals, promotes contaminant stability, effects compositional changes, and limits the longevity of LNAPL bodies.

This document provides an overview of the scientific principles underlying NSZD assessments, including the technical background and the methodologies employed.

### Technical background

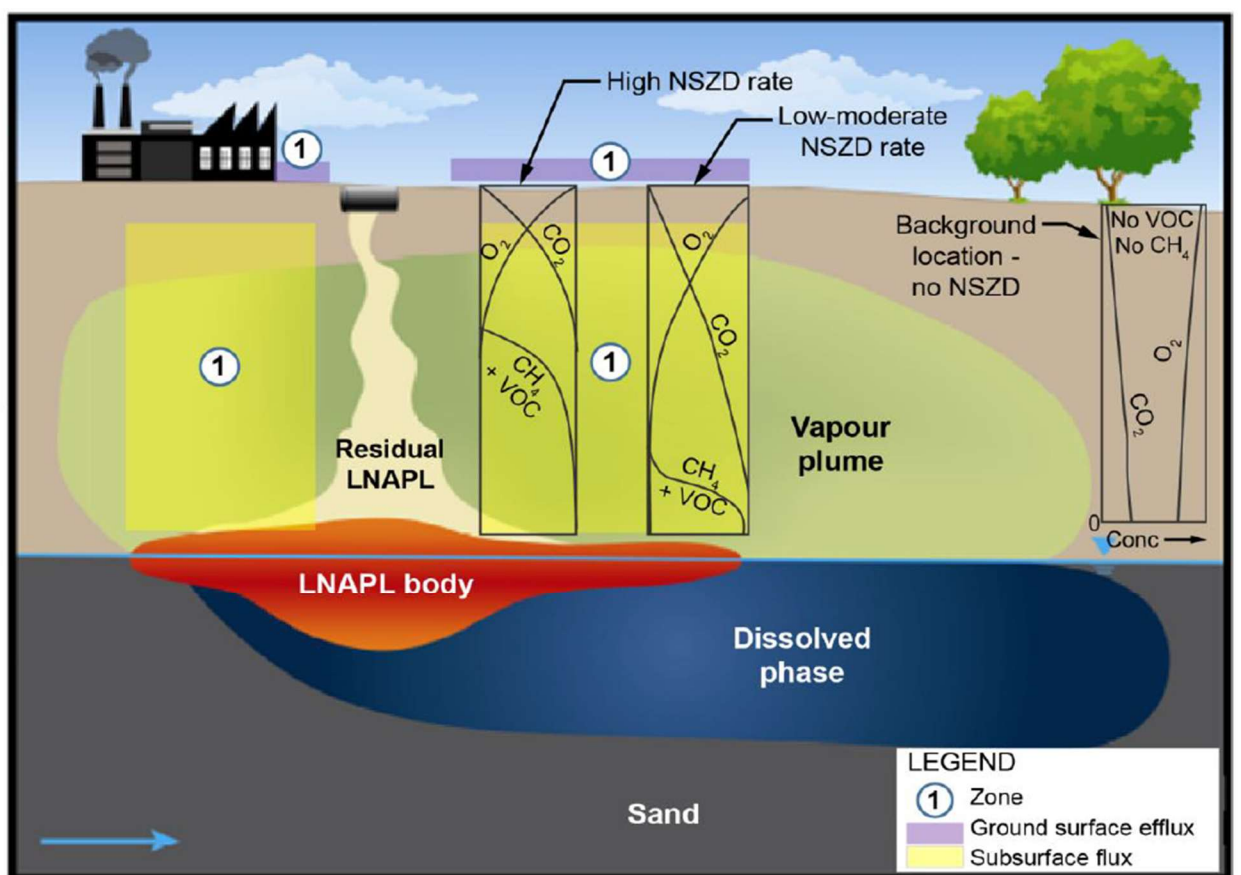
The natural biodegradation of LNAPL will generally proceed anaerobically via methanogenesis, producing methane ( $\text{CH}_4$ ) and carbon dioxide ( $\text{CO}_2$ ), with  $\text{CH}_4$  subsequently oxidized to  $\text{CO}_2$  via an exothermic process in the vadose zone. A conceptual depiction of these processes follows<sup>1</sup>.



<sup>1</sup> NSZD conceptualization from American Petroleum Institute (API) Publication #4784 *Qualification of Vapor Phase-related Natural Source Zone Depletion Processes, First Edition*. (May 2017).

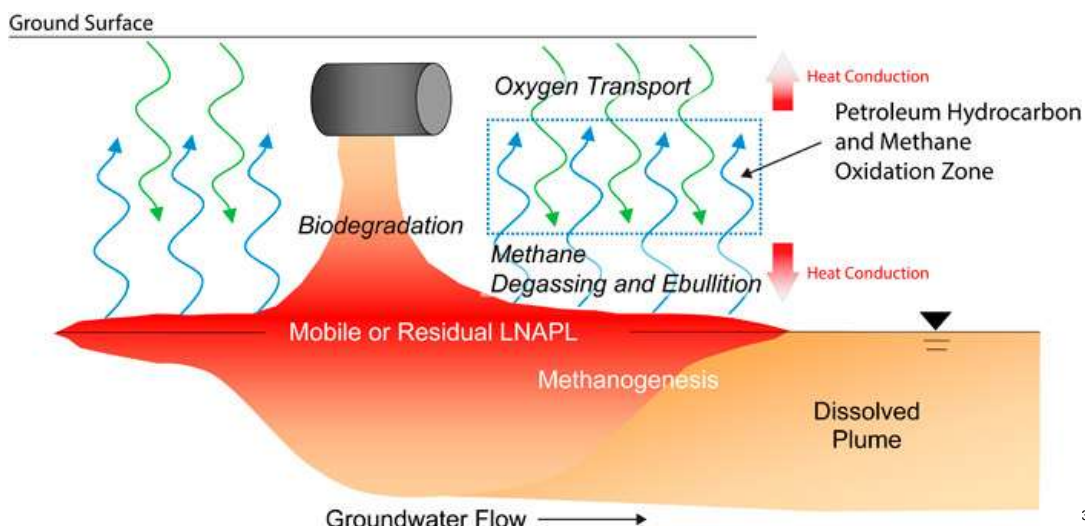
Since gaseous  $\text{CO}_2$  will be the ultimate product of LNAPL mineralization, rates of LNAPL degradation can be estimated by measuring the near surface flux of  $\text{CO}_2$  at sites with petroleum hydrocarbon impacts and isolating the portion of the  $\text{CO}_2$  that is petrogenic (as opposed to that which is produced by other natural processes such as plant respiration). However, surficial  $\text{CO}_2$  methods will be limited in detecting the NSZD signal at many sites due to depth of impacts, stratigraphy, soil moisture, etc. that inhibit the free vertical movement of NSZD byproducts from the saturated zone at depth through the vadose zone to the surface. Therefore, additional techniques for measuring NSZD focus more on NSZD activity in the vadose zone nearer to the LNAPL such as changes in the vadose-zone gases or the exothermic  $\text{CH}_4$  oxidation reaction.

The confirmation of methanogenic conditions ( $\text{O}_2$  depletion,  $\text{CH}_4$  and/or  $\text{CO}_2$  production) in the vadose zone provides a line of evidence of NSZD activity. As shown in the figure below, vertical subsurface soil gas gradient profiles will exhibit a characteristic pattern within an LNAPL-impacted area compared with areas where LNAPL is not present when NSZD is active. Since gases are transported through the vadose zone, mainly via diffusion, the soil gas gradient method uses soil gas measurements taken at discrete depths to estimate the diffusive flux through the vadose zone. Because NSZD directly impacts both  $\text{O}_2$  and  $\text{CO}_2$ , either the diffusive flux of  $\text{O}_2$  (consumption) or  $\text{CO}_2$  (production) can be stoichiometrically equated to an NSZD rate. Thus, the flux of the gases (i.e. mass flow per unit area per unit time) can be measured and used to estimate the NSZD rate.

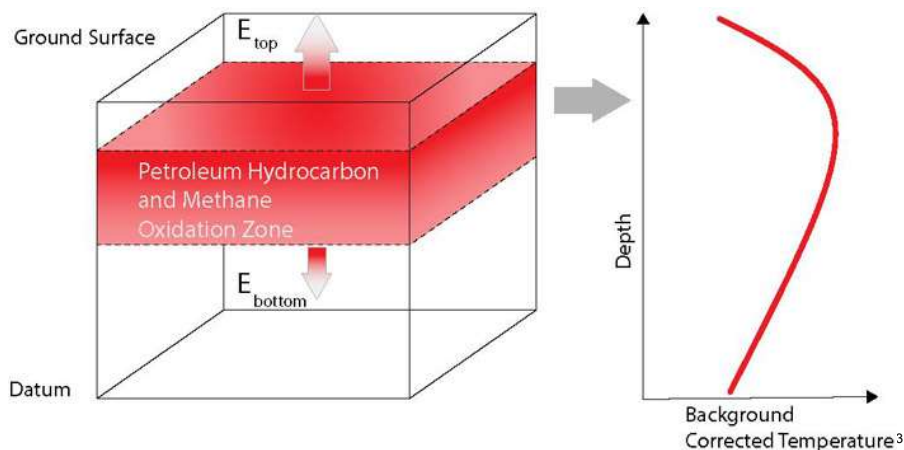


Similarly, temperature anomalies within an LNAPL-impacted area compared with areas where LNAPL is not present can provide evidence NSZD is active, particularly when correlated with other data such as  $\text{CO}_2$  flux results. Vertical subsurface temperature profiling at locations both in and outside of LNAPL-impacted areas can be used to approximate NSZD rates by relating estimates of heat flux above background levels to the heats of reaction for the NSZD processes. The following figure provides a conceptualization of the methane oxidation related to LNAPL degradation and the associated heat conduction from the exothermic reaction.

<sup>2</sup> Figure from Cooperative Research Centre for Contaminated Site Assessment and Remediation (CRC CARE) Technical Report 44: *Technical measurement guidance for LNAPL natural source zone depletion*. August 2018.



As seen below, the heat released during the exothermic CH<sub>4</sub> oxidation reaction can be conceptualized as two-dimensional heat transfer upward toward ground surface and downward toward the water table. This heat transfer can result in temperature anomalies/gradients that mimic this two-dimensional conceptualization when compared to background locations away from the contamination or modelled subsurface temperatures, resulting in a characteristic temperature profile that peaks in the heart of the CH<sub>4</sub> oxidation zone.



These temperature gradients (i.e., temperature change over vertical distance or  $\Delta T/\Delta z$ ) and the summation of the associated heat fluxes form the basis for the estimation of the biogenic heat NSZD estimate.

And finally, natural attenuation plays a large role in the long-term stability of both LNAPL and associated dissolved plumes. It is well established that natural attenuation in groundwater has a significant impact on the extent and stability of dissolved petroleum hydrocarbon plumes, which forms the basis of monitored natural attenuation (MNA) as a groundwater remedy. Similarly, it has been demonstrated NSZD processes can result in LNAPL mass loss rates sufficient to balance residual LNAPL gradients, thereby stabilizing the LNAPL body/footprint.<sup>4</sup> Therefore, demonstrations of a stable (or diminishing) LNAPL body and/or related dissolved plumes represent complimentary lines of evidence of active natural attenuation and vice versa.

<sup>3</sup> ITRC (Interstate Technology & Regulatory Council). 2018. *Light Non-Aqueous Phase Liquid (LNAPL) Site Management: LCSM Evolution, Decision Process, and Remedial Technologies*. ITRC Document No. LNAPL-3. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPL Update Team.

<sup>4</sup> Mahler et al, 2012, *A Mass Balance Approach to Resolving LNAPL Stability*, Groundwater, Volume 50, Number 6, doi: 10.1111/j.1745-6584.2012.00949.x

An NSZD assessment confirms LNAPL natural attenuation and approximates NSZD rates using a multiple lines of evidence approach via the following methods:

- Biogenic heat method - snapshot measurement of temperature profiles in the headspace of existing wells.
- Soil gas gradient method - snapshot measurement of soil gas profiles in the headspace of existing wells.

More detail on NSZD, the underlying processes, and associated monitoring approaches is provided by API<sup>1</sup>, ITRC<sup>3</sup>, CRC CARE<sup>2</sup>, and ASTM.<sup>5</sup>

## NSZD Assessment Methodology

The applications of the biogenic heat and soil gas gradient methods are described below. All NSZD methods will be performed consistent with the principles and general methodology described by API<sup>1</sup>, ITRC<sup>3</sup>, and CRC CARE<sup>2</sup>.

### Biogenic Heat

The biogenic heat method uses temperature anomalies above background levels within an LNAPL-contaminated zone along with known heats of reaction and stoichiometry to estimate NSZD rates based on the heat released during the oxidation of petrogenic methane in the vadose zone. The method was first described by Sweeney and Ririe<sup>6</sup>, and has been further elaborated on by Warren & Bekins<sup>7</sup>, ITRC<sup>3</sup>, API<sup>1</sup>, CRC CARE<sup>2</sup> and ASTM<sup>5</sup> since.

'Background'-corrected temperature gradients are used as the basis for the estimates. The temperature gradients are converted to heat fluxes according to the following equation:<sup>2,6</sup>

$$q_h = -K_T(\Delta T/\Delta z),$$

where:  $q_h$  = heat flux (J/m<sup>2</sup>/s)

$-K_T$  = thermal conductivity of the soil/rock (J/s/m/°C)

$\Delta T/\Delta z$  = temperature gradient (°C/m)

Thermal conductivities are typically derived from reference material on the thermal properties of soil/rock. The total heat flux,  $q_T$ , is then represented by the summation of the heat fluxes upwards and downwards as follows:<sup>4,8</sup>

$$q_T = -K_T(\Delta T/\Delta z)_{\text{upward}} - K_T(\Delta T/\Delta z)_{\text{downward}}$$

The ultimate estimation of the NSZD rate is facilitated by dividing the total heat flux,  $q_T$ , by the heat of reaction for the methane oxidation reaction as shown below:

$$R_{\text{NSZD}} = q_T/\Delta H_{\text{rxn}},$$

where:  $R_{\text{NSZD}}$  = NSZD rate (g hydrocarbon degraded/m<sup>2</sup>/s)

$\Delta H_{\text{rxn}}$  = heat of reaction (Joules per gram [J/g])

This method will be performed consistently with the principles and general methodology described by ITRC<sup>3</sup>, API<sup>1</sup>, and CRC CARE<sup>2</sup>. Instantaneous or "snapshot" vertical temperature profiles will be mapped with a multi-level string of HOBO® Pendant® temperature data loggers (model MX2201) or comparable loggers. Temperature profiles will be collected from near surface to the top of the fluid with measurements spaced at 1-ft intervals.

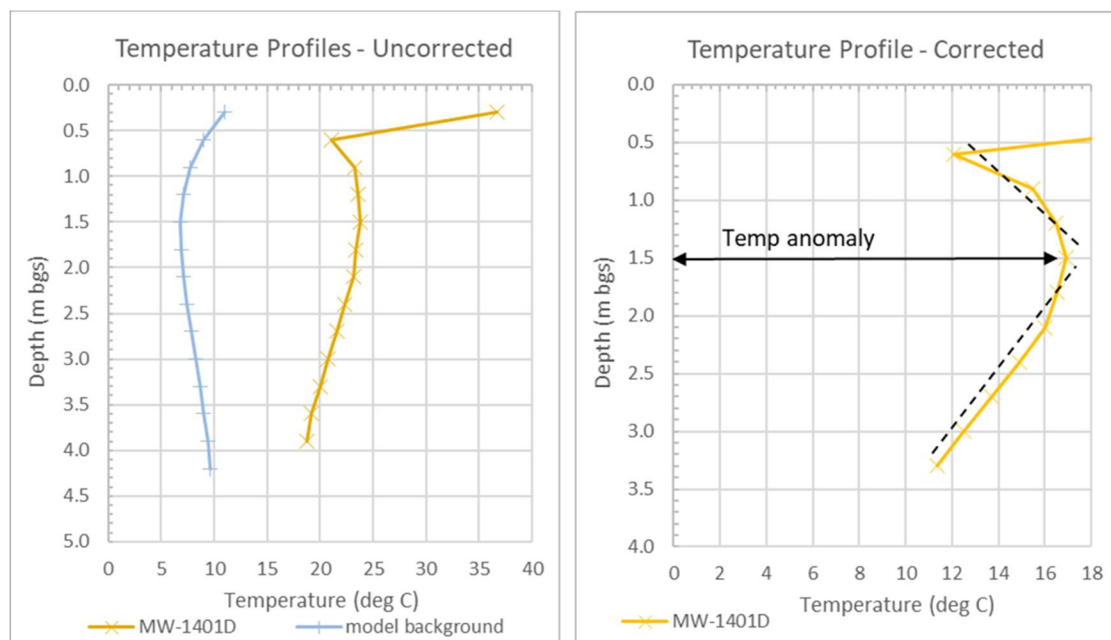
<sup>5</sup> ASTM Standard E3361-22, *Standard Guide for Estimating Natural Attenuation Rates for Non-Aqueous Phase Liquids in the Subsurface*. December 2022.

<sup>6</sup> Sweeney, R.E., and G.T. Ririe. 2014. *Temperature as a Tool to Evaluate Aerobic Biodegradation in Hydrocarbon Contaminated Soil*. Groundwater Monitoring & Remediation (doi:10.1111/gwmr.12064).

<sup>7</sup> Warren, E., and B.A. Bekins. 2015. *Relating subsurface temperature changes to microbial activity at a crude oil-contaminated site*. Journal of Contaminant Hydrology (doi: 10.1016/j.jconhyd.2015.09.007).

This method requires a 'background' correction, which involves subtracting a temperature profile representative of subsurface background conditions from the measured temperature profiles in the assessment area to identify heat anomalies associated with NSZD processes. At complex sites, it can be difficult to find a true 'background' location as often no single Site well will exhibit obvious signs of being suitable as a 'background' location. In such cases, background correction will be performed using a modeled subsurface background temperature profile. Estimated background soil temperatures are determined through mathematical means using the sinusoidal Van Wijk & de Vries function (Van Wijk & de Vries, 1963), which provides an analytical solution to estimate subsurface temperatures based on ambient temperature variation, key soil properties, and curve fitting constants as discussed in literature such as Sweeney & Ririe (2014) and CRC CARE Technical Report no. 44.

An example of uncorrected (as measured) and corrected subsurface temperature profiles are provided below in Graph 1. A typical temperature anomaly (solid line with arrows) can be seen in the corrected temperature profile on the right at a depth of approximately 1.5 m bgs, where the maximum vadose zone temperature is approximately 17.0°centigrade warmer than the background temperature used for correction (blue curve on the left). The slopes used for the upward and downward temperature gradient calculations are denoted by dashed black lines.

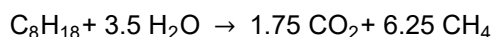


**Graph 1** Typical example of Uncorrected and Modeled Temperature Profiles (left) and Corrected Temperature Profile (right) with Typical Biogenic Heat Anomaly (right).

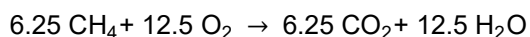
## Soil Gas Gradient

The standard procedure for the soil gas gradient method assumes that the average molecular weight of an LNAPL source is appropriately represented by octane (C<sub>8</sub>H<sub>18</sub>). The following stoichiometric reactions describe the process:

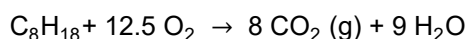
*Anaerobic Reaction in Vadose Zone (Immediately Above Source)*



*Aerobic Reaction in Vadose Zone (Above Anaerobic Halo)*



*Overall Reaction (summation of both reactions)*



For the gradient method, the ratio of O<sub>2</sub> to C<sub>8</sub>H<sub>18</sub> is used to determine NSZD rate. The overall reaction indicates 2 moles of C<sub>8</sub>H<sub>18</sub> react with 25 moles of O<sub>2</sub>. The molecular weight of C<sub>8</sub>H<sub>18</sub> is 114.23 grams per mole (g/mole) and the molecular weight of O<sub>2</sub> is 32 g/mole, giving a stoichiometric conversion ratio of C<sub>8</sub>H<sub>18</sub>:O<sub>2</sub> = 0.285.

This conversion can be used to determine the amount of octane consumed based on the amount of O<sub>2</sub> depleted. Assuming an LNAPL specific gravity of 0.77 (upper range for gasoline), a NAPL loss rate (NSZD rate) can then be determined by converting the O<sub>2</sub> depleted as follows:

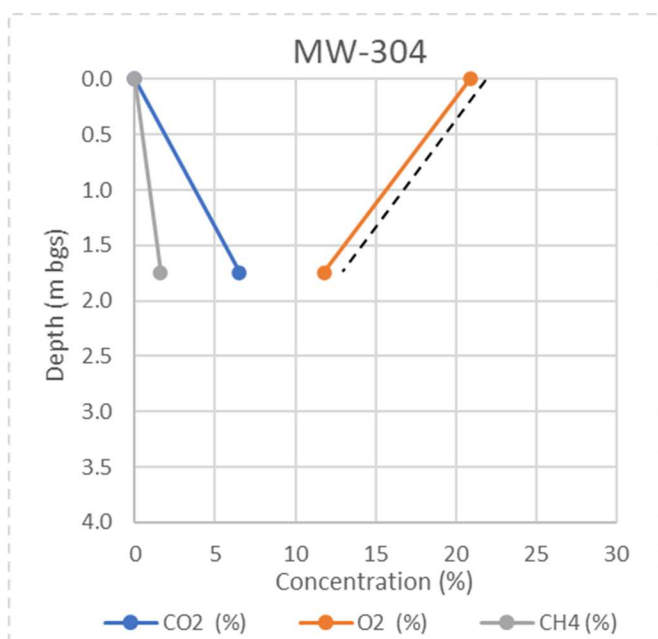
$$1 \frac{\text{g O}_2}{\text{m}^2 \cdot \text{d}} \times 0.285 \frac{\text{g C}_8\text{H}_{18}}{\text{g O}_2} \times \frac{1}{770 \frac{\text{g C}_8\text{H}_{18}}{\text{L}}} \times \frac{365 \text{ d}}{1 \text{ yr}} = 0.14 \frac{\text{L C}_8\text{H}_{18}}{\text{m}^2 \cdot \text{yr}}$$

$$\times \frac{1 \text{ U.S. gal}}{3.785 \text{ L}} \times \frac{4,047 \text{ m}^2}{1 \text{ acre}} = 140 \frac{\text{US gallon C}_8\text{H}_{18}}{\text{acre} \cdot \text{yr}}$$

Therefore, the approximate NAPL loss rate for every gram (g) of O<sub>2</sub> depleted per square meter (m<sup>2</sup>) per day (d) represents 140 U.S. gal of LNAPL degraded per acre per year (0.14 L of LNAPL degraded per square meter per year).

Determining the O<sub>2</sub> depletion rate requires the development of a 2-point gradient for O<sub>2</sub> in soil gas in the headspace of existing wells. For each well, the atmospheric level of O<sub>2</sub> (20.9%) is assumed to represent ambient conditions at the surface. For the second point, O<sub>2</sub> concentration is measured at depth in the vadose zone, approximately 1 foot (ft) above the air/liquid interface (i.e., near top of NAPL, if present, otherwise near top of groundwater) where well screen is open to the subsurface. These measurements are collected with a handheld multigas analyzer (such as the Landtec GEM5000) and a handheld methane-specific gas analyzer (such as the Landtec SEM5000). The next step involves ‘background’ correction of the resulting O<sub>2</sub> concentration gradients using the mean of the lowest NSZD signals (i.e., the lowest O<sub>2</sub> gradients) measured at the test locations in order to isolate the oxygen consumption associated with NSZD activity.

The soil gas gradient profiles provide an additional method to confirm the occurrence of NSZD other than the quantitative method described above. The second method provides a screening level analysis based on expected trends in soil gas constituent concentrations that are known to correspond to NSZD processes. More specifically, multi-gas measurements indicating an increase in CH<sub>4</sub> and CO<sub>2</sub> levels with a simultaneous decrease in O<sub>2</sub> levels with increasing depth qualitatively indicate NSZD processes as this is the typical NSZD soil gas signature. An example of target gas gradients (O<sub>2</sub>, CO<sub>2</sub>, and CH<sub>4</sub>) indicating NSZD processes is shown below in Graph 2, with the dashed black line indicating the decreasing O<sub>2</sub> concentration with depth.



Graph 2 Soil gas profiles of CH<sub>4</sub>, CO<sub>2</sub>, and O<sub>2</sub> illustrating trends indicative of NSZD activity.

# Appendix D

**ITRC, 2018 - LNAPL 3 Site Management,  
Section 3.3.5**

### 3.5.5 LNAPL Indicators

At petroleum release sites where an LNAPL concern exists, but it has not been directly observed, a determination of LNAPL presence should rely on multiple lines of evidence to verify or eliminate the suspected LNAPL concern. Monitoring for the presence or absence of LNAPL in monitoring wells can be helpful; however, it should not be the only assessment tool. Where LNAPL is present in a properly constructed monitoring well, LNAPL can also be assumed present in the surrounding subsurface formation. However, it is a common misconception to assume that if no LNAPL is present in a monitoring well, then there is no LNAPL in the soil. Similarly, if in-well LNAPL thickness changes from measurable to not measurable following LNAPL remediation, it is a common misconception to assume that LNAPL is no longer present within the surrounding subsurface soil. In both of these scenarios, LNAPL may be present in discontinuous pores at saturations less than those needed to migrate laterally or to mobilize into a monitoring well.

Table 3-2 lists potential indicators of the presence of LNAPL in unconsolidated materials, and more importantly, also cautions the use of indicators that should be viewed as ‘lines of evidence’ rather than absolute indicators. Note also that Table 3-2 does not cover all situations (e.g., sediments nor fractured media). The use of soil or groundwater concentrations to assess whether LNAPL is present should be regarded as supporting evidence and not as absolute indicators. There is not a specific concentration in groundwater that indicates the presence of LNAPL, because varying product compositions and degrees of weathering affect concentrations of dissolved components. Similarly, the use of TPH concentrations in soil as an indicator of LNAPL presence should be exercised with caution as soil TPH concentrations may be affected by non-hydrocarbons (such as soil organic matter) and by the choice of analytical method. However, the closer a measured concentration in groundwater is to the effective solubility, the greater the likelihood that LNAPL is present. For more information, reference the ITRC TPH Risk Document (ITRC 2018).

A comparison of historic and current site-specific dissolved and vapor phase concentrations, and boring logs with notes about locations and depths of impacted soils, can provide additional lines of evidence pertaining to the presence or absence of an LNAPL body. For example, significant lateral migration and an increase in dissolved-phase concentrations, or the sudden appearance of vapor in buildings, may suggest that LNAPL is present.

Visual observations of the soil core combined with field screening tools such as a photoionization detector (PID) or flame ionization detector (FID) with CH<sub>4</sub> correction, or use of LIF tools as the boring is advanced, can confirm the presence or absence of LNAPL in the borings. Care should be taken to design a soil investigation that assesses the areas with the greatest potential for LNAPL. Inadequate distribution or placement of soil borings can lead to an incomplete investigation and the presumption of no LNAPL presence when it may indeed be present in the subsurface.

**Table 3-2. Potential LNAPL indicators**

Indicator <sup>1</sup>	Limitations
<b>Groundwater</b>	
<ul style="list-style-type: none"> <li>• <b>Effective solubility of a given constituent:</b> Greater than 1% to 10% (e.g., for gasoline)</li> <li>• <b>Benzene:</b> &gt; 1 - 5 mg/L<sup>2,3</sup></li> <li>• <b>TPH<sub>(gasoline)</sub>:</b> &gt; 30 mg/L<sup>4</sup></li> <li>• <b>BTEX:</b> &gt; 20 mg/L<sup>5</sup></li> <li>• <b>Current or historical presence of LNAPL (including sheens)</b> <sup>2,3</sup></li> </ul>	<ul style="list-style-type: none"> <li>• There is not a specific petroleum hydrocarbon compound (PHC) concentration in groundwater that defines LNAPL because of varying product types and degrees of weathering.</li> </ul>
<b>Soil</b>	

Indicator <sup>1</sup>	Limitations
<ul style="list-style-type: none"> <li>• <b>Current or historical presence of LNAPL (including sheens, staining)<sup>2,3</sup></b></li> <li>• <b>Benzene &gt; 10 mg/kg<sup>2</sup></b></li> <li>• <b>TPH<sub>(gasoline)</sub> &gt; 250 - 500 mg/kg<sup>2,5</sup></b></li> <li>• <b>TPH<sub>(diesel)</sub>: &gt; 10 - 30 mg/kg<sup>6</sup></b></li> <li>• <b>Ultraviolet fluorescence (UV) or LIF response in LNAPL range<sup>7</sup></b></li> <li>• <b>PID or FID readings for a recent release &gt; 500 ppm<sup>8</sup></b></li> </ul>	<ul style="list-style-type: none"> <li>• The use of TPH soil concentration data as LNAPL indicators should be exercised with caution. Note that the information in this table may not be applicable to media such as sediment or fractured media.</li> <li>• TPH soil concentrations can be affected by the presence of soil organic matter.</li> <li>• TPH soil concentrations are not well correlated with TPH or O<sub>2</sub> soil gas concentrations (Lahvis and Hers 2013).</li> <li>• Organic vapor readings are composition dependent. For older (weathered) releases, LNAPL may be present at much lower PID/FID readings.</li> </ul>
<b>Location Relative to Release Area</b>	
<ul style="list-style-type: none"> <li>• <b>Adjacent to (e.g., within 20 feet of) a known or suspected LNAPL release area or petroleum equipment<sup>2</sup></b></li> </ul>	<ul style="list-style-type: none"> <li>• The probability of encountering LNAPL increases closer to a known or suspected release.</li> </ul>
<p><b>Notes:</b> Order of listing does not imply ranking. Indicators above are generalized and do not represent all possible situations.</p> <p><sup>1</sup> One or more of these indicators may be used to define LNAPL.</p> <p><sup>2</sup> Used in the derivation of PVI screening distances by (EPA 2013) and (Lahvis et al. 2013).</p> <p><sup>3</sup> Used in the derivation of PVI screening distances by (Peargin and Kolhatkar 2011).</p> <p><sup>4</sup> Used in the derivation of PVI screening distances by (EPA 2013).</p> <p><sup>5</sup> Recommended by (Lahvis and Hers 2013).</p> <p><sup>6</sup> From ITRC TPH Risk Document (ITRC 2018).</p> <p><sup>7</sup> From ASTM E2531-06 (ASTM 2014b).</p> <p><sup>8</sup> Recommended by (EPA 2013) and (Lahvis and Hers 2013).</p>	

## 3.6 LNAPL Recoverability and Transmissivity

This section discusses the relation between mobile LNAPL and recoverability and introduces the key concept of LNAPL transmissivity.

### 3.6.1 LNAPL Recoverability

LNAPL recoverability refers to the ability to remove mobile LNAPL from the subsurface at a given location, as evaluated by comparing the measured LNAPL transmissivity to an agreed upon threshold. Understanding LNAPL recoverability is important, particularly for sites where one or more remediation endpoints are based on removal of LNAPL (e.g., to the maximum extent practicable). Although this discussion focuses on LNAPL recoverability under ambient site conditions, additional remedial technologies that rely on increasing the recoverability of LNAPL (e.g., water flooding, surfactant-enhanced remediation, and co-solvent flushing) are discussed in Section 6 of this document.

Reaching a recoverability limit does not necessarily mean that LNAPL saturations are reduced to residual, but it does typically represent an endpoint where the majority of remaining LNAPL is of limited mobility and/or residual. It may continue to accumulate in a monitoring well, for example. A critical factor in LNAPL recoverability is the decrease in LNAPL relative permeability over the operating time of the remediation technology. As removal progresses over time, LNAPL saturations are reduced, which causes the relative permeability of LNAPL to decrease (red line on Figure 3-11), and also results in declining recovery rates.

# Appendix E

## Public Notice

## NOTICE FOR NEWSPAPER

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The submitted Stage 2 Abatement Plan proposal consists of: (1) continued operation and evaluation of the existing multi-phase extraction (MPE) remediation system for recovery of light non-aqueous phase liquid (LNAPL) and vapor, (2) passive recovery of LNAPL using hydrocarbon absorbent socks in wells with detectable product that are not serviced by the MPE system, (3) evaluation of natural source zone depletion (NSZD) as a potential long-term management strategy for residual LNAPL, and (4) continued groundwater monitoring and gauging of monitoring and recovery wells.

The Director of the NMOCD will consider the proposed Stage 2 Abatement Plan and all comments received from the public in determining whether to approve the plan or notify Plains of any deficiencies.

The Stage 2 Abatement Plan is available for public review on the NMOCD public notices webpage at <https://www.env.nm.gov/public-notice/> and may also be obtained by contacting the New Mexico Energy, Minerals and Natural Resources Department during normal business hours.

Written comments regarding the proposed Stage 2 Abatement Plan, as well as requests for a public meeting or hearing (including a statement of reasons why such a meeting or hearing should be held), must be received within 30 days of publication of this notice.

Written statements, comments, and/or requests must be submitted to:

Karolanne Hudgens, HSE Remediation Specialist  
Plains All American Pipeline, L.P.  
1106 Griffith Drive  
Midland, Texas 79706  
Karolanne.Hudgens@plains.com  
(432) 221-7921

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# Affidavit of Publication

STATE OF NEW MEXICO } SS  
COUNTY OF BERNALILLO }

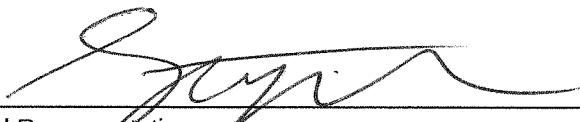
Ad Cost: \$168.75  
Ad Number: 355860  
Account Number: 1115012  
Classification: NON-GOVERNMENT LEGALS

I, Steve Yoder, the undersigned, Legal Representative of the Albuquerque Journal, on oath, state that this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, chapter 167, Session Laws of 1937, and payment of fees has been made of assessed and a copy of which is hereto attached, was published in said publication in the daily edition, 1 time on the following date:

February 6, 2026

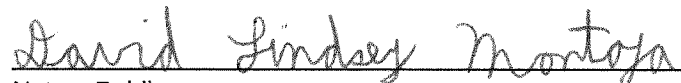
That said newspaper was regularly issued and circulated on those dates.

SIGNED:



Legal Representative

Subscribed to and sworn to me this 6<sup>th</sup> day of February 2026.



Notary Public

County Bernalillo

ID#: 1140229

My commission expires: 04-26-2027

STATE OF NEW MEXICO  
NOTARY PUBLIC  
DAVID LINDSEY MONTOYA  
COMMISSION NUMBER 1140229  
EXPIRATION DATE 04-26-2027

GHD  
11451 Katy Freeway  
STE 400  
Houston, TX 77079

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com  
(432) 221-7921

Journal: February 6, 2026.

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1106 Griffith Drive  
Midland, Texas 79706  
Karolanne.Hudgens@plains.

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STATE OF NEW MEXICO  
COUNTY OF LEA

I, Daniel Russell, Publisher of the Hobbs News-Sun, a newspaper published at Hobbs, New Mexico, solemnly swear that the clipping attached hereto was published in the regular and entire issue of said newspaper, and not a supplement thereof for a period of 1 issue(s).

Beginning with the issue dated  
February 06, 2026  
and ending with the issue dated  
February 06, 2026.



Publisher

Sworn and subscribed to before me this  
6th day of February 2026.



Business Manager

My commission expires  
January 29, 2027

(Seal) STATE OF NEW MEXICO  
NOTARY PUBLIC  
GUSSIE RUTH BLACK  
COMMISSION # 1087526  
COMMISSION EXPIRES 01/29/2027

This newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, Chapter 167, Laws of 1937 and payment of fees for said publication has been made.

### LEGAL NOTICE February 6, 2026

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HOUSTON, TX 77040

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Baton Rouge LA 70808-2371

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Office of Natural Resources Trustee  
121 Tijeras Ave Ne Ste 1000  
Albuquerque NM 87102-3400



2237 S. Acadian Thruway, Suite 701 Baton Rouge, LA 70808, US

**Angell #2 Family Partnership LTD  
Dickinson Ranch DBA  
P.O. Box 190  
Lovington, New Mexico 88260**





2237 S. Acadian Thruway, Suite 701 Baton Rouge, LA 70808, US

**Keigm L & Susan E Revo Crook Trust  
Keigm L & Susan E Crook Co-Trustee  
5519 Avenida Cuesta  
Albuquerque, New Mexico 8711**





2237 S. Acadian Thruway, Suite 701 Baton Rouge, LA 70808, US

**Commission Chambers  
100 North Main 2<sup>nd</sup> Floor  
Lovington, New Mexico 88260**



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(432) 221-7921

Sante Fe Main Office  
Phone: (505) 476-3441

General Information  
Phone: (505) 629-6116

Online Phone Directory  
<https://www.emnrd.nm.gov/ocd/contact-us>

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

CONDITIONS

Action 543613

**CONDITIONS**

Operator: PLAINS MARKETING L.P. 333 Clay Street Suite 1900 Houston, TX 77002	OGRID: 34053
	Action Number: 543613
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

**CONDITIONS**

Created By	Condition	Condition Date
shanna.smith	Weekly O&M activities shall include checking effectiveness of MPE and passive recovery and/or other remediation methods being utilized.	1/29/2026
shanna.smith	Install three downgradient monitor wells according to Stage 2 AP. Pursuant to 19.15.30.9 (A) Each soil boring will have at least a minimum of two soil samples collected from the depth exhibiting the highest concentration observed, at the capillary fringe, and will be analyzed for all constituents in 20.6.2.3103 NMAC.	3/3/2026
shanna.smith	Install 2 replacement wells RW-1R and RW-2R. Pursuant to 19.15.30.9 (A) Each soil boring will have at least a minimum of two soil samples collected from the depth exhibiting the highest concentration observed, at the capillary fringe, and will be analyzed for all constituents in 20.6.2.3103 NMAC.	3/3/2026
shanna.smith	Continue MPE activities along with passive recovery to assist with remediation of LNAPL.	3/3/2026
csmith	Within 30 days of this approval, Pains will submit an estimated timeline for when Abatement will be complete.	3/5/2026
shanna.smith	Continue quarterly monitoring and sampling events. Submit Annual Report by April 1, 2027.	3/5/2026
shanna.smith	Clarify site monitor wells have been analyzed for chlorides and TDS. If there is no historic analysis, sample wells.	3/5/2026