District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

NM OIL CONSERVATION
ARTESIA DISTRICT
AUG 16 2017
RECEIVED

Form C-141
Revised August 8, 2011

Submit 1 copy to appropriate District Office in accordance with 19.15.29 NMAC.

# Release Notification and Corrective Action

NAB1722953239

## OPERATOR

☒ Initial Report ☐ Final Report

| | |
|---|---|
| Name of Company WPX Energy Inc/RKI 246289 | Contact Karolina Blaney |
| Address 5315 Buena Vista Dr. | Telephone No. 970 589 0743 |
| Facility Name: RDU 54 tank battery | Facility Type: Well Pad |

| | | |
|---|---|---|
| Surface Owner: Federal | Mineral Owner: Federal | API No. 30- 015-41975 |

## LOCATION OF RELEASE

| Unit Letter | Section | Township | Range | Feet from the | North/South Line | Feet from the | East/West Line | County |
|---|---|---|---|---|---|---|---|---|
| C | 27 | 26S | 30E | 778 | FNL | 1448 | FWL | Eddy |

**Latitude:** 32.018376N **Longitude:** -103.872455W

## NATURE OF RELEASE

| | | |
|---|---|---|
| Type of Release. Produced Water | Volume of Release: 15 Bbls | Volume Recovered: 3 Bbls |
| Source of Release<br>Flowline | Date and Hour of Occurrence<br>8/1/2017 | Date and Hour of Discovery<br>8/1/2017 - 1400 hrs MT |
| Was Immediate Notice Given?<br>☐ Yes ☐ No ☒ Not Required | If YES, To Whom?<br>NMOCD Crystal Weaver & Michael Bratcher, BLM Shelly Tucker | |
| By Whom? Karolina Blaney | Date and Hour: 8/2/17– 7:30 hrs MT | |
| Was a Watercourse Reached?<br>☐ Yes ☒ No | If YES, Volume Impacting the Watercourse.<br>N/A | |

If a Watercourse was Impacted, Describe Fully.* N/A

Describe Cause of Problem and Remedial Action Taken.*

The cause of this spill is equipment failure. The Section 5 injection facility went down and there is no automatic shut in system in place that would trigger the transfer pumps from individual facility to shut down. The water transfer line from the RDU 54 tank battery got over pressured and ruptured a hole on the side of the line (southwest of the tank battery location). Approximately 15 bbls of produced water migrated for about 70 yards into the pasture.

Describe Area Affected and Cleanup Action Taken.*

The impacted area was immediately mapped with a Trimble to establish horizontal extent of impacts. The impacted area was sampled for BTEX, TPH, and chlorides in accordance with NM OCD Guidelines for Remediation of Leaks, Spills, and Releases. Further remediation will be based on these results.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD 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 NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD 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: Karolina Blaney | OIL CONSERVATION DIVISION |
| Printed Name: Karolina Blaney | Approved by Environmental Specialist: Signed By [signature] |
| Title: Environmental Specialist | Approval Date: 8/17/17 Expiration Date: N/A |
| E-mail Address: Karolina.blaney@wpxenergy.com | Conditions of Approval: See attached Attached ☐ 2RP-4349 |
| Date: 8-16-17 Phone: 970-589-0743 | |

* Attach Additional Sheets If Necessary

www.emnrd.state.nm.us
Current forms are available on our website and should be used when filing regulatory documents.

District I
1625 N. French Dr., Hobbs, NM 88240
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811 S. First St., Artesia, NM 88210
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1000 Rio Brazos Road, Aztec, NM 87410
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State of New Mexico
Energy Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 24, 2018
Submit to appropriate OCD District office

| | |
|---|---|
| Incident ID | nAB1722953239 |
| District RP | |
| Facility ID | |
| Application ID | |

# Release Notification

## Responsible Party

| | |
|---|---|
| Responsible Party: WPX Energy Permian, LLC | OGRID: 246289 |
| Contact Name: Jim Raley | Contact Telephone: 575-689-7597 |
| Contact email: Jim.Raley@dvn.com | Incident # *(assigned by OCD)*: nAB1722953239 |
| Contact mailing address: 5315 Buena Vista Drive, Carlsbad NM | |

## Location of Release Source

Latitude 32.018376 Longitude -103.872455
*(NAD 83 in decimal degrees to 5 decimal places)*

| | |
|---|---|
| Site Name: Ross Draw Unit 54 Tank Battery | Site Type: Well Pad |
| Date Release Discovered: 8/1/2017 | API# *(if applicable)*: 30-015-41975 |

| Unit Letter | Section | Township | Range | County |
|---|---|---|---|---|
| C | 27 | 26S | 30E | Eddy |

Surface Owner: ☐ State ☒ Federal ☐ Tribal ☐ Private (*Name:* _____)

## Nature and Volume of Release

Material(s) Released (Select all that apply and attach calculations or specific justification for the volumes provided below)

| | | |
|---|---|---|
| ☐ Crude Oil | Volume Released (bbls): | Volume Recovered (bbls): |
| ☒ Produced Water | Volume Released (bbls): 15 | Volume Recovered (bbls): 3 |
| | Is the concentration of dissolved chloride in the produced water >10,000 mg/l? | ☒ Yes ☐ No |
| ☐ Condensate | Volume Released (bbls) | Volume Recovered (bbls) |
| ☐ Natural Gas | Volume Released (Mcf) | Volume Recovered (Mcf) |
| ☐ Other (describe) | Volume/Weight Released (provide units) | Volume/Weight Recovered (provide units) |

Cause of Release:
The cause of this spill is equipment failure. The Section 5 injection facility went down and there is no automatic shut in system in place that would trigger the transfer pumps from individual facility to shut down. The water transfer line from the RDU 54 tank battery got over pressured and ruptured a hole on the side of the line (southwest of the tank battery location). Approximately 15 bbls of produced water migrated for about 70 yards into the pasture.

$$bbl\ estimate = \frac{saturated\ soil\ volume\ (ft^3)}{4.21\ (\frac{ft^3}{bbl\ equivalent})} * estimated\ porosity\ (\%) + recovered\ fluids\ (bbl)$$

State of New Mexico
Oil Conservation Division

| | |
|---|---|
| Incident ID | nAB1722953239 |
| District RP | |
| Facility ID | |
| Application ID | |

| | |
|---|---|
| Was this a major release as defined by 19.15.29.7(A) NMAC?<br><br>☐ Yes ☒ No | If YES, for what reason(s) does the responsible party consider this a major release? |
| If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)? | |

## Initial Response

*The responsible party must undertake the following actions immediately unless they could create a safety hazard that would result in injury*

☒ The source of the release has been stopped.
☒ The impacted area has been secured to protect human health and the environment.
☒ Released materials have been contained via the use of berms or dikes, absorbent pads, or other containment devices.
☒ All free liquids and recoverable materials have been removed and managed appropriately.

If all the actions described above have not been undertaken, explain why:

Per 19.15.29.8 B. (4) NMAC the responsible party may commence remediation immediately after discovery of a release. If remediation has begun, please attach a narrative of actions to date. If remedial efforts have been successfully completed or if the release occurred within a lined containment area (see 19.15.29.11(A)(5)(a) NMAC), please attach all information needed for closure evaluation.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD 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 OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD 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.

Printed Name: Jim Raley Title: Environmental Professional

Signature: Jim Raley Date: 8/18/2023

email: Jim.Raley@dvn.com Telephone: 575-689-7597

**OCD Only**

Received by: _____ Date: _____

| | |
|---|---|
| Incident ID | nAB1722953239 |
| District RP | |
| Facility ID | |
| Application ID | |

# Site Assessment/Characterization

*This information must be provided to the appropriate district office no later than 90 days after the release discovery date.*

| | |
|---|---|
| What is the shallowest depth to groundwater beneath the area affected by the release? | >100 (ft bgs) |
| Did this release impact groundwater or surface water? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 1000 feet of any other fresh water well or spring? | ☐ Yes ☒ No |
| Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 300 feet of a wetland? | ☐ Yes ☒ No |
| Are the lateral extents of the release overlying a subsurface mine? | ☐ Yes ☒ No |
| Are the lateral extents of the release overlying an unstable area such as karst geology? | ☐ Yes ☒ No |
| Are the lateral extents of the release within a 100-year floodplain? | ☐ Yes ☒ No |
| Did the release impact areas **not** on an exploration, development, production, or storage site? | ☒ Yes ☐ No |

Attach a comprehensive report (electronic submittals in .pdf format are preferred) demonstrating the lateral and vertical extents of soil contamination associated with the release have been determined. Refer to 19.15.29.11 NMAC for specifics.

**Characterization Report Checklist**: ***Each of the following items must be included in the report.***

☒ Scaled site map showing impacted area, surface features, subsurface features, delineation points, and monitoring wells.
☒ Field data
☒ Data table of soil contaminant concentration data
☒ Depth to water determination
☒ Determination of water sources and significant watercourses within ½-mile of the lateral extents of the release
☒ Boring or excavation logs
☒ Photographs including date and GIS information
☒ Topographic/Aerial maps
☒ Laboratory data including chain of custody

If the site characterization report does not include completed efforts at remediation of the release, the report must include a proposed remediation plan. That plan must include the estimated volume of material to be remediated, the proposed remediation technique, proposed sampling plan and methods, anticipated timelines for beginning and completing the remediation. The closure criteria for a release are contained in Table 1 of 19.15.29.12 NMAC, however, use of the table is modified by site- and release-specific parameters.

State of New Mexico
Oil Conservation Division

| | |
|---|---|
| Incident ID | nAB1722953239 |
| District RP | |
| Facility ID | |
| Application ID | |

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD 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 OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD 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.

Printed Name: Jim Raley Title: Environmental Professional

Signature: Jim Raley Date: 8/18/2023

email: Jim.Raley@dvn.com Telephone: 575-689-7597

**OCD Only**

Received by: Shelly Wells Date: 8/18/2023

| | |
|---|---|
| Incident ID | nAB1722953239 |
| District RP | |
| Facility ID | |
| Application ID | |

# Closure

The responsible party must attach information demonstrating they have complied with all applicable closure requirements and any conditions or directives of the OCD. This demonstration should be in the form of a comprehensive report (electronic submittals in .pdf format are preferred) including a scaled site map, sampling diagrams, relevant field notes, photographs of any excavation prior to backfilling, laboratory data including chain of custody documents of final sampling, and a narrative of the remedial activities. Refer to 19.15.29.12 NMAC.

**Closure Report Attachment Checklist**: ***Each of the following items must be included in the closure report.***

☒ A scaled site and sampling diagram as described in 19.15.29.11 NMAC

☒ Photographs of the remediated site prior to backfill or photos of the liner integrity if applicable (Note: appropriate OCD District office must be notified 2 days prior to liner inspection)

☒ Laboratory analyses of final sampling (Note: appropriate ODC District office must be notified 2 days prior to final sampling)

☒ Description of remediation activities

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD 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 OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD 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. The responsible party acknowledges they must substantially restore, reclaim, and re-vegetate the impacted surface area to the conditions that existed prior to the release or their final land use in accordance with 19.15.29.13 NMAC including notification to the OCD when reclamation and re-vegetation are complete.

Printed Name: Jim Raley Title: Environmental Professional

Signature: Jim Raley Date: 8/18/2023

email: Jim.Raley@dvn.com Telephone: 575-689-7597

**OCD Only**

Received by: Shelly Wells Date: 8/18/2023

Closure approval by the OCD does not relieve the responsible party of liability should their operations have failed to adequately investigate and remediate contamination that poses a threat to groundwater, surface water, human health, or the environment nor does not relieve the responsible party of compliance with any other federal, state, or local laws and/or regulations.

Closure Approved by: Brittany Hall Date: 8/28/2023

Printed Name: Brittany Hall Title: Environmental Specialist

Environmental & Safety Solutions, Inc.

# CLOSURE VARIANCE REPORT

**Ross Draw Unit 54 Tank Battery**

**Eddy County, New Mexico**

**Incident Number nAB1722953239**

**Prepared For:**

**WPX Energy Permian, LLC**

**5315 Buena Vista Dr.**

**Carlsbad, NM 88220**

Carlsbad ● Midland ● San Antonio ● Lubbock ● Hobbs ● Lafayette

## SYNOPSIS

Etech Environmental & Safety Solutions, Inc. (Etech), on behalf of WPX Energy Permian, LLC (WPX), presents the following Closure Variance Report (CVR) detailing a decision from the Bureau of Land Management (BLM) to cease remediation and continued soil investigation proposed in an approved work plan for an inadvertent release of produced water at the Ross Draw Unit 54 Tank Battery (Site). Based on the incident review, field observations and results documented in a Cultural Resources Survey Report (CRSR) provided by SWCA Environmental Consultants (SWCA) for the Site, WPX respectfully submits this CVR based on a formal decision by BLM that leaving de minimis residual soil impacts in place would be more protective of the environment, as mechanical disturbance to remove those impacts would devastate cultural resources and disrupt evident vegetative growth. As such, WPX is requesting No Further Action (NFA) at the Site.

A previous Closure Request Report (CRR), authored by Etech was denied on August 1, 2023, by the New Mexico Oil Conservation Division (NMOCD) due to the following:

> *"A variance for remediation and reclamation for this site will need to be requested in order for closure to be granted. Per 19.15.29.14A. The variance request must include: (1) a detailed statement explaining the need for a variance; and (2) a detailed written demonstration that the variance will provide equal or better protection of fresh water, public health and the environment."*

## SITE LOCATION AND RELEASE BACKGROUND

The Site is located in Unit C, Section 27, Township 26 South, Range 30 East, in Eddy County, New Mexico (32.018376°, -103.872455°) and is associated with oil and gas exploration and production operations on Federal Land managed by the BLM (**Figure 1** in **Appendix A**).

On August 1, 2017, the over-pressurization of a water transfer line caused the release of approximately 15 barrels (bbls) of produced water into the adjacent pasture. A vacuum truck was dispatched to the Site to recover free-standing fluid; approximately 3 bbls of fluids were recovered. WPX reported the release to the NMOCD on a Release Notification and Corrective Action Form C-141 (Form C-141), which was received by the NMOCD on August 16, 2017, and was subsequently assigned Incident Number nAB1722953239.

A third-party environmental consultant prepared a Remediation Work Plan (RWP) to address residual impacts based on delineation soil sample data that exceeded the reclamation standard. The RWP was conditionally approved by the NMOCD on October 5, 2022, as they required additional delineation within the release. WPX requested via meeting if additional delineation within the release could be achieved via confirmation soil sampling and was approved by the NMOCD. A Sundry Request was submitted for the proposed work location and off pad access areas and approved on November 21, 2022, with the requirement of a traditional arch survey to be completed. Results from the desktop review performed by SWCA yielded positive for a sensitive cultural site within the subject release area. The CRSR can be referenced in **Appendix B**.

## SITE CHARACTERIZATION AND CLOSURE CRITERIA

Etech confirmed the characterization of the Site according to Table I, Closure Criteria for Soils Impacted by a Release, of Title 19, Chapter 15, Part 29, Section 12 (19.15.29.12) of the New Mexico Administrative Code (NMAC) as it was detailed in the approved RWP. Based on the results from the desktop review and estimated regional depth to groundwater at the Site, the following Closure Criteria was applied:

| Constituents of Concern (COCs) | Laboratory Analytical Method | Closure Criteria† |
|---|---|---|
| Chloride | Environmental Protection Agency (EPA) 300.0 | 20,000 milligram per kilogram (mg/kg) |
| Total Petroleum Hydrocarbon (TPH) | EPA 8015 M/D | 2,500 mg/kg |
| Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) | EPA 8015 M/D | 1,000 mg/kg |
| Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX) | EPA 8021B | 50 mg/kg |
| Benzene | EPA 8021B | 10 mg/kg |

†*The reclamation concentration requirements of 600 mg/kg chloride and 100 mg/kg TPH apply to the top 4 feet of areas to be immediately reclaimed following remediation pursuant to NMAC 19.15.17.13*.

## CLOSURE VARIANCE REQUEST

Based on the discussions with the BLM regarding environmental impacts of the Site, specifically the cultural sensitivity, the following conclusion regarding the release is presented:

- The proposed corrective actions in the approved RWP would devastate established vegetation and cultural resources.

Based on the conclusion drawn above, WPX requests a variance to leave chloride impacts within the top 4 feet below ground surface (bgs). WPX and BLM believe that leaving identified impacts in place is equally and/or more protective to the environment, groundwater, and human health as it would be otherwise, for the following reasons:

i) Identified chloride impacts exceeding the applicable Site Closure Criteria are characterized by concentrations ranging from 1,400 mg/kg to 20,000 mg/kg, which is below the Site Closure Criteria but greater than the reclamation standard for chloride; however, vegetation coverage throughout the subject release area appears unaffected and matches the coverage of the surrounding established vegetation. There is no evidence of staining or stressed vegetation within the subject release area.

ii) An archeological cultural survey yielded positive for a culturally significant site that overlaps a large portion of the release area. Continued remedial actions within the proposed work area would disrupt the identified sensitive area by performing additional sampling and excavation activities. Per the CRSR, the status of the cultural site was recorded to be in good condition and up to 75 percent intact, containing an artifact assemblage exceeding 500 artifacts distributed on the ground surface across an area measuring approximately 1,644 feet by 587 feet. Due to the dispersed nature of the cultural site, any further disturbance in the release area and/or area surrounding the release would desecrate the site.

iii) As summarized on **Figure 1** in **Appendix A**, there are no sensitive receptors within proximity of the Site to be affected by residual impacts left in place. Regional depth to groundwater is estimated to be greater than 100 feet bgs at the Site based on two recently advanced soil borings approximately 0.5-mile from the Site and two additional soil borings within 1 mile of the Site. The remaining sensitive receptors listed in NMAC 19.15.29.12 are outside the specified buffers of the Site. The well logs for the referenced soil borings are provided in **Appendix C**.

WPX and BLM believe the determination to cease further remedial action is equally protective of human health and groundwater and more protective of the environment and the cultural resources it preserves. As such, WPX respectfully requests approval of this CVR from NMOCD. Correspondence with BLM and WPX is provided in **Appendix D**. Previous remediation activities and soil sample analytical results for the subject release can be referenced in the original RWP in **Appendix E**.

If you have any questions or comments, please do not hesitate to contact Joseph Hernandez at (281) 702-2329 or joseph@etechenv.com or Anna Byers at (575) 200-6754 or anna@etechenv.com.

Sincerely,

eTECH Environmental and Safety Solutions, Inc.

Anna Byers
Senior Geologist

Joseph S. Hernandez
Senior Managing Geologist

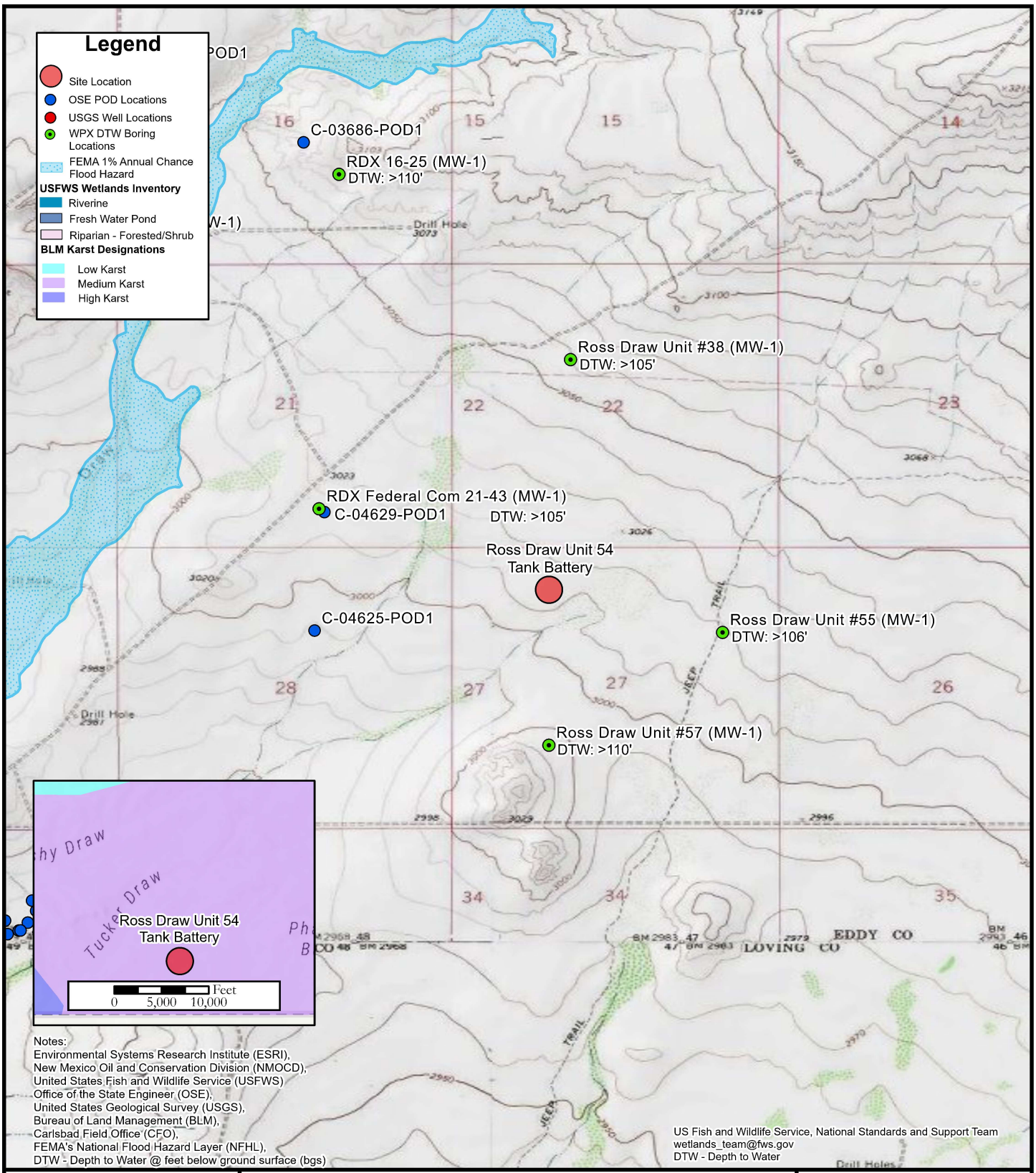
cc: Jim Raley, WPX
New Mexico Oil Conservation Division
Bureau of Land Management

**Appendices:**

**Appendix A**: Figure 1: Site Map
**Appendix B**: Cultural Resources Survey Report
**Appendix C**: Referenced Well Records
**Appendix D**: BLM Correspondence
**Appendix E**: Approved Remediation Work Plan

# APPENDIX A

## Figure 1: Site Map




Notes:
Environmental Systems Research Institute (ESRI),
New Mexico Oil and Conservation Division (NMOCD),
United States Fish and Wildlife Service (USFWS)
Office of the State Engineer (OSE),
United States Geological Survey (USGS),
Bureau of Land Management (BLM),
Carlsbad Field Office (CFO),
FEMA's National Flood Hazard Layer (NFHL),
DTW - Depth to Water @ feet below ground surface (bgs)

US Fish and Wildlife Service, National Standards and Support Team
wetlands_team@fws.gov
DTW - Depth to Water

eTECH

FIGURE 1

## Site Map

WPX ENERGY PERMIAN, LLC
Ross Draw Unit 54 Tank Battery
Unit C Sec 27 T26S R30E
Eddy County, New Mexico

N

Feet
0 1,250 2,500

# APPENDIX B

# Cultural Resources Survey Report

# Cultural Resources Survey for the RDU 54 Tank Battery Inadvertent Release and Remediation Project in Eddy County, New Mexico

**MARCH 2023**

PREPARED FOR

**Bureau of Land Management**
**Carlsbad Field Office**

and

**WPX Energy, Inc.**

PREPARED BY

**SWCA Environmental Consultants**

# CULTURAL RESOURCES SURVEY FOR THE RDU 54 TANK BATTERY INADVERTENT RELEASE AND REMEDIATION PROJECT IN EDDY COUNTY, NEW MEXICO

Prepared for

**Bureau of Land Management**
**Carlsbad Field Office**
620 East Greene Street
Carlsbad, New Mexico 88220-6292

Prepared for

**WPX Energy, Inc.**
5315 Buena Vista Drive
Carlsbad, New Mexico 88220

Prepared by

Ad A. Muniz, Cory Green, and Courtney Blair
Meaghan Trowbridge, Principal Investigator

**SWCA Environmental Consultants**
7770 Jefferson Street NE, Suite 410
Albuquerque, New Mexico 87109
Telephone: (505) 254-1115; Fax: (505) 254-1116
www.swca.com

SWCA Project No. 78552
SWCA Cultural Resources Report No. 23-128

March 2023

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## Registration

**Lead Agency:** Bureau of Land Management (BLM) Carlsbad Field Office (CFO)

**Performing Agency:** SWCA Environmental Consultants
**Activity ID:** 78552
**Performing Agency Report No:** 23-128

**Report Recipient (Your Client):** WPX Energy, Inc.

**Activity Types:**
- ☐ Research Design
- ☑ Archaeological Survey/Inventory
- ☐ Architectural Survey/Inventory
- ☐ Test Excavation
- ☐ Monitoring
- ☐ Collections/Non-Field Study
- ☐ Compliance Decision
- ☐ Literature Review Overview
- ☐ Excavation
- ☐ Ethnographic Study
- ☐ Resource/Property Visit
- ☐ Historic Structures Report
- ☐ Other:

**Total Survey Acreage:** 11.34
**Total Tribal Acreage:** 0.00
**Total Resources Visited:** 1

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## Associate/Register Resources

| Prefix | Number | Field Site/Other Number | In GIS | Resource Type | Collections Made? | Revisit |
|---|---|---|---|---|---|---|
| LA | 86207 | NM-06-5240 (BLM CFO)<br>PAC/ED-425 (Pecos Archaeological Consultants) | ✔ | Non-Structural | ☐ | January 2023 |

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## Report Details

### Lead Agency

**Lead Agency:** Bureau of Land Management Carlsbad Field Office

### Lead Agency Report No.

**Report Number:**

### Title of Report

**Title of Report:** Cultural Resources Survey for the RDU 54 Tank Battery Inadvertent Release and Remediation Project in Eddy County, New Mexico

**Authors:** Cory Green, Ad Muniz, and Courtney Blair

### Type of Report

**Publication Type:** Report, Monograph, or Book Positive

### Description of Undertaking (what does the project entail?)

**Description:** WPX Energy, Inc., a subsidiary of Devon Energy Corporation, contracted SWCA Environmental Consultants (SWCA) to conduct an intensive cultural resources pedestrian survey in support of the RDU 54 Tank Battery Inadvertent Release and Remediation Project in Eddy County, New Mexico. To meet the cleanup standards of the New Mexico Oil Conservation Division 19.15.29 New Mexico Administrative Code, the remediation process will require removing impacted sediments from the contaminated area and replacing them with clean soil. The release area of impact totals 1.15 hectares (ha) (2.85 acres) and is located approximately 29.38 kilometers (18.25 miles) southeast of Malaga, New Mexico, on land managed by the Bureau of Land Management Carlsbad Field Office. The project's area of potential effects (APE) is 2.17 ha (5.36 acres). WPX Energy, Inc. included a 50-foot-wide remediation buffer around the release area.

### Dates of Investigation

**From:** January 4, 2023 January 6, 2023

### Report Date

**Report Date:** March 29, 2023

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## Performing Agency/Consultant

**Name:** SWCA Environmental Consultants
**Principal Investigator:** Meaghan Trowbridge
**Field Supervisor:** Ad Muniz
**Field Personnel Names:** Elizabeth Lemus
**Historian/Other:** Not applicable

## Report Details

### Performing Agency Report Number

**Report Number:** 23-128

### Client/Customer (project proponent)

**Name:** WPX Energy, Inc.
**Contact:** Jim Raley
**Address:** 5315 Buena Vista Drive, Carlsbad, New Mexico 88220
**Phone:** (575) 885-1313

### Client/Customer Project Number

**Project Number:** 78552

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## Ownership & Location

Land Ownership Status (Must be indicated on Project Map)

**Land Ownership:**

| Landowner/Manager | Protocol | Acres Surveyed | Acres in APE |
|---|---|---|---|
| Bureau of Land Management Carlsbad Field Office | Class III | 11.34 | 5.36 |

**Total Survey Acreage:** 11.34

**Total Tribal Acreage:** 0.00

Record Search(es)

**Date of HPD/ARMS File Review:** December 19, 2022

**Date of Other Agency File Review:** December 19, 2022

Survey Data

**Source Graphics:** NAD 83

- ✔ USGS 7.5' (1:24,000) topo map
- ✔ GPS Unit
- ☐ Aerial Photos
- ☐ Other Topo Map Scale:
- ☐ Other Source Graphic(s):

**The following tables (b, c, & e) are calculated by the NMCRIS Map Service**

USGS 7.5' Topographic Map(s)

| Map Name | USGS Quad Code |
|---|---|
| Phantom Banks, NM | 32103A7 |

County(ies)

| County | FIPS |
|---|---|
| Eddy | 015 |

Legal Description

| Unplatted | Township (N/S) | Range (E/W) | Section |
|---|---|---|---|
| No | 26 South | 30 East | 27 |

**Nearest City or Town:** Malaga

Projected Legal Description

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## GIS

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# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## Methodology

### Survey Field Methods

**Intensity:** 100 percent coverage

**Configuration:** ✔ Block Survey Units ☐ Linear Survey Units (l x y)

**Other Survey Units**

**Scope:** Non-selective

**Coverage Method:** ✔ Systematic Pedestrian Coverage **Other Method:**

**Survey Interval (m):** 15 **Crew Size:** 2

**Fieldwork Dates:** **From:** January 4, 2023 **To:** January 6, 2023

**Survey Person Hours:** 6 **Recording Person Hours:** 10

**Additional Narrative:** Survey included a 100-foot cultural buffer around the inadvertent release area and the remediation APE.

### Environmental Setting (NRCS soil designation; vegetative community; elevation; etc.)

**Environmental Setting:** The project area is in Eddy County within the Chihuahuan Desert Basins and Playas (24a) Environmental Protection Agency Level III ecoregion (Griffith et al. 2006). The Chihuahuan Desert Basins and Playas ecoregion includes deep depressions or grabens filled with sediment to form flat to rolling basins. The typical desert shrubs and grasses within the Chihuahuan Basin and Playas ecoregion are dominated by creosote bush, along with tarbush, four-wing saltbush, acacias, gypsum grama, and alkali sacaton. Plants observed during the survey include honey mesquite, creosote bush, broom snakeweed, grassland croton, four-wing saltbush, dropseed grass, prickly pear cactus, and other forbs and grasses. Common animals include mule deer, coyote, bobcat, cottontail rabbit, jackrabbit, peccary, and various species of field mice, striped skunk, packrat, birds, lizards, and snakes (Biota Information System of New Mexico 2023).

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

The elevation within the project area averages approximately 920 meters (3,021 feet) above mean sea level. The geology underlying the project area consists of Holocene to middle Pleistocene (Qe/Qp) eolian deposits (U.S. Geological Survey 2001). One soil type, Reeves-Gypsum land complex, 0 to 3 percent slopes (RG), has been mapped in the survey area. The Reeves series consists of very deep soils that are moderately deep to gypsum material. They are well-drained, moderately permeable soils that formed in calcareous and gypsiferous fine-textured alluvium derived from gypsum beds. These soils are found on hillslopes, plateaus, and basin floors. The soils are usually expressed as loam (Natural Resources Conservation Service 2023).

The climate information for the survey area was compiled using the Carlsbad, New Mexico (291469) climate station data (period of record from February 1, 1900, to June 10, 2016). Rainfall for the general project area is most abundant from May through October, averaging 4.14 centimeters (cm) (1.63 inches), with September having the heaviest average precipitation. Snowfall is heaviest between December and January, with an average of 3.10 cm (1.2 inches) and can fall from November through April; annual snowfall averages 11.18 cm (4.4 inches). The average temperatures are coldest in January at −2.33 degrees Celsius (27.8 degrees Fahrenheit) and warmest in July at 35.33 degrees Celsius (95.6 degrees Fahrenheit) (Western Regional Climate Center 2023).

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## Methodology

Percent Ground Visibility

**Ground Visibility:** 51 to 75 percent

**Condition of Survey Area:** Observed disturbances include oil and gas development, including a pad with storage batteries, lease roads, overhead transmission lines, surface polylines, and buried pipeline rights-of-way. Water erosion in the form of drainage systems and sheet washing are present throughout the area. Wind erosion around dunes has redeposited sand and partially buried artifacts. Bioturbation from small to large animals and cattle grazing were also observed. The survey area has also been impacted by the inadvertent release related. Most of the area where the spill is in was already disturbed by construction activities related to oil and gas in the area.

Attachments (check all appropriate boxes)

- ✔ USGS 7.5 Topographic Map with sites, isolates, and survey area clearly drawn (required)
- ✔ Copy of NMCRIS Map Check (required)
- ☐ LA Site Forms – new sites (with sketch map & topographic map) if applicable
- ✔ LA Site Forms (update) – previously recorded & un0relocated sites (first 2 pages minimum)
- ☐ List and Description of Isolates, if applicable
- ☐ List and Description of Collections, if applicable

Other Attachments

- ✔ Photographs and Log
- ✔ Other attachments **Describe:** BLM Field Authorization Form

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

## Cultural Resource Findings

### Investigation Results

| | |
|---|---|
| **Archaeological Sites Discovered and Registered:** | 0 |
| **Archaeological Sites Discovered and NOT Registered:** | 0 |
| **Previously Recorded Archaeological Sites Revisited (site update form required):** | 1 |
| **Previously Recorded Archaeological Sites Not Relocated (site update form required):** | 0 |
| **Total Archaeological Sites (visited & recorded):** | 1 |
| **Total Isolates Recorded:** | 0 |

✔ Non-Selective Isolate Recording

| | |
|---|---|
| **HCPI Properties Discovered and Registered:** | 0 |
| **HCPI Properties Discovered and NOT Registered:** | 0 |
| **Previously Recorded HCPI Properties Revisited:** | 0 |
| **Previously Recorded HCPI Properties NOT Relocated:** | 0 |
| **Total HCPI Properties (visited & recorded, including acequias):** | 0 |
| **If No Cultural Resources Found, Discuss Why:** | 0 |

### Management Summary

**Summary:**

The intensive pedestrian surveys for the RDU 54 Tank Battery Inadvertent Release and Remediation Project covered a total of 4.58 ha (11.34 acres) on lands managed by the BLM CFO in Eddy County, New Mexico. No new archaeological sites or isolated manifestations were observed during the current investigation. One previously recorded site, LA 86207, was expected within the project APE. A site visit and update recording of LA 86207 was conducted by SWCA archaeologists. The investigators updated the site boundary based on the distribution of artifacts and existing disturbances from oil and gas activity.

LA 86207 is a prehistoric site with scatters of lithic artifacts and dispersed fire-cracked rock. The site is in a dune field west and south of an active oil pad. Water and wind erosion and active cattle grazing have eroded the landscape and redistributed and buried artifacts. Sections of the existing boundaries of the site were adjusted during the current site visit based on artifact distribution and oil and gas activity disturbances to the site. The artifact assemblage at LA 86207 is estimated to be in the thousands. During the current visit, a representative artifact sample was recorded. In addition, many of the previously identified artifact concentrations, lithic debitage, lithic tools, ground stone implements, ceramics, and disarticulated thermal features were relocated. A total of 13 shovel tests were conducted within the project APE, seven of which were placed within the inadvertent release spill area and six within the 50-foot remediation area of the APE. All shovel tests were negative for subsurface cultural materials. In addition, the ground surface within the remediation area has been partially impacted by oil and gas activity, and wind and water erosion. Fire-cracked rock and artifacts were dispersed across the site in general from natural erosion. The portion of the site outside the survey area, however, may have some subsurface materials. The site has been previously determined eligible for the National Register of Historic Places under Criterion D. SWCA concurs with this determination of eligibility; however, SWCA suggests that the portion within the project's APE likely does not retain any subsurface materials based on testing and impacts from natural and human-made erosion. SWCA recommends a cultural monitor be present during cleanup of the spill.

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

**Update:** Per consultation with the BLM CFO in May 2023 soil samples were conducted by client with an archaeologist present to monitor any ground disturbing activities at or within 100 feet of the site. After review of the soil sample levels from the spill it was determined by the BLM CFO between May 9–11 that it would be less of a significant impact to the site to leave the spill in place than to undergo the cleanup process.

## Attachments

### Documents:

| Attachment Type | Description | Name | File Type | Size | Upload Date | Upload By |
|---|---|---|---|---|---|---|
| Report | Project Report for NMCRIS 152297. | Report_78552_RDU_23 March2023 | PDF | 6,270 | March 29, 2023 | Courtney Blair |

# NMCRIS Investigation Abstract Form (NIAF)

**NMCRIS Activity No. 1 5 2 2 9 7**

Received by OCD: 8/18/2023 7:05:03 AM




# CONTENTS



## Appendices



## Tables





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Received by OCD: 8/18/2023 7:05:03 AM




# Figures





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# CHAPTER 1. INTRODUCTION AND PROJECT DESCRIPTION

SWCA Environmental Consultants (SWCA) was retained by WPX Energy, Inc. (WPX), a subsidiary of Devon Energy Corporation, to perform an intensive cultural resources pedestrian survey and testing in support of the RDU 54 Tank Battery Inadvertent Release and Remediation Project located 29.38 kilometers (km) (18.25 miles) southeast of the town of Malaga in Eddy County, New Mexico **(**Figure 1-1 andFigure 1-2**)**. The project is located on land managed by the Bureau of Land Management (BLM) Carlsbad Field Office (CFO). In compliance with New Mexico Oil Conservation Division 19.15.29 New Mexico Administrative Code, the remediation process would require removing impacted sediments from the contaminated area and replacing them with clean soil.

SWCA conducted an intensive cultural resources pedestrian survey and testing within LA 86207. The project area of potential effects (APE) consists of a 15-meter (m) (50-foot) buffer around the inadvertent release spill area. The total survey area is entirely on BLM-managed lands and measures 4.58 hectares (ha) (11.34 acres). The APE is 2.16 ha (5.36 acres), and the spill area is 1.15 ha (2.85 acres). A 30-m (100-foot) survey buffer was placed on all sides of the APE. The Public Land Survey System legal description is shown in Table 1-1.

The survey and testing were completed in accordance with policies and regulations implementing Section 106 of the National Historic Preservation Act (Public Law 89-665), as amended, and the cultural resources inventory was completed to find, identify, and record any cultural resources that might be affected within the APE and to provide National Register of Historic Places (NRHP) eligibility recommendations. The pedestrian survey took place on January 5 and 6, 2023. One previously recorded site, LA 86207, was updated during the current investigation.

Jim Raley is the point of contact for WPX Energy, Inc. (5315 Buena Vista Drive, Carlsbad New Mexico 88220; 575-885-1313). The cultural resources survey was conducted out of SWCA's Albuquerque office (7770 Jefferson Street Northeast Suite 410, Albuquerque, New Mexico 87109; 505-254-1115), with Meaghan Trowbridge serving as principal investigator, Courtney Blair as the project manager, Ad Muniz the field supervisor, and Elizabeth Lemus provided field support. Val Woefel and Jeremy Charley served as the geographic information system (GIS) specialists. The report was compiled by Cory Green, Ad Muniz, and Courtney Blair. Malia Volke was the technical editor and Kimberly Proa formatted the report.

Details on the location of investigated archaeological sites, including Archaeological Records Management Section (ARMS) data of previous investigations and archaeological sites and surveys within 0.5 km (0.31 mile) of the survey area, are provided in Appendix A. Locational information is confidential and for official use only. Public disclosure of archaeological site locations is prohibited by 16 United States Code 470hh and 36 Code of Federal Regulations 296.18.

**Table 1-1. Public Land Survey System Legal Description for the Survey Area (PLSS)**

| Township | Range | Section | Quarters |
|---|---|---|---|
| 26 South | 30 East | 27 | NWNW, NENW |

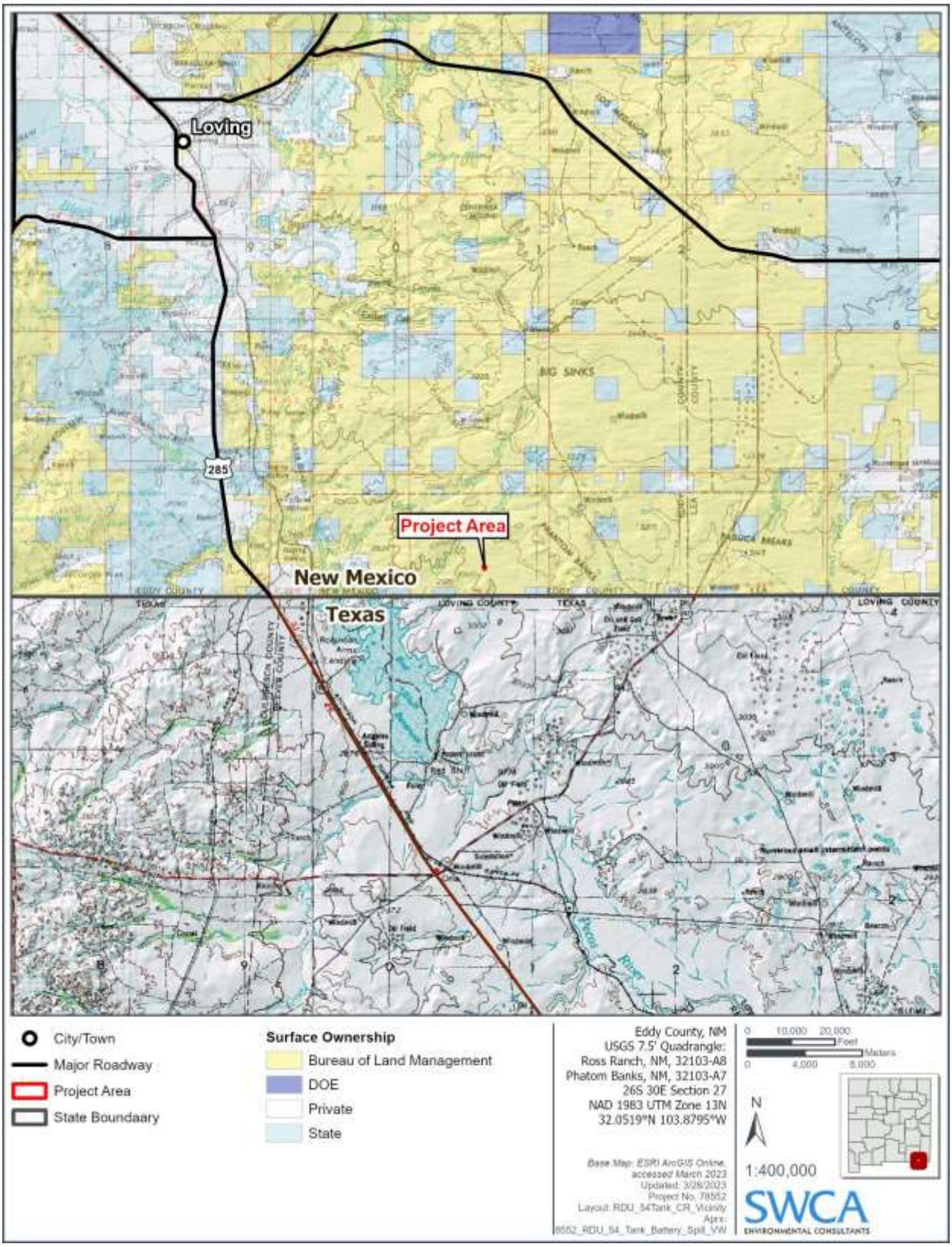


**Figure 1-1. Project vicinity map.**

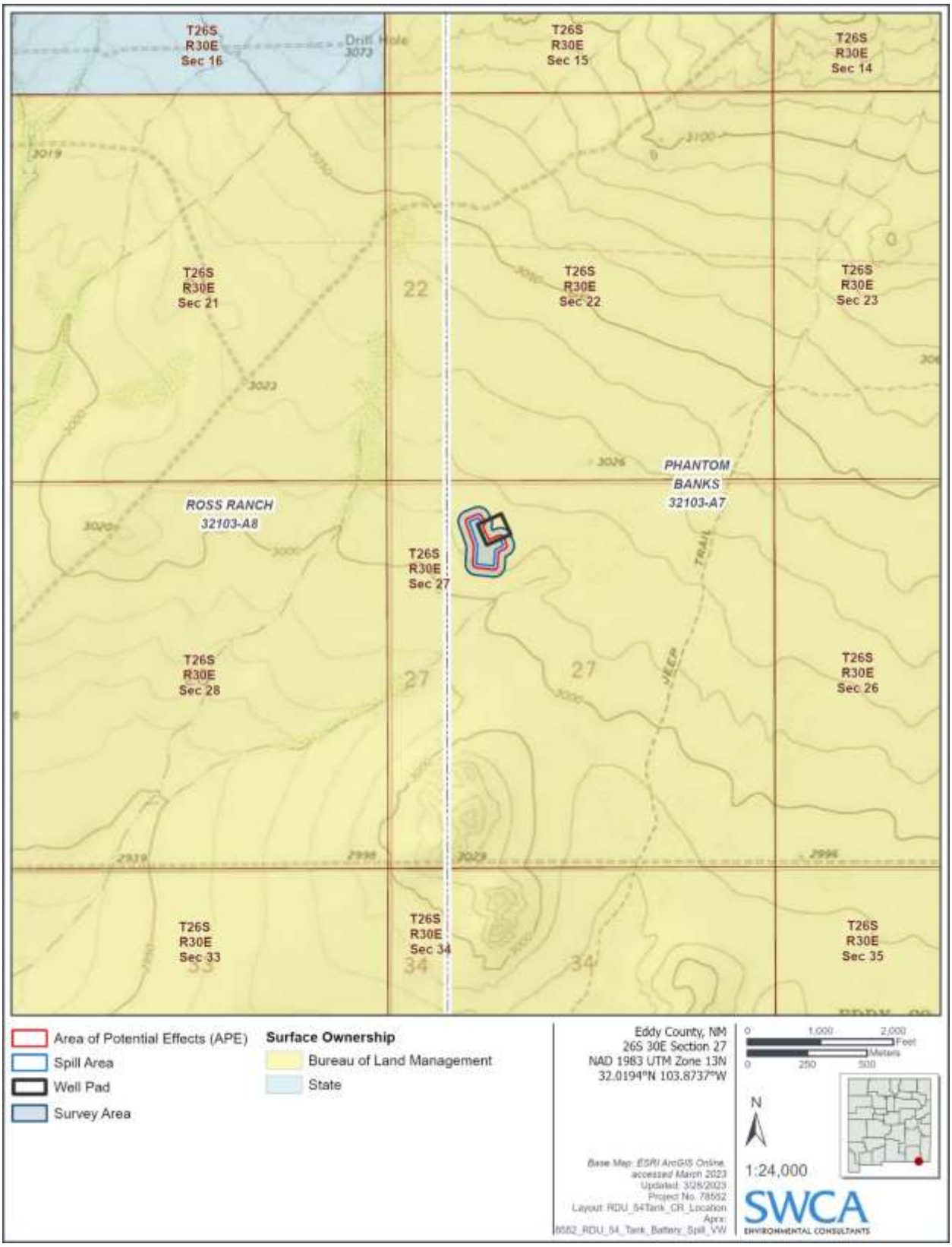


**Figure 1-2. Project location map.**

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# CHAPTER 2. ENVIRONMENTAL SETTING AND CULTURE HISTORY

The remediation project is in Eddy County, New Mexico, and is approximately 29.38 km (18.25 miles) southeast of Malaga, New Mexico, on land managed by the BLM CFO. The elevation of the project area is 919 m (3,015 feet) above mean sea level (amsl). Today, the area is used primarily for rangeland and oil and gas exploration. Because of oil and gas development, numerous roads, power lines, surface and buried pipeline rights-of-way, and well pads are present within and adjacent to the project area.

## ENVIRONMENT AND GEOLOGY

The project area is within the Chihuahuan Desert Basins and Playas (24a) U.S. Environmental Protection Agency Level III ecoregion (Griffith et al. 2006). The Chihuahuan Desert Basins and Playas ecoregion includes deep depressions or grabens filled with sediment to form flat to rolling basins. The geology underlying the project area consists of Holocene to middle Pleistocene (Qe/Qp) eolian deposits. Qe/Qp includes deposits of higher gradient tributaries bordering major streams, valleys, alluvial veneers of the piedmont slope, and alluvial fans (U.S. Geological Survey [USGS] 2001).

## SOILS

One soil type, Reeves-Gypsum land complex, 0 to 3 percent slopes (RG), has been mapped in the survey area. This soil type is typical of southeastern New Mexico and reflects the arid climate. The Reeves series consists of very deep soils that are moderately deep to gypsum material. They are well-drained, moderately permeable soils that formed in calcareous and gypsiferous fine-textured alluvium derived from gypsum beds (Natural Resources Conservation Service 2023).

## CLIMATE

The climate information for the survey area was compiled using the Carlsbad, New Mexico (291469), climate station data (period of record from February 1, 1900, to June 10, 2016). Rainfall for the general project area is most abundant from May through October, averaging 4.14 centimeters (cm) (1.63 inches), with September having the heaviest average precipitation. Snowfall is heaviest between December and January, with an average of 3.10 cm (1.2 inches) and can fall from November through April; annual snowfall averages 11.18 cm (4.4 inches). Average temperatures are coldest in January at −2.33 degrees Celsius (27.8 degrees Fahrenheit) and warmest in July at 35.33 degrees Celsius (95.6 degrees Fahrenheit) (Western Regional Climate Center 2023).

## FLORA AND FAUNA

The typical desert shrubs and grasses within the Chihuahuan Basins and Playas ecoregion are dominated by creosote bush, along with tarbush, four-wing saltbush, acacias, gyp grama, and alkali sacaton. Plants observed during the survey include catclaw acacia, honey mesquite, althorn, broom snakeweed, grassland croton, four-wing saltbush, prickly pear cactus, and other forbs and grasses. Mesquite was an important prehistoric resource. Many of the other grasses and plants common to the region were also collected for subsistence and to provide material for non-subsistence use.

The most common animals found in the region are mule deer and coyotes. Also typical to the area are bobcat, gopher, cottontail rabbit, jackrabbit, peccary, and various species of field mice, striped skunk, and pack rat (Biota Information System of New Mexico 2023). There are a variety of birds, including

Received by OCD: 8/18/2023 7:05:03 AM




mourning doves and hawks; numerous lizards and snakes (western diamondback rattlesnake are also in the project area). Cottontail rabbits were the animal most frequently observed during the survey. Prehistorically, bison were in the region during at least some periods. Bison, antelope, deer, and rabbit were important food resources for the prehistoric inhabitants.

# CULTURE HISTORY

The culture history of far southeastern New Mexico is a local expression of trends that prevailed over a much larger geographic region. Human prehistory in the area began with the highly mobile hunter-gatherers of the Paleoindian tradition, followed by the Archaic tradition in which hunter-gatherers adapted to changing environmental conditions. The introduction of ceramics marks a major milestone that increased the archaeological visibility and temporal identification of sites in the region, although the prevailing lifeway of highly mobile foraging continued for several centuries, after which some groups in the region established village-type settlements and practiced farming. This lifeway was abandoned, however, prior to the arrival of Europeans and other non-Native Americans in the region.

This chapter presents a summary of culture history, focused broadly on the eastern extension of the Jornada Mogollon region (Leslie 1979) and more specifically on the BLM CFO region, which encompasses the project area.

The following discussion is distilled down from a longer and much more detailed culture history prepared by Jim Railey for the Permian Basin Research Design (Railey 2016). The reader is referred to that document for additional detail and a full bibliography for the area's culture history.

## Paleoindian Tradition (11,500–6000 B.C.)

Humans were present in North America by ca. 11,500 B.C. (Fiedel 1999), and the Paleoindian tradition dates from this time to approximately 6000 B.C. This period spans the climatic transition from the Pleistocene to the Holocene. Climatic conditions were generally cooler and moister but also were changing rapidly, as the vast ice sheets of the north (and alpine glaciers, including ones in the higher mountains of New Mexico) retreated and the climate approached the warmer and more arid conditions of the Holocene. Lanceolate projectile points are the most characteristic artifacts of this tradition. The earlier points in the series exhibit distinct flutes—large flake scars extending up from their bases. In addition to projectile points, unifacial and bifacial scrapers, gravers with single, double, and even multiple spurs, and other flake artifacts have been found in Paleoindian tool kits.

In the American Southwest and southern High Plains, the Paleoindian tradition comprises three periods: Clovis (11,500–10,800 B.C.), Folsom (10,800–9800 B.C.), and Late Paleoindian (9800–7000 B.C.). Low population densities prevailed among these early inhabitants of the Americas, who apparently were organized as small-scale, residentially mobile, and socially fluid groups. These conditions, along with wide-ranging exchange and interaction networks maintained by Paleoindians, worked to homogenize projectile point styles and other cultural marker traits over vast areas (although some regional differentiation in style zones becomes apparent over the course of Paleoindian times). Moreover, high mobility and very low population densities mean that Paleoindian sites are rare and have low archaeological visibility. In the Great Plains and the Southwest, the distinctive Paleoindian projectile points have been recovered in association with the remains of large Pleistocene mammals, such as mammoth, camel, and several bison species, and these discoveries have contributed to an image of Paleoindians as specialized big-game hunters. But a growing number of researchers are questioning this characterization. Some suggest that big-game hunting and the production of exquisite projectile points—typically made from exotic materials obtained from distant sources—may have been motivated more by hunters seeking high status rather than by daily subsistence needs. Still, Paleoindians' use of plant foods



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Received by OCD: 8/18/2023 7:05:03 AM




was probably highly opportunistic compared to their Archaic successors, perhaps due to highly unstable climatic conditions in late Pleistocene times.

Few identified Paleoindian components are in sites in the CFO region, although their locations suggest concentrations along the Pecos River, the base of the Mescalero Escarpment, and in far southeastern Lea County near what were probably pluvial lakes (Condon and Smith 2012). Data from ARMS obtained for the Permian Basin Research Design (Railey 2016) indicated at that time that there were only seven identified Clovis components in sites in the CFO region, but the number jumps to 27 for Folsom and 29 for the Late Paleoindian period.

## Archaic Tradition (6000 B.C.–A.D. 500)

The beginning of the Holocene epoch, around 10,000 years ago, corresponds to the termination of major glacial activity, a shift to drier and warmer climates, and the extinction of the Pleistocene megafauna. Concurrent with these changes, prehistoric peoples of the Southwest developed new lifeways and material items during the time referred to by archaeologists as the Archaic tradition. Spanning roughly 6,000 years, the Archaic tradition encompassed several trends. One is population growth, evidenced by the much larger numbers of sites relative to those of the Paleoindian tradition, and increasing numbers of sites for successive Archaic periods and phases. Another trend involves a progressive decrease in residential mobility, indicated by the appearance of structures and other facilities (including storage pits) that suggest a more substantial and long-term commitment to at least certain settlements and localities. Social development over the course of the Archaic tradition probably led to increasingly larger sociopolitical units that inhabited progressively smaller, more sharply defined territories, with one archaeological outcome being an increasing regionalization of artifact styles over time. Archaic peoples intensively used a wide variety of plants and animals and developed new strategies to feed larger numbers of people crowded into ever-smaller territories. Such strategies included both subsistence intensification and complex exchange and interaction networks. Increasing population densities (especially after the beginning of Middle Archaic times) and the consequent shrinking of group territories are also typically tied to sociopolitical dynamics involving escalating social conflict, which probably helped further motivate intensified subsistence production.

Archaeologically, the intensification of subsistence practices is best reflected in the appearance and gradually increasing abundance of ground stone implements over the course of the Archaic. Domesticated maize and appreciable farming dependence is evident by the final centuries of the B.C. time frame in the Rio Hondo drainage to the northwest, but similar trends are not evident in the CFO region for the pre-ceramic time frame. Hunting also provided a significant part of the subsistence economy throughout the Archaic sequence, since food-producing domesticated animals were absent. Contrary to prevailing notions, people may not have exploited a broader range of resources during this time than their Paleoindian predecessors, although they clearly exploited them using less opportunistic, more intensified strategies. New cooking techniques included the use of pit ovens, often involving quantities of heated stones, leaving behind rock-filled pits, scatters of burned rock, and huge rock piles or “ring middens,” which in the CFO region occur mainly along the Pecos River and (especially) to the west.

Besides ground stone implements, Archaic tool assemblages included knives, scrapers, drills, perforators, and numerous stemmed and notched projectile points of various types. Awls, handles, and flakers were fashioned of bone and antler. Although rarely preserved, wood was used for a variety of implements, including spear throwers or atlatls (the bow and arrow did not appear in this area until around the end of the Archaic tradition). Many dry caves and rock shelters have preserved rich assemblages of artifacts made from plants and other perishable materials and underscore the impressive diversity of prehistoric material culture.



Released to Imaging: 8/28/2023 9:55:09 AM

Received by OCD: 8/18/2023 7:05:03 AM




The Archaic tradition is commonly divided into three periods—Early Archaic (6000–3200 B.C.), Middle Archaic (3200–1800 B.C.), and Late Archaic (1800 B.C.–A.D. 500). Across at least most of the CFO region, Archaic peoples pursued a highly mobile lifeway based on hunting and gathering. Radiocarbon frequency trends and other data indicate accelerating population growth during the Late Archaic period. Data for the CFO region from ARMS obtained for the Permian Basin Research Design revealed 110 Early Archaic, 162 Middle Archaic, and 660 Late Archaic components in sites (Railey 2016). Population growth during the Late Archaic was probably helped by improved climatic conditions following the Mid-Holocene Dry Period of ca. 5500 to 2000 B.C., which probably resulted in a proliferation of new water sources and increased biomass across the Mescalero Plain. Some sites have abundant and dense concentrations of Late Archaic archaeological remains, suggesting repeated visits to localities and/or seasonal or occasional large gatherings of socially related groups. Punto de los Muertos (LA 116471) (Wiseman 2003a, 2003b), just outside Carlsbad along the Pecos River, was a Late Archaic stone mound that was badly looted prior to professional excavations and contained human remains with associated grave goods. Among other things, it may have served as some sort of social gathering place and territorial marker, and if so, it underscores the potential effects of population growth and territorial packing.

## Formative Tradition (A.D. 500–1450)

"Formative" is a term commonly applied by archaeologists to the ceramic periods of the Jornada Mogollon region (Miller and Kenmotsu 2004:236–237). The well-dated sequence of sites in the Hondo Valley, northwest of the CFO region, suggests that ceramics appeared there around A.D. 500 (Campbell and Railey 2008), and this date is used here for the beginning of the Formative tradition. The addition of ceramics to the inventory of artifacts provides a tremendous advantage in recognizing Formative period site components as compared to pre-ceramic ones. Ceramics also enhance temporal resolution and age estimates of site components, especially for the more distinctive, painted wares that can cross-date between different regions. Ceramics, however, may not have been all that common in far southeastern New Mexico during the Early Formative period. At about the same time ceramics appeared in the region, the bow and arrow also arrived. This is inferred from a sharp reduction in the size of projectile points, which occurred across most of sub-boreal North America around A.D. 400 to 700.

Thanks to both ceramic seriation and abundant radiocarbon dates, the Formative tradition can be divided into two periods: Early (ca. A.D. 500–1100) and Late Formative (ca. A.D. 1100–1450), with the appearance of Chupadero Black-on-white ceramic being the most prominent marker separating the two. The successive appearance of decorated ceramic types in the Late Formative, along with changes in arrow point forms, point to a two-phase division of this period, divided at ca. A.D. 1100. Accordingly, this discussion uses the previously established Maljamar (A.D. 1100–1300) and Ochoa (A.D. 1300–1450) phases to subdivide the Late Formative. Also included here is the Querecho phase (A.D. 900–1100), not because of any prominent markers in archaeological assemblages or site characteristics (other than the rare appearance of some decorated pottery types, such as Mimbres Black-on-white), but because it corresponds to the onset of the Medieval Warm Period and a precipitous drop in the number of radiocarbon dates in the CFO region, which is used as proxy for population sizes.

Radiocarbon frequencies indicate that population growth and ubiquitous use of the landscape by highly mobile hunter-gatherers continued after the Late Archaic in the first few centuries of the Early Formative period. However, with the onset of the Medieval Warm Period during the Querecho phase, radiocarbon frequencies plummet sharply in the Mescalero Plain. This suggests increased mortality, out-migration, withdrawal of human groups to now-reduced numbers of reliable water sources, or some combination of these trends. Some groups in the Mescalero Plain may have begun to settle into less mobile lifeways during the Querecho phase, but the evidence for this is at best equivocal. At any rate, the response to the



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Received by OCD: 8/18/2023 7:05:03 AM




Medieval Warm Period may have helped prompt some fundamental changes in cultural adaptations that took hold during the subsequent Late Formative period.

The Late Formative period indeed witnessed some of the most profound changes in the prehistory of the CFO region. In terms of artifacts, the most prominent temporal indices of this period are a variety of distinct and well-dated, decorated ceramic types. Chupadero Black-on-white and El Paso painted (bichrome and early polychromes, and later just El Paso Polychrome) were present by the beginning of this period, or soon after, eventually edged out undecorated brown wares, and persisted as common types throughout the Late Formative time frame. Other painted and corrugated wares appeared in the Late Formative as well. After A.D. 1300, exotic ceramic types from a variety of areas in the Southwest appeared in southeastern New Mexico, including Rio Grande glaze wares, Lincoln Black-on-red from the Sierra Blanca highlands, Ramos Polychrome from the Casas Grandes area, and Gila Polychrome from the Salado region. Another post–A.D. 1300 ceramic type is Ochoa Indented, a Southern Plains type that appears to have been restricted to areas east of the Pecos River. Also, around A.D. 1200 or 1300, arrow points changed in style from strongly shouldered, corner-notched, or stemmed forms to side-notched specimens.

By A.D. 1300, if not earlier, substantially occupied "villages" were established across much of the CFO region, from the Mountain Slope area in the west to near the Texas state line in the east. This was part of a widespread pattern of greater sedentism and village formation across the southeastern Great Plains and Jornada Mogollon region in the early to mid-second millennium A.D. The appearance of villages corresponds to an increase in bison hunting across the southern High Plains, as well as maize-based farming. Recent investigations at the Merchant Site have provided the clearest evidence to date of these trends in the Mescalero Plain of the CFO region.

These trends also occurred in concert with the development of the Pueblo-Plains Interaction Sphere, which geared up around A.D. 1300 and in which Plains groups traded hides, dried meat, and perhaps other products to the more settled farmers to the west in exchange for decorated pottery, obsidian, turquoise, scarlet macaws, copper bells, cotton blankets, and maize. Among the key archaeological indicators of this phenomenon is the appearance in the southern Plains of numerous beveled knives and end scrapers that were used to process bison hides. Prior to A.D. 1450, however, Pueblo-Plains interaction was limited mostly to gift exchange involving small numbers of items.

## Post-Formative Native Americans (after A.D. 1450)

The post-Formative began with the widespread abandonment of late prehistoric villages in the southern Plains around A.D. 1450, as groups throughout the region shifted to a more nomadic lifeway centered more squarely on bison hunting. Archaeologically, the post-Formative is somewhat of a phantom, as many of the diagnostic ceramic types largely disappeared along with village sites. Ceramics are either absent in the CFO region currently or, to the extent they were still in use, consist of types that are largely unknown. People on the west side of the Llano Estacado apparently ceased making pottery at this time, obtaining vessels from the Pueblo societies to the west. Side-notched arrow points, similar to those that appeared after A.D. 1200 (see above), continued into this period to an unknown date, along with Perdiz points that are characteristic of the Toyah phase in Texas and spill over in small numbers into the CFO region. During historic times, stone arrow points were replaced by metal points and, eventually, firearms. A metal arrow point at LA 147382, a site along Dog Town Draw in the Pecos River Corridor (not far from the project area), is one of the very few such finds in the region.

As part of the shift to nomadism during post-Formative times, it is reasonable to expect that tipis became a more common dwelling form. Some argue that tipi rings in the region are very late in time, postdating other types of structures. That may be true, but tipi rings date back several thousand years on the Plains,



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and it is entirely possible that at least some in southern New Mexico predate the post-Formative time frame.

At any rate, by A.D. 1500, if not earlier, people on the southern Plains had given up their attempts at village life, with its mixed focus on farming and bison hunting, and had become nomadic, tipi-dwelling bison hunters. This probably occurred at least in part due to increased demand from the pueblos for bison products and other resources from the southern Plains (such as Alibates and Edwards chert). As discussed below, during historic times along the western edges of the Plains, the Jumano, Apache, Comanche, and Hispanic ciboleros successively filled the role of mobile hunters who supplied the pueblo and Spanish villagers of the Southwest with meat and other bison products. However, it is unknown if bison hunting was as productive at this time in the CFO region as it was in neighboring areas of the southern High Plains. If not, then the continued drop in the number of radiocarbon dates into the post-Formative and historic time frame may indicate that many people moved out of the CFO region to better bison-hunting areas. By the time the earliest Spanish explorers entered the region, there were few Native Americans reported here. Over time, the region became the domain of the Apache and, beginning later, the Comanche.

## Historic and Recent Traditions (A.D. 1500–Present)

When the earliest Spanish explorers entered the Southwest and southern Great Plains, they arrived in a world that had been substantially transformed over the preceding couple of centuries. Throughout most of the historic time frame, Euro-American exploration, settlement, and commercial activities occurred mostly along and beyond the margins of far southeastern New Mexico. As a result, the present-day CFO region remained a remote, little-known expanse, and the domain of nomadic Native Americans until well into the nineteenth century. It was one of the last parts of the state to be settled by Europeans and Americans of European descent.

### *Initial Spanish Exploration (A.D. 1540–1598)*

Francisco Vásquez de Coronado's 1540 to 1542 expedition to southwestern North America and the southern Plains passed well to the north of the Carlsbad region during the 1541 journey to the Great Plains in search of the legendary Quivira (Flint and Flint 1997; Hammond and Rey 1940; Winship 1904). Four decades later, the Chamuscado and Rodriguez expedition of 1580 to 1581 journeyed up the Rio Grande to the pueblos of New Mexico and also traveled eastward onto the Plains in the vicinity of Santa Rosa, again well to the north of the present-day CFO region (Hammond and Rey 1966; Mecham 1926a). The first team of Spaniards known to have traversed the CFO region was the 1582 to 1583 expedition of Antonio de Espejo, who found the pueblo inhabitants of the Rio Grande valley sufficiently hostile that he returned to Mexico via the Pecos River (Hammond and Rey 1966; Mecham 1926b). This was followed by the illegal colonizing expedition of Gaspar Castaño de Sosa in 1590, which traveled up the Pecos River valley and encountered several deserted Native American camps and groups of nomads (Hammond and Rey 1966:29, 34–35, 48). The following year, a team led by Juan Morlette pursued Sosa and arrested him at Santo Domingo Pueblo. Little is known about Morlette's route, but he probably followed the Rio Grande to the north and back to Mexico, rather than the Pecos River (Hammond and Rey 1966:298–301).

During their journeys out onto the Plains, these early Spanish entradas witnessed herds of bison and the tipi-dwelling nomads, who moved with the herds using travois pulled by dogs. These "dog nomads" were usually referred to by the earliest Spanish explorers as the "Querecho" or "Vaqueros," and at least some of them were probably ancestral to historically known Apache groups (Opler 1983a:385–386; Sonnichsen 1973:35). Along with the Navajo, the Apache are Athapaskan speakers whose linguistic homeland lies far



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Received by OCD: 8/18/2023 7:05:03 AM




to the north in subarctic Canada. These groups moved southward through the western Plains and entered the southern Plains and Southwest probably not long before the arrival of Coronado's expedition (Opler 1983a).

Non-Apache groups living on the southern Plains and Southwest were also observed by, or reported to, the early Spanish explorers. Among the more prominent of these are the Jumano, whose ethnic identity remains largely a mystery. Kenmotsu (2001) argues that the Jumano were a distinct ethnic group, with a homeland between the Pecos and Colorado Rivers in west Texas, although they ranged widely beyond this area (see also Anderson 1999:15–66). The Jumano apparently had close relations with the Tompiro or Salinas Pueblos (located between the Rio Grande and Pecos River valleys), which were referred to by the Spanish as the "Humanas" or "Ximenas," and there may have been considerable intermarriage between the occupants of these pueblos and the Jumano (Kenmotsu 2001).

At any rate, the Spanish explorers observed the thriving trade in bison products from the Plains to the pueblos and other surrounding regions, which minimally involved Apache and Jumano groups. However, during the return journey of Espejo's team from Pecos Pueblo down the Pecos River, they

> adhered to the river's course for a distance of about 120 leagues [i.e., 579 km or 360 miles] without seeing a single human being; nor did they catch a glimpse of the buffalo, although they discovered numerous traces along the way. (Mecham 1926b:135)

There were almost certainly Native inhabitants along the Pecos River in far southeastern New Mexico at the time of Espejo's traverse, and if so, they probably observed the passing team of explorers from a distance and avoided contact. As a result, unlike the rich accounts of Native peoples in south Texas from Cabeza de Vaca's journey, and in New Mexico and the Plains region to the north from the Coronado and Chamuscado-Rodriguez expeditions, the earliest entry of Europeans into far southeastern New Mexico has left us with essentially no information about Native peoples and their lifeways. This leaves open an important question as to whether Contact period peoples in this area were more like hunter-gatherers of south Texas (who subsisted on a wide variety of foods, including roots and cacti), the nomadic bison hunters to the north, or some combination of both.

## *Spanish Colonization and Continued Exploration (A.D. 1598–1821)*

The Spanish colonization of New Mexico began in 1598 with the expedition of Juan de Oñate, whose team traveled up the Rio Grande valley, staying well to the west of the CFO region. The ensuing settlement of the region remained focused on the Rio Grande valley, with settlers clustered in the El Paso–Las Cruces and Albuquerque–Santa Fe areas throughout the Spanish Colonial period. However, excursions out onto the Plains—again, well to the north of far southeastern New Mexico—continued. These included a journey in 1601 by Oñate deep into the Plains of present-day Kansas, as part of an investigation of Umana's and Leyba's illegal expedition, and a 1634 expedition by Captain Alonzo Baca that probably followed a similar route (Bolton 1916; Hammond and Rey 1953; Simmons 1991; Twitchell 1911:345).

In 1650, Hernán Martín and Diego del Castillo set out from Santa Fe on a journey to the southeast in search of pearls reported by the Jumano Indians living in that direction. This expedition traveled deep into the Edwards Plateau of west-central Texas to El Río de las Perlas (River of Pearls) and El Río de los Nueces (River of Nuts). These place names probably refer to the area around the confluence of the Concho and Middle Concho Rivers, where pearl-bearing freshwater mollusks were found. This expedition was soon followed in 1654 by another, this one led by Diego de Guadalajara, which reportedly followed the same route to the Rio Concho (Bolton 1916; Twitchell 1911:345). One or both of these expeditions



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may have passed through the CFO region, although their precise routes are not entirely clear, and it is equally possible that both passed just to the north of Lea County.

Following the Pueblo Revolt of 1680 and the subsequent Reconquest in the 1690s, the Spanish more firmly and permanently entrenched themselves in New Mexico. Throughout the seventeenth and eighteenth centuries, relations between the Spanish, Pueblo, and Apache fluctuated between states of mutual hostility and brutality at one extreme, to alliances, trade relations, and even co-residence at the other. The "Apache de Sieto Rios" (Seven Rivers Apache) were first mentioned by the Spanish in 1659 (Opler 1983a), reportedly living within the present-day CFO region. In his published maps, Schlesier (1972) shows the Seven Rivers area lying within the "Pecos Division" of the Southern Plains Athapaskan Aspect in 1692, and the "Siete Rios-Guihlkainde" branch in his maps dated between 1706 and 1768. By the early nineteenth century, the Siete Rios-Guihlkainde branch became one of the five main bands of the Mescalero Apache (Opler 1983b; Schlesier 1972:112).

The spread of horses among Native Americans was catalyzed by the Pueblo Revolt of 1680, as the Spanish fled south and left behind large herds of horses in the Santa Fe area. The historical evidence strongly suggests that the use of horses reached the Apache in far southeastern New Mexico (and any other Native groups that may have been living there) sometime in the 1680s. The spread of the horse had a profound impact on lifeways and geopolitical dynamics among various Native American groups, as well as the Spanish colonists (Hämäläinen 2003). The acquisition of the horse by the Apache, in conjunction with their growing numbers and perhaps superior military tactics, gave them a decisive advantage over their rivals on the southern Plains. They hit the Jumano and other groups especially hard, gaining control of east-west trade routes by 1700 (Hämäläinen 1998:488). But their advantage was short-lived, as the Comanche soon became the main beneficiary of the historical geopolitical shake-up following the spread of the horse.

Belonging to the Eastern Shoshone language group, the Comanche were descendants of Numic speakers whose dramatic expansion was the signature development of late prehistory in the Great Basin (Bettinger and Baumhoff 1982). By the early eighteenth century, the Comanche were specialized, horse-mounted bison hunters concentrated along the Arkansas River in southeastern Colorado and western Kansas (Hanson 1998:470; Richardson 1933), and their important role in New Mexico history commenced during this period. Along with their Numic-speaking linguistic relatives, the Utes, Comanches first appeared as traders in New Mexico in 1706 (Hämäläinen 1998:488; Hanson 1998:469; Richardson 1933:55; Shimkin 1940), and in 1719 they started raiding and trading widely in New Mexico. By 1740, their range expanded southward, extending from western Kansas and southeastern Colorado to south-central Texas, and from the Pecos River on the west to central Kansas, Oklahoma, and Texas on the east.

Relations between the Spanish, Comanche, and other players in the region continued to fluctuate between trading, raiding, and all-out war during the late eighteenth century, and the Comanche-orchestrated trade network suffered some serious setbacks beginning in 1779 and into the 1780s (Hämäläinen 1998:502–503). But the Comanche's trade capabilities were enhanced and reinvigorated by a peace agreement with Spain in 1786, after which Comancheros (settled traders of Spanish, Pueblo, and other Native American ethnic affiliation) began to trade more actively with the Comanche. The Spanish also supported further Comanche attacks against Apache groups at this time (Hämäläinen 1998:504–505; Kenner 1969:53–58). Although Comancheros operated mainly to the north, they continued to support their Comanche allies into the Mexican and American periods, when the Comanche made their last stand against the U.S. military in the Llano Estacado.



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## Mexican and American Periods (A.D. 1821–1880)

Following the Louisiana Purchase in 1803, most of the Great Plains became part of the United States, and American traders began following their French predecessors into the Plains, and on to New Mexico along the Santa Fe Trail. Mexico's independence from Spain in 1821 further reshaped the geopolitical mosaic of the southern Plains and the Southwest. Mexico's financial troubles adversely affected trade, and relations between Comanche and New Mexico shifted from an emphasis on exchange to warfare at this time. Meanwhile, incursions by Arapahoe and Cheyenne into upper Arkansas led to intense competition between them and Comanches based in that area. The once-flourishing Western Comanche trade center was already facing considerable challenges when it was finally brought to an end with the establishment of Bent's Fort in 1833. Bent's Fort was intentionally situated in the same area as the Western Comanche trade center, along the upper Arkansas River (which was then part of the U.S.-Mexico border), to take advantage of the vast trade network's existing geographic nexus and position along the Santa Fe trail (Hämäläinen 1998:512–513).

Texas and New Mexico became part of Mexico after 1821, but were acquired by the United States following the Mexican–American War of 1846 to 1848. During and after the war, far southeastern New Mexico remained an isolated and largely uncharted frontier occupied by Comanche and Apache peoples. Soon after the Mexican–American War, the United States launched military expeditions that passed through far southeastern New Mexico. The primary purpose of these expeditions was to scout potential transportation routes and document conditions in anticipation of future settlement and development. These include the expeditions headed by Randolph B. Marcy in 1849 and John Pope in 1854, which sought to establish wagon and railway routes between southern New Mexico and west Texas (Sebastian and Larralde 1989:117–118; Sheridan 1975:20–25). When scouting parties reported that the Llano Estacado was impassable due to lack of water, these expeditions and the transportation routes they established veered to the south of the New Mexico–Texas border, where several military forts were already established in the Trans-Pecos area of Texas. Meanwhile, other routes were established to the north of the present-day region (Sheridan 1975:28–31).

As one of the last unsettled frontiers in the United States, far southeastern New Mexico remained well beyond the extent of Euro-American settlement during the first half of the nineteenth century. The ongoing spread of Anglo settlers and ranchers in Texas reached far southeastern New Mexico soon after the Civil War. The Colorado mining boom and operation of military forts to the south resulted in a large demand for beef, and Texas cattlemen were eager to supply that demand (Beck 1962). The west Texas route to Colorado followed the Pecos River to a fording place for crossing the river that intersects with what is now Guadalupe Street in Carlsbad, New Mexico. In 1866, Oliver Loving and Charles Goodnight drove 1,600 cattle up this Pecos River route toward Denver. Along the way, they stopped at Fort Sumner and discovered there was a viable market for their cattle here as well. The following years more cattlemen, including John Chisum in 1867, moved an estimated 100,000 head of cattle north along the Loving-Goodnight trail, as the Pecos route came to be known (Sebastian and Larralde 1989:119–120).

The continued Indian attacks, along with growing Anglo-American interest in southeastern New Mexico and the Llano Estacado, prompted a concerted military effort to explore the region and rid it of these last remaining Native Americans. During the U.S. expeditions to the Llano Estacado in the 1870s, military units camped at springs and other water sources that had been used as Comanche base camps. Meanwhile, to the west, Euro-American settlers were encroaching on the Mescalero Apache, and U.S. military action resulted in an 1852 treaty that confined Mescalero Apache to a small reservation near Fort Sumner at Bosque Redondo. The reduced territorial range imposed by the reservation, along with failed attempts to force the Mescalero to become full-time farmers, left them dependent on food rations from the government. Competition over beef contracts helped spark the infamous Lincoln County War of 1878. The dire conditions prompted the Mescalero to resume raiding, which was met with a brutal response by



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the U.S. military in 1880, and by 1885 the Mescalero were out of options and forced to accept life on their reservation (Opler 1983b:422–424; Sonnichsen 1973:157–162, 193–206).

## Euro-American Settlement, Ranching, and Industry

With the threat of Native American attacks removed, Euro-Americans were free to move into far southeastern New Mexico and establish ranches and other settlements. During the 1870s, commercial bison hunters moved into the region. Among these were James Harvey and Dick Wilkerson, who in 1879 claimed squatter's rights at Monument Spring (Murrah 2005:2), making improvements, and by 1885 had killed the last bison in the area. The extermination of the bison coincided with an expansion of cattle ranching efforts in southeastern New Mexico, and ranching dominated the region's agricultural economy during the latter half of the nineteenth century. The Texas cattle drives only lasted 14 years (1866–1880) but were instrumental in populating the area and feeding miners and railroad crews (Katz and Katz 1985). As cattle became the mainstay of the economy in far southeastern New Mexico in the late 1800s, the immense herds and intensity of grazing had a devastating effect on the environment. The coppice dunes that cover much of the Mescalero Plain are a direct result of overgrazing and destabilization of surface sands across the region.

The passage of the Desert Land Act in 1877, the Kinkaid Homestead Act of 1904, and the Enlarged Homestead Act of 1909 facilitated the acquisition of public lands, which effectively ended the open range. These acts of legislation, coupled with the great droughts in the 1880s, brought about the end of the cattle empires (Sebastian and Larralde 1989). In fact, the year 1896 brought about a drought dubbed the "Big One" by locals, in which over 35 percent of the cattle in the region starved to death (Tracy 1982:64).

With the multiple droughts in the 1880s, John and Charles Eddy decided something must be done in order to keep water flowing in the valley. They purchased wells and started an irrigation ditch—the Halagueno Ditch—that was diverted from the east side of the Pecos River. This ditch would supply their multiple properties with enough water to irrigate their fields and support their interests. A business partner of the Eddys, Joseph S. Stevens, had recently inherited money and, thinking of the great success of irrigation in California, decided it would be smart to invest his money with the Eddys and in the irrigation of the Pecos Valley (Tracy 1982:64). The Pecos Valley Land & Ditch Company was formed by the Eddys and Stevens on October 31, 1887.

Of the homesteading legislation, Desert Land Entry was the most popular in southeast New Mexico, because of the amount of acreage available and the fact that living on the land was not required (Merlan 2008:18). With these options of obtaining land and the encouragement of the Eddy brothers and Stevens, claims were filed in earnest by newcomers and supporters of the Pecos Valley Land & Ditch Company (Tracy 1982:65). At this time, Charles Greene, a local promoter of the railroad and New Mexico in general, came upon the scene. He saw a great opportunity to help build the area and approached Pat Garrett, of Lincoln County War fame, at his ranch and asked him to introduce him to the Eddy brothers. Garrett and Greene traveled from Garrett's Roswell ranch to Charles Eddy's ranch and a new partnership—the Pecos Irrigation & Investment Company—was born in 1888 and a town site was selected. The town of Eddy was laid out, and Greene traveled to Europe to promote the town, and therefore, the company (Tracy 1982:65). Two main irrigation canals were started, but the cost of promoting the town and building the irrigation system took its toll on the money at hand. To combat the shortness of cash, Eddy and R. W. Tansill enlisted the help of J. J. Hagerman, a miner from Colorado. Because of Hagerman's money, he was able to direct the structure of the new corporation that was formed, the Pecos Irrigation and Improvement Company. Greene was very successful, and immigrants from Switzerland, Italy, and England poured into the valley. Development of the town and its surrounding area progressed and at one time the Pecos Irrigation and Improvement Company planned on eventually irrigating 1,000,000 acres between Pecos, Texas, and Roswell, New Mexico (Tracy 1982:66).



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Received by OCD: 8/18/2023 7:05:03 AM




Realizing that success for the region depended on the ability to transport agricultural products to market, Hagerman also elected to provide the Pecos Valley with a railroad link to the outside world. In 1890, joining forces with Charles Eddy, Hagerman announced the incorporation of the Pecos Valley Railroad Company. The proposed railroad line would connect Eddy and Roswell with Pecos, Texas, and the main line of the Texas & Pacific Railroad. The Pecos Valley Railway reached Eddy (now Carlsbad) in January 1891 and Roswell in 1894 (Schroeder and Jenkins 1974). The railroad brought settlers to the area while crops of cotton and alfalfa (perfect for the Eddy County climate), along with cattle, sheep, and wool, could be moved into and out of the area more efficiently. Eddy and Hagerman parted company in 1895. Hagerman formed a new company, the Pecos Valley and Northeastern Railway, laying 182 km (113 miles) of track from Roswell to Portales, Cameo, and Texico (Boggess 2011).

The Panic of 1893 (caused in part by railroad overbuilding, shaky railroad financing, and a depleted gold supply) set off a series of bank failures, and flooding of the Pecos River devastated the irrigation system, damaged the railroad tracks, and washed out the Avalon Dam and Hagerman Dam (renamed the Tansill Dam). Hagerman's company, the Pecos Irrigation and Improvement Company, declared bankruptcy in 1898, and by 1899 control of the railroad had passed to the Atchison, Topeka & Santa Fe railway. Ongoing difficulties with irrigation, coupled with a long-term drought, unregulated drilling for water, and poor irrigation practices, as well as years of heavy grazing, compounded the problem (Katz 1987). More than half of the cattle died, and beef prices dropped considerably (Katz and Katz 1985). Without water for the land, settlers faced complete ruin. Unable to finance another repair, the Pecos Irrigation and Improvement Company petitioned the federal government to step in and take over the company as well as the Carlsbad Irrigation Project, another irrigation company in the region. In 1905, the Bureau of Reclamation purchased the Carlsbad Irrigation Project and by 1907, the Carlsbad Irrigation Project was fully operational again, irrigating up to 30,000 acres with 233 km (145 miles) of ditches. This led to an increased production of alfalfa and cotton. By 1918, cotton was the major cash crop in New Mexico, grossing $500,000 that year (Beck 1962). During that period, the New Mexico territory was granted statehood, becoming the forty-seventh state of the union (Schroeder and Jenkins 1974).

Just 16 km (10 miles) southwest of Carlsbad in the northeastern extension of the Guadalupe Mountains, the exploration of bat caves in 1915 changed the Carlsbad region's economy forever. For years, locals collected and sold bat guano as fertilizer from the cave. It was not, however, until Jim White, a local resident, with the aid of Ray Davis and his camera, explored and documented the cave that non-locals took an interest. Tours began with a 52-m (170-foot) descent in a bucket previously used to haul bat guano out of the cave (Uhler 1995). In 1923, the U.S. Department of the Interior sent inspectors to investigate claims about the caves. In his final report Robert Holley stated, "I am wholly conscious of the feebleness of my efforts to convey in the deep conflicting emotions, the feeling of fear and awe, and the desire for an inspired understanding of the Devine Creator's work which presents to the human eye such a complex aggregate of natural wonders" (National Park Service [NPS] 2022). Carlsbad Caverns were designated a National Monument on October 25, 1923. By 1925, a staircase was built at the cave's natural entrance, ending use of the guano bucket to enter the cave. In 1926, the first trail was built by the NPS, and wooden stairs connecting the Main Corridor, King Palace, and Queens Chamber were built and an electric lightening system was installed through the Main Corridor and Kings Palace. Three elevators were installed in the early 1930s.

Cattle ranching was a major economic influence in the area. Some of the largest ranches included the Hat Ranch, the Four Lakes Ranch, and the Jal Ranch. The end of the government's open range policy in the 1890s led to the demise of these and other ranching empires established in the 1880s. They were replaced by smaller cattle operations, sheep ranches, but mostly by homesteaders from Texas and the south (Katz 1987).



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Received by OCD: 8/18/2023 7:05:03 AM




Oil was discovered in Eddy County in 1909, but the market for it had to wait for an increase of use in heating plants and in automotive vehicles. After Martin Yates, Jr., brought in a well near Artesia in 1923, so much drilling occurred that by 1938, the southeast corner of the state was "gushing oil," valued then at $32 million annually. Although Carlsbad was on the far edge of the oilfields, it already had a head start as a trading center and thus naturally became also a headquarters for some of the companies and workers engaged in petroleum industries.

Potash became a major industry for Eddy County in the mid-1920s. "Potash" refers to a variety of salts containing water-soluble potassium acquired through mining or manufacture. The name "potash" is derived from the Old Dutch potaschen, a potassium carbonate ($K_2CO_3$) that was manufactured by dissolving hardwood ash in solution in iron pots then evaporating the liquid, leaving an ashy residue in the pots. The term "potash" can be applied to potassium carbonate, potassium chloride (KCl), potassium sulfate ($K_2SO_4$), potassium magnesium sulfate ($K_2SO_4$-$MgSO_4$), langbeinite ($K_2Mg_2[SO_4]_3$), and potassium nitrate ($KNO_3$), all of which are commonly referred to as "fertilizer potassium" (Potash and Phosphate Institute 2014). As an element of fertilizer, potash provides a valuable nutrient to plants, improves water retention, and contributes to crop-disease resistance (Boggess 2011). World War II essentially stopped the importation of potash from Germany for processing into fertilizer, thus providing the impetus for exploration of domestic sources of potash. In 1924, Texas Senator Morris Sheppard introduced a bill authorizing additional exploration for potash in Texas and New Mexico (Boggess 2011; Bureau of Mines 1945). A year later, the USGS found potassium-bearing minerals at the Snowden-McSweeney Co.'s McNutt No. 1 Well (Ellis 1929:38). The find led to the formation of the American Potash Company on December 18, 1926. The company, organized by the Snowden McSweeney Company and the Pacific Coast Borax Company, changed its name in 1929 to United States Potash Company to avoid confusion with the American Potash and Chemicals Company located at California. The West Mine, the first potash mine built in the Carlsbad area, was constructed in 1931. The HB mine opened its second mine, the HD, in 1933. That same year, the United States Potash Company hired Horace Albright, then serving as director of the NPS, as vice-president and general manager. Albright managed the company in Carlsbad and was company president from 1946 to 1956 (Boggess 2011).

The potash industry in the area continued to expand throughout the 1940s in response to World War II and in the 1950s to an increased demand for fertilizer (Boggess 2011). The demand for New Mexico potash continued until inexpensive potash from Canada entered the market in the 1960s. The reduced demand for potash continued into the mid-1980s, with the farming debt crisis in the United States, and the introduction of inexpensive Soviet-made fertilizer in the 1990s. The natural gas Enron fiasco of the early 2000s added to this downtrend, leading to the lowest potash prices on record in 2003. Mine companies in the Carlsbad area became subsidiaries of larger companies that were able to absorb temporary financial setbacks, or mines changed hands entirely. Seven producers worked the Carlsbad area from 1965 to 1982, and by the 1990s the number was reduced to four.

## *Eddy and Lea Counties*

Lea County is closely tied to the development of the preceding Eddy County. The two counties continue to evolve together; therefore, a history of both counties is provided.

Eddy County was named for Charles B. Eddy, a rancher in southeastern New Mexico during the last decades of the nineteenth century. It was created in 1889 from the southeastern portion of Lincoln County and encompassed the entire southeastern corner of New Mexico (Beck 1962). Seven Rivers was named the county seat, but during the 1890 election, a referendum changed the seat from Seven Rivers to Carlsbad (Schroeder and Jenkins 1974). Eddy County was reduced to its current size with the creation of Lea County in 1917 (Beck and Haase 1969; Whisenhunt 1979).



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Political struggle over what would become Lea County began in 1912 with the proposal of a new county named Heard County, after Allen C. Heard, founder of the High Lonesome Ranch and the town of Knowles. The proposal was defeated, and the creation of the county not attempted again until 1917 with a suggestion of the name Llano County, after the Llano Estacado. Although the suggestion of the name was defeated, Chaves County agreed to the creation of a new county to its east. The leaders of Chaves County insisted on the name of Lea County, after Captain Joseph Calloway Lea, founder of the New Mexico Military Institute in Roswell. Instrumental in the formation of Chaves County, Captain Lea fought for the county to be named after his friend Colonel J. Francisco Chaves. By naming the new county after Lea, they were returning the favor (Julyan 1996). At the time it was created from the eastern portions of Chaves and Eddy Counties, Lea County had no railroads, telegraph, newspaper, or major population centers (Hinshaw 1984).

Along with the town of Eddy, by the late 1800s, small communities were springing up in the future Eddy County, including Stegman (now Artesia), Loving, and Malaga. In 1889, the town of Eddy changed its name to Carlsbad after the famous European spa Carlsbad, Bohemia (now Karlovy Vary, Czech Republic) (Whisenhunt 1979).

Charles B. Eddy, the namesake of Eddy County, was also the promoter of the Carlsbad Irrigation Project, which turned formerly arid land into fertile farms. The Carlsbad Irrigation District was designated a National Historic Landmark on July 19, 1964. Eddy County is also the site of large oil deposits (the first oil strike was in Dayton in 1909) and some of the world's largest potash deposits. Tourism became significant early on for Carlsbad and continues to play a role in Eddy County's economy, drawing 400,000 visitors per year to Carlsbad Caverns National Park.

In 1924, Van S. Welch, Tom Flynn, and Martin Yates drilled the first commercial oil well in southeastern New Mexico (New Mexico Museum of Art 2010). In the wake of the stock market crash of 1929, New Mexico oil and gas producers gathered to discuss industry issues and concerns. They formed the New Mexico Oil Men's Protective Association, now known as the New Mexico Oil and Gas Association. Despite the nation's financial turmoil, New Mexico's oil industry quickly grew, and by 1932, major pipelines extended into Lea County, transporting oil to eastern markets. In the same year, New Mexico established six refineries manufacturing gasoline, kerosene, heating oil, and road oil—a key factor in the development of New Mexico's first asphalt highways. The market value of oil and gas tripled between 1932 and 1942, and New Mexico's oil and gas industry flourished. At this time, the New Mexico Oil Conservation Commission was established, pioneering the controlled production of oil and gas to prevent unnecessary waste. New Mexico's stance helped Congress form the Interstate Oil and Gas Compact Commission, a government entity designed to regulate the nation's petroleum production (New Mexico Museum of Art 2010).

In 1940 the City of Carlsbad obtained land approximately 10 km (6 miles) southwest of town with the intent of building a municipal airport funded by city bonds and the federal Works Progress Administration. Construction was completed in 1941 (Cranston 2013). In 1942, the Carlsbad Municipal Airport was selected by the War Department as the site of an Army Air Corps training center. Temporary headquarters were established at the old Civilian Conservation Corps camp north of Carlsbad until the Carlsbad Army Airfield officially opened in September 1942. The base was used to train bombardiers and navigators as the first and only low-altitude D-8-type bombardier school in the country. More than 4,000 students attended the air field's training programs between 1942 and its closure in 1945, including two classes from China and the Carlsbad Civil Air Patrol. There are multiple military geoglyph bombing ranges around the Carlsbad area, some featuring swastikas, factories, ships, and bull's-eyes that can be plainly seen from the air but look like dirt mounds on the ground (Birchell 2010:84–87). After the air field's closure on September 30, 1945, most of the buildings and associated structures were sold and moved or relocated for use elsewhere.



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Oil and gas development continued and between 1952 and 1962, additional pipelines were built from the gas fields of northwestern New Mexico to West Coast markets. With distribution channels coast to coast, New Mexico's oil and gas industry thrived and is still active in Eddy and Lea Counties today (New Mexico Museum of Art 2010). Oil and gas development continues to play a dominant role in the region's economy. Eddy County relies heavily on resource extraction, with rich oil and gas deposits and some of the largest potash deposits in the United States. Carlsbad has become the headquarters for several companies and employees engaged in mining and related services. Lea County, sometimes called the "Energy Plex," is one of the state's leading producers of oil and gas. In Eddy and Lea Counties, the mining industry supports the most jobs of any industry (16 and 22 percent, respectively).

Gone are the cattle barons that owned from 15,000 to 50,000 head of cattle or the "big" sheepmen that owned as many as half a million head. The cattle industry, however, still maintains a presence in the region. The large ranches have been replaced by smaller operations; only a few ranchers own more than 3,000 cows and/or 10,000 to 20,000 sheep. Other industries flourishing in the area include agriculture and the dairy industry; in addition, Lea County is home to a state correctional institution (Lea County 2022).

The once small farming community of Artesia now boasts one the few residential training sites of the Federal Law Enforcement Training Center, mostly for U.S. Border Patrol Agents and U.S. Air Marshals. The training center is situated on the former campus of the College of Artesia, which operated from 1966 to 1971. The Navajo Refinery built in 1960 at Artesia is the largest oil refinery in New Mexico, with the capacity to produce 100,000 barrels a day (Center for Land Use Interpretation 2022).

White's City (named for a Kentucky homesteader, not the White that explored the Carlsbad Caverns), which tourists must pass through on their way to or from Carlsbad Caverns, is fast becoming a tourist center. People from all over the world send Valentines to be hand stamped at Loving. About 40 km (25 miles) north of Carlsbad, Illinois Camp, site of the first oil discovery east of the Pecos River in 1924, consists of a refinery and a few residents. The same can be said for Loco Hills and Maljamar, settlements that also began as oil camps in the late 1920s. Oil still dominates the Loco Hills and Maljamar economy.

Hobbs, founded in 1907 by a chance meeting between two covered wagons on a trail across the Llano Estacado plain, grew quickly with the discovery of oil in 1928. In 1930, the U.S. Census designated Hobbs the fastest-growing town in America. Today, the Hobbs area continues to dominate New Mexico's oil production (Lea County 2022). In 2006, Hobbs accounted for about 70 percent of all the oil pumped in the state.



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# CHAPTER 3. PRE-FIELD INVESTIGATIONS AND FIELD METHODS

## PRE-FIELD INVESTIGATIONS

An SWCA archaeologist conducted records searches on December 19, 2022, using the New Mexico Cultural Resources Information System (NMCRIS) database maintained by the New Mexico Historic Preservation Division (HPD). Database records were searched for previously recorded archaeological sites, properties, districts, historical markers, and previously conducted archaeological surveys in and within 0.4 km (0.25 mile) of the survey area (in accordance with BLM standards). The HPD and NRHP database records searches were concurrently conducted for properties listed in the NRHP and/or the State Register of Cultural Properties within 0.4 km (0.25 mile) of the survey area. Results of the records searches showed that 22 previous investigations have been completed within 0.4 km (0.25 mile) of the survey area. In total, four previously recorded sites were located within 0.4 km (0.25 mile) of the survey area and one previously recorded site, LA 86207, is located within the APE. Records search data are summarized in Appendix A. Additionally, The BLM CFO specified that any site within 100 feet of the project area should be visited and updated. Updating the sites included locating and recording all features and artifacts and establishing a new site boundary, if required.

## FIELD METHODS

A 100 percent (Class III) pedestrian cultural resources survey was conducted by an SWCA archaeologist walking parallel transects spaced no more than 15 m (50 feet) apart. The total survey acreage was 4.58 ha (11.34 acres) on BLM CFO land. The survey was conducted on January 24, 2023. Site recording was conducted on January 25, 2023.

Field protocol dictates that the recording of cultural locations be initiated with the pin-flagging of artifacts and other cultural manifestations. Isolated manifestations (IMs) were defined by nine or fewer artifacts, an isolated feature with no potential for dating, or manifestations that are not related to other nearby IMs or sites. Archaeological sites are defined as locations dating to an age, or likely age, of 50 years (pre-1973) or more that contain 10 or more artifacts or as a feature or features associated with any artifacts meeting the 50-year age criterion.

Cultural locations were described and recorded according to current archaeological standards using ODK Collect and NextGIS Mobile software. ODK Collect documents archaeological data (artifacts, features, etc.), and NextGIS Mobile is used to record spatial data (site and survey boundaries). Both programs were run on Samsung Galaxy Android tablets connected to a Juniper Geode GNSS receiver. Resource recording consisted of preparing a plan map (post-field, using GPS data), taking photographs, completing a New Mexico Laboratory of Anthropology (LA) site form, recording all artifacts and features, and recording resource boundaries with the GPS system. All GPS data were collected using submeter accuracy.

Shovel tests are excavated on a site only to determine the presence or absence of cultural deposits buried deeper than 10 cm and to support or negate recommendations of eligibility. Sediments are screened through 0.25-inch mesh. Shovel tests are not excavated on historic archaeological sites if site eligibility can be determined without subsurface testing. As requested by the BLM, thermal features with potential integrity were tested with trowels to locate any potential subsurface cultural deposits.

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All cultural resources were assessed for NRHP eligibility in accordance with BLM CFO resource standards (BLM 2012). These standards establish that a site is eligible when

1) a radiocarbon (carbon-14) dateable feature is present,
2) a dateable assemblage with proven depositional potential (buried artifacts or features) is present, or
3) proven depositional potential is present (buried artifacts or features).

In the case of newly recorded cultural resources, all surficial artifacts and features were individually flagged, diagnostic artifacts point-located (PL), and the PL artifacts and features recorded using a GPS unit with submeter capabilities. For any debitage found, maximum flake size in 1-cm increments (e.g., 0–1 cm, 1–2 cm, 2–3 cm), percent cortex, and material type were recorded. For any ground stone, stone-tool manufacturing artifacts, and lithic tools found, type (e.g., mano, projectile point, core, metate, biface); maximum length, width, and thickness (cm); completeness (broken or complete); material; and percent cortex were recorded. Recorded ceramic attributes include ware, type, form (e.g., bowl, jar, plate), and portion (e.g., rim, body). All projectile points and other formal tools were photographed with a centimeter scale. Other objects, including ceramics, bifaces, and ground stone, were photographed to illustrate assemblage diversity. If identified, diagnostic projectile points were to be collected and deposited with the BLM CFO with the information data tags to associate the artifact with the exact day and place it was recovered.

When 100 or fewer artifacts are observed at a site, all surface artifacts are recorded. At sites with more than 100 artifacts, concentrations are defined, and a representative sample of artifacts is fully recorded, as described above, for at least 100 artifacts per artifact type. All lithic tools and ground stone artifacts, as well as features, were fully recorded. All field records from the survey are on file at SWCA's Albuquerque office (see Chapter 1 for contact information).



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# CHAPTER 4. SURVEY RESULTS

SWCA archaeologists surveyed a 30.5-m (100-foot) cultural buffer around the release for a total of 4.58 ha (11.34 acres) on land managed by the BLM CFO in Eddy County, New Mexico. No new archaeological sites or IMs were observed. One previously recorded site, LA 86207, is within the APE. Testing on the site consisted of excavating 13 shovels tests across portions of the site within the project APE to determine whether subsurface cultural deposits were present.

## LA 86207

**Additional Site Numbers:** NM-06-5240 (BLM CFO); PAC/ED-425 (Pecos Archaeological Consultants)
**Universal Transverse Mercator (UTM)/ PLSS Data:** See Appendix A

**USGS:** Ross Ranch, NM (32103-A8); Phantom Banks, NM (32103-A7)

**County:** Eddy

**Elevation:** 919 m (3,015 feet) amsl

**Landowner:** BLM CFO

**Cultural Affiliation and Age:** Jornada Mogollon, Late Pithouse (A.D. 750–1100); Early Pueblo (A.D. 1100–1175)

**Site Type:** Artifact scatter

**Size:** 89,970 $m^2$ (968,433 square feet, or 22.23 acres)

**NRHP Eligibility:** Eligible, Criterion D

**Management Recommendations:** Avoidance of the site.

### *Site Description*

### *Previous Investigation*

LA 86207 had been recorded three times prior to the current visit. The original recording was completed by Pecos Archaeological Consultants (PAC) in January 1991 under NMCRIS Activity No. 36790 (Hunt 1991). The site measured 500 × 400 m and was described as a Temporary Camp Locale composed of surface artifacts and thermally altered rock scatters. The site was described as a dune blowout approximately 8 km (5 miles) east of the Pecos River. Disturbances observed included erosion caused by alluvial and eolian processes and cattle grazing. The artifact assemblage was reported to be composed of hundreds of lithic debitage flakes, cores, several concentrations of thermally altered quartzite cobbles, ground sandstone fragments, and three distinct pottery types including Chupadero Black-on-white, El Paso Plain, and Jornada Brown. One semi-intact circular feature was also noted during the original recording. Based on the diagnostic ceramic sherds, LA 86207 was assigned an Jornada Mogollon, Querecho and/or Maljamar Phase (A.D. 650–1350) cultural and temporal affiliation. PAC noted that subsurface materials were likely present and would provide data on the specific nature of the occupation. PAC recommended LA 86207 as “insufficiently evaluated” (Hunt 1991).

The second recording was completed by Desert West Archaeological Services in May 1997 under NMCRIS Activity No. 56412 (Wilcox 1997). The primary disturbances noted were water and wind erosion, bioturbation and construction/land development, and the site was recorded as being 76 to 99 percent intact. Desert West Archaeological Services noted a similar artifact assemblage to the original 1991 recording. The site boundary was adjusted to account for the distribution of the surface artifacts. LA 86207 was assigned a Jornada Mogollon cultural affiliation within the Late Pithouse (A.D. 750–1100)

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to Early Pueblo Period (A.D. 1100–1175). The site was recommended eligible for the NRHP under Criterion D due to its vastness of artifacts, stains, and possible buried features/structures (Wilcox 1997).

The third site recording was completed by Southern New Mexico Archaeological Services in June 1998 under NMCRIS Activity No. 61414 (Sanders 1999). The investigators reported the site was 51 to 75 percent intact with wind and water erosion representing the main impacts. Also noted was a similar artifact assemblage consisting of lithic debitage, fire-cracked rock, ground stone fragments, three types of ceramic sherds, and several disarticulated hearths. The site boundary was significantly decreased in size during the visit. LA 86207 was recommended eligible under Criterion D.

The three visits to LA 86207 resulted in the site being determined eligible by the BLM in 2004 (HPD Log No. 72596). The State Historic Preservation Office also determined the site eligible in 1991 and 1997 (HPD Log No. 23249, HPD Log Nos. 53271 and 53511).

## *Current Investigation*

LA 86207 is a large site consisting of a prehistoric artifact scatter. During the current investigation, LA 86207 was identified in its originally plotted area; however, the site boundary was adjusted to reflect the distribution of artifacts observed at the site. The site measures 502 x 179 m (1,644 x 587 ft) in diameter and is located within a dune and interdunal area (Figure 4-1). Tucker Draw is located approximately 1.97 km (1.22 miles) to the northwest and the Pecos River is approximately 9.62 km (5.98 miles) west of the site. The Texas/New Mexico state line is approximately 1.68 km (1.045 miles) south of the site.

The site has been impacted by wind and water activities. The erosional activities have redeposited sand over loam and caliche deposits and have redistributed artifacts. Diffused fire-cracked rocks were observed within several dunes. Shallow drainages and cattle trails have contributed to further erosion and impacts to the site (Figure 4-2). Oil and gas activities have resulted in surface polylines, and a large pad with storage batteries in the southern section. Vegetation on the site is consistent with the Desert Scrubland biotic environment and includes mesquite, acacia, creosote bush, althorn, snakeweed, yucca, four-wing saltbush, javelina bush, prickly pear cacti, narrowleaf yucca, and various grasses and forbs (Figure 4-3). Overall ground surface visibility is estimated to be 75 to 99 percent.

The observed artifact assemblage at LA 86207 consists of a general surficial scatter that has a total assemblage estimated to contain more than 500 artifacts with 119 analyzed and recorded. Observed prehistoric artifacts include lithic debitage, lithic tools including two edge-modified flake tools, one basin metate fragment, one mano fragment, one unknown ground stone implement, one tested cobble, four cores, and ceramics consisting of three undifferentiated brown ware body sherds. Thirteen shovel tests were excavated during the current investigation. All excavated shovel tests yielded negative results for subsurface cultural materials.

LA 86207 is in good condition and estimated to be 51 to 75 percent intact. Impacts to the site consist of alluvial erosion, eolian erosion, bioturbation, and construction/land development. LA 86207 is located on a low rise and hill slope with ephemeral drainages running through the site boundary. The most significant impacts to the site consist of construction/land development with oil and gas development, alluvial erosion, and eolian erosion.



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**Figure 4-1. Site overview, facing northwest (Frame T66-1523).**

**Figure 4-2. Site overview with drainages, facing east (Frame T66-7499).**



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**Figure 4-3. Site overview from northern boundary showing vegetation, facing north (Frame T66-8946).**

## *Materials Identified*

A representative sample of 119 artifacts included lithic debitage, lithic tools, ground stone implements, and ceramics. The sample is approximately 20 percent of the observed artifact assemblage. Artifacts that were diagnostic or complete tools were point-located (PL) at the site.

Lithic debitage materials consist of silicified limestone, chert, chalcedony, quartzite, and orthoquartzite (Table 4-1). The recorded debitage assemblage is approximately 42 percent whole cortical flakes (n = 45), 3 percent cortical shatter (n = 3), 12 percent broken cortical flakes (n = 13), 26 percent whole noncortical flakes (n = 28), 4 percent noncortical shatter (n = 4), and 13 percent broken noncortical flakes (n = 14). Two edge-modified flake tools (PL 1 and PL 5), one basin metate fragment (PL 4), one mano fragment, one unknown ground stone implement, one tested cobble, four cores (Table 4-2), and three undifferentiated brown ware bowl sherds (PL 2 and PL 3; Table 4-3) were recorded at the site. Point-located artifact (PL 1) is an edge-modified flake with attributes similar to a chopper and the other edge-modified flake (PL 5) had attributes similar to an agave knife. Artifact photographs are in Figure 4-4 through Figure 4-8.

**Table 4-1. General Scatter Lithic Debitage Observed at LA 86207**

| Material Color/Type | Maximum Length of Flake (cm) | | | | | | | Type Total | Material Total |
|---|---|---|---|---|---|---|---|---|---|
| | Type | 0–1 | 1–2 | 2–3 | 3–4 | 4–5 | 5+ | | |
| Chalcedony | Whole cortical flake | - | - | 1 | - | - | - | 1 | 4 |
| | Broken noncortical flake | - | 2 | - | - | - | - | 2 | |
| | Cortical shatter | - | - | - | 1 | - | - | 1 | |



Released to Imaging: 8/28/2023 9:55:09 AM

Received by OCD: 8/18/2023 7:05:03 AM




| Material Color/Type | Maximum Length of Flake (cm) | | | | | | | Type Total | Material Total |
|---|---|---|---|---|---|---|---|---|---|
| | Type | 0–1 | 1–2 | 2–3 | 3–4 | 4–5 | 5+ | | |
| Silicified limestone | Whole cortical flake | - | - | - | - | - | 3 | 3 | 6 |
| | Whole noncortical flake | - | 1 | - | - | - | - | 1 | |
| | Broken noncortical flake | - | - | 2 | - | - | - | 2 | |
| Chert | Whole cortical flake | 1 | 2 | 11 | 4 | 3 | 1 | 22 | 71 |
| | Whole noncortical flake | 4 | 8 | 8 | 3 | - | - | 23 | |
| | Broken cortical flake | 2 | 5 | 6 | - | - | - | 13 | |
| | Broken noncortical flake | 5 | 1 | 3 | - | - | - | 9 | |
| | Cortical shatter | - | - | - | - | - | 1 | 1 | |
| | Noncortical shatter | - | - | 3 | - | - | - | 3 | |
| Quartzite | Whole cortical flake | - | 2 | - | 1 | 1 | 3 | 7 | 9 |
| | Whole noncortical flake | 1 | - | - | - | - | - | 1 | |
| | Cortical shatter | - | - | - | 1 | - | - | 1 | |
| Orthoquartzite | Whole cortical flake | - | 1 | 1 | 2 | 5 | 3 | 12 | 17 |
| | Whole noncortical flake | - | 1 | 2 | - | - | - | 3 | |
| | Broken noncortical flake | - | - | 1 | - | - | - | 1 | |
| | Noncortical shatter | - | 1 | - | - | - | - | 1 | |
| **Total** | | | | | | | | | **107** |

## Table 4-2. General Scatter Lithic Tools Observed at LA 86207

| PL No. | Material Type | Artifact Type | Dimensions (cm) | Description |
|---|---|---|---|---|
| 1 | Silicified limestone | Edge-modified flake tool | 11.1 × 7.5 × 3.2 | One silicified limestone edge-modified flake tool that has been bifacially worked with approximately 80 percent cortex. Possibly a chopper tool. |
| 4 | Sandstone | Metate | Not available | One sandstone basin metate end section fragment. Polishing and crushing exhibited on the metate. |
| 5 | Silicified Limestone | Edge-modified flake tool | 12.9 × 9.9 × 0.8 | One silicified limestone edge-modified flake tool that could possibly be an agave knife. |
| - | Quartzite | Tested cobble | 5–10 | One quartzite tested cobble. |
| - | Orthoquartzite | Core | >10 | One orthoquartzite multidirectional core with six visible flake scars. |
| - | Orthoquartzite | Core | 5–10 | One orthoquartzite multidirectional core with 12 visible flake scars. |
| - | Orthoquartzite | Core | >10 | One orthoquartzite multidirectional core with eight visible flake scars. |
| - | Orthoquartzite | Core | 5–10 | One orthoquartzite multidirectional core with 12 visible flake scars. |
| - | Sandstone | Mano | 7.9 × 8.2 × 5.7 | One unknown sandstone mano type end section. Polish was observed on the mano. |
| - | Sandstone | Ground stone implement | 5.9 × 4.1 × 2.9 | One unknown ground stone implement type with polish observed. |



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**Figure 4-4. PL 1, silicified limestone edge-modified flake tool, side A (left) (Frame T66-8173) and side B (right) (Frame T66-3066).**

**Figure 4-5. PL 4, sandstone basin metate end section fragment, side A (left) (Frame T66-3337) and cross section showing basin dip (right) (Frame T66-4055).**



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**Figure 4-6. PL 5, silicified limestone flake tool (possible agave knife), side A (left) (Frame T66-8785) and side B (right) (Frame T66-7968).**

**Table 4-3. General Scatter Ceramics Observed at LA 86207**

| PL No. | Ware/Type | Vessel Form | Temper | Description | Count | | |
|---|---|---|---|---|---|---|---|
| | | | | | Body | Rim/Other | Total |
| 2 | Undifferentiated brown ware | Jar | Sand and crushed rock | One undifferentiated brown ware bowl body sherd. The interior is rough with temper showing. | 1 | – | **1** |
| 3 | Undifferentiated brown ware | Jar | Sand and crushed rock | One undifferentiated brown ware bowl body sherd. The interior is smooth. | 1 | – | **1** |
| - | Undifferentiated brown ware | Jar | Sand and crushed rock | One undifferentiated brown ware bowl body sherd | 1 | – | **1** |

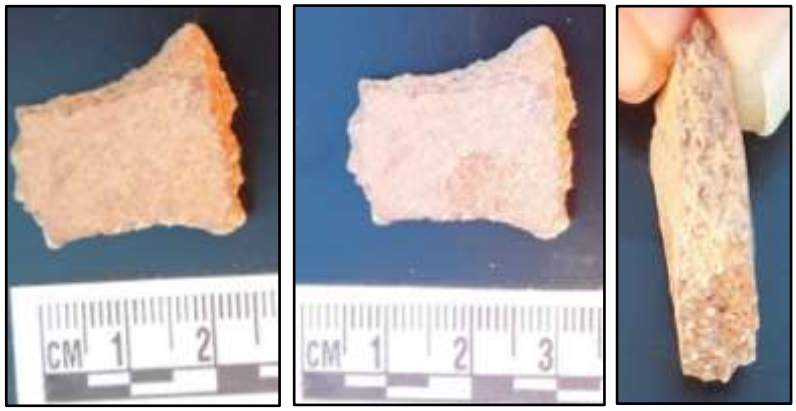


**Figure 4-7. PL 2, undifferentiated brown ware body sherd, interior (left) (Frame T-66-5987), exterior (center) (Frame T66-7966), and temper detail (right) (Frame T66-6133).**



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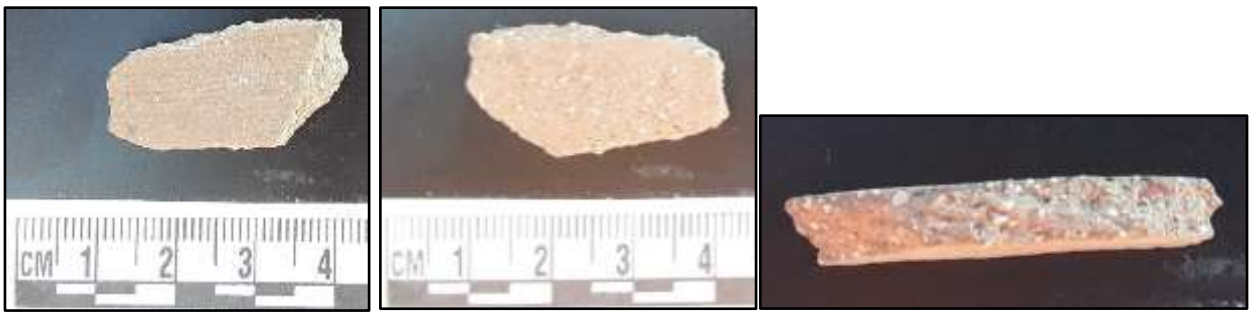

**Figure 4-8. PL 3, undifferentiated brown ware body sherd, interior (left) (Frame T66-9963), exterior (center) (Frame T66-2438), and temper detail (right) (Frame T66-2657).**

## *Shovel Tests*

Thirteen shovel tests were excavated within the project APE, seven of which were placed within the spill area and six within the 50-foot remediation area buffer, to test for potential intact subsurface cultural deposits (Table 4-4). Shovel tests consisted of 50 × 50–cm wide areas and were excavated down to 1 m or until obstructions that impeded excavation were encountered. All shovel tests were negative for subsurface cultural deposits. Photographs of shovel tests are found in Figure 4-9 through Figure 4-21.

**Table 4-4. Shovel Tests at LA 86207**

| Shovel Test | Level | Depth (cm below the surface) | Munsell | Soil Color | Soil Texture | Inclusions | Positive (P) or Negative (N) | Cultural Material and Comments |
|---|---|---|---|---|---|---|---|---|
| 1 | 1–6 | 0–60 | 7.5YR 6/4 | Dull orange | Sandy loam | 5 percent gravel | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 2 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets, 5 percent gravel | N | The shovel test was located in between two small dunes. Vegetation observed around the shovel test location consists of yucca and snakeweed. No subsurface cultural deposits were encountered. |
| | 2–6 | 10–57 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets, 5 percent gravel | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 3 | 1 | 0–10 | 7.5YR 6/4 | Dull orange | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located west of the base of a dune. Vegetation observed around the shovel test location consists of mesquite and snakeweed. No subsurface cultural deposits were encountered. |
| | 2–4 | 10–40 | 7.5YR 6/4 | Dull orange | Sandy loam | 5 percent roots and rootlets, 5 percent gravel | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |



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| Shovel Test | Level | Depth (cm below the surface) | Munsell | Soil Color | Soil Texture | Inclusions | Positive (P) or Negative (N) | Cultural Material and Comments |
|---|---|---|---|---|---|---|---|---|
| 4 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a flat area west of a dune. No subsurface cultural deposits were encountered. |
| | 2–6 | 10–60 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets, 5 percent gravel | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 5 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a flat area near the base of a dune. No subsurface cultural deposits were encountered. |
| | 2–6 | 20–60 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets, 5 percent gravel | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 6 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a dune blowout. Vegetation observed around the shovel test location consists of various bunch grasses. No subsurface cultural deposits were encountered. |
| | 2–10 | 10–100 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 7 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a dune blowout. Vegetation observed around the shovel test location consists of croton and various bunch grasses. No subsurface cultural deposits were encountered. |
| | 2–9 | 10–85 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 8 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a dune blowout. Vegetation observed around the shovel test location consists of mesquite, four-wing saltbush, and various bunchgrasses. No subsurface cultural deposits were encountered. |
| | 2–10 | 10–97 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 9 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a dune blowout. Vegetation observed around the shovel test location consists of croton and various bunchgrasses. No subsurface cultural deposits were encountered. |
| | 2–6 | 10–60 | 7.5YR 6/4 | Dull orange | Sandy loam | 5 percent roots and rootlets | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |



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| Shovel Test | Level | Depth (cm below the surface) | Munsell | Soil Color | Soil Texture | Inclusions | Positive (P) or Negative (N) | Cultural Material and Comments |
|---|---|---|---|---|---|---|---|---|
| 10 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a dune blowout. Vegetation observed around the shovel test location consists of mesquite, yucca, and various bunchgrasses. No subsurface cultural deposits were encountered. |
| | 2–7 | 10–65 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 11 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a dune blowout. Vegetation observed around the shovel test location consists of croton and various bunchgrasses. No subsurface cultural deposits were encountered. |
| | 2–6 | 10–60 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 12 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was located within a dune blowout. Vegetation observed around the shovel test location consists of croton and various bunchgrasses. No subsurface cultural deposits were encountered. |
| | 2–7 | 10–65 | 7.5YR 5/4 | Dull brown | Sandy loam | 5 percent roots and rootlets | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |
| 13 | 1 | 0–10 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | The shovel test was north of a dune. Vegetation observed around the shovel test location consists of croton and various bunch grasses. No subsurface cultural deposits were encountered. |
| | 2–8 | 10–75 | 7.5YR 5/4 | Dull brown | Sandy silt | 5 percent roots and rootlets | N | No subsurface cultural deposits were encountered. Shovel test terminated due to compaction. |



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**Figure 4-9. Shovel test 1, post-excavation overview, detail (Frame 66-0952).**

**Figure 4-10. Shovel test 2, post-excavation overview, detail (Frame T66-6432).**



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Received by OCD: 8/18/2023 7:05:03 AM




**Figure 4-11. Shovel test 3, post-excavation overview, detail (Frame 66-6533).**

**Figure 4-12. Shovel test 4, post-excavation overview, detail (Frame T66-6616).**



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Received by OCD: 8/18/2023 7:05:03 AM




**Figure 4-13. Shovel test 5, post-excavation overview, detail (Frame T66-4334).**

**Figure 4-14. Shovel test 6, post-excavation overview, detail (Frame T66-7738).**



Released to Imaging: 8/28/2023 9:55:09 AM

**Figure 4-15. Shovel test 7, post-excavation overview, detail (Frame T66-2932).**

**Figure 4-16. Shovel test 8, post-excavation overview, detail (Frame T66-1499).**

Received by OCD: 8/18/2023 7:05:03 AM




**Figure 4-17. Shovel test 9, post-excavation overview, detail (Frame T66-0222).**

**Figure 4-18. Shovel test 10, post-excavation overview, detail (Frame T66-9176).**



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Received by OCD: 8/18/2023 7:05:03 AM




**Figure 4-19. Shovel test 11, post-excavation overview, detail (Frame T66-0686).**

**Figure 4-20. Shovel test 12, post-excavation overview, detail (Frame T66-8441).**



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Received by OCD: 8/18/2023 7:05:03 AM




**Figure 4-21. Shovel test 13, post-excavation overview, detail (Frame T66-2035).**

## Site Chronology

During the first visit by Pecos Archaeological Consultants, LA 86207 was determined to have a temporal and cultural affiliation from the Mogollon (Jornada)/Mixed Ancestral Puebloan and Mogollon, Late Pit house (A.D. 750–1100) to Early Pueblo (A.D. 1100–1200). The following investigations by Desert West Archaeological Services and Southern New Mexico Archaeological Services concurred with the original temporal and cultural designation. During the current investigation, SWCA did not find any change with the temporal and cultural designation and therefore agrees with previous assessments.

## Site Summary and Interpretation

LA 86207 is a large prehistoric artifact scatter that is located within a dune and interdunal area. The site was originally recorded by Pecos Archaeological Services in 1991 with subsequent revisits by Desert West Archaeological Services in 1997, Southern New Mexico Archaeological Services in 1998, and SWCA Environmental Consultants in 2023. The artifact assemblage observed during the current investigation suggests that LA 86207 was potentially used as a temporary camp or activity area where lithic tool manufacturing/maintenance, resource exploitation, and resource processing were taking place. The site is estimated to have an artifact assemblage of more than 500 artifacts on the surface. The original recording of LA 86207 gives it a temporal and cultural designation from the Mogollon (Jornada)/Mixed Ancestral Puebloan and Mogollon, Late Pit house (A.D. 750–1100) to Early Pueblo (A.D. 1100–1200).



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Received by OCD: 8/18/2023 7:05:03 AM




## Eligibility Recommendations

Following the previous recordings, LA 86207 has been previously determined eligible under Criterion D for information potential by the BLM (HPD Log No. 72596, dated 10/26/2004) and the State Historic Preservation Office (HPD Log No. 23249, dated 08/30/1991; HPD Log No. 53511, dated 09/8/1997; and HPD Log No. 53271, dated 08/01/1997). SWCA agrees with the previous eligibility determination on file.

## Management Recommendations

LA 86207 is eligible for listing in the NRHP under Criterion D. The proposed remediation area directly impacts and overlaps a large portion of the site along the eastern site boundary; therefore, monitoring of construction activities is recommended.

**Update**: Per consultation with the BLM CFO in May 2023 soil samples were conducted by client with an archaeologist present to monitor any ground disturbing activities at or within 100 feet of the site. After review of the soil sample levels from the spill it was determined by the BLM CFO between May 9–11 that it would be less of a significant impact to the site to leave the spill in place than to undergo the cleanup process.



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# CHAPTER 5. SUMMARY OF ELIGIBILITY AND MANAGEMENT RECOMMENDATIONS

The intensive pedestrian surveys for the RDU 54 Tank Battery inadvertent release project covered a total of 4.58 ha (11.34 acres) on lands managed by the BLM CFO in Eddy County, New Mexico.
No previously unrecorded archaeological sites or IMs were observed during the current investigation. One previously recorded site (Table 5-1), LA 86207, was expected within the project APE. During the survey, the site boundary required some adjustments.

LA 86207 is a large prehistoric artifact scatter and is located on a south-facing slope and has been heavily impacted by wind and water erosion and construction activities. Several drainages flowing toward Tucker Draw have eroded the landscape and redistributed and buried artifacts. The northern boundary of the site was extended north, west, and east during the current site visit. The artifact assemblage at LA 86207 is estimated to be more than 500 artifacts on the surface. During the current visit, a representative artifact sample was recorded, and 13 shovel tests were excavated throughout the site. The site has been previously determined eligible for the NRHP under Criterion D. SWCA concurs with this determination of eligibility; however, SWCA suggests that the portion within the project's APE likely does not retain any subsurface materials based on testing and impacts from natural and human-made erosion. SWCA recommends a cultural monitor be present during clean-up of the spill.

**Update**: Per consultation with the BLM CFO in May 2023 soil samples were conducted by client with an archaeologist present to monitor any ground disturbing activities at or within 100 feet of the site. After review of the soil sample levels from the spill it was determined by the BLM CFO between May 9–11 that it would be less of a significant impact to the site to leave the spill in place than to undergo the cleanup process.

**Table 5-1. Site Summary, Eligibility, and Mitigation Recommendations**

| Site Number | Site Type/Cultural Affiliation and Dates | NRHP Eligibility Recommendation/Criterion | Recommended Mitigation |
|---|---|---|---|
| LA 86207 | Mogollon (Jornada)/Mixed Ancestral Puebloan and Mogollon, Late Pit house (A.D. 750–1100) to Early Pueblo (A.D. 1100–1200) | Eligible, D | Avoidance of the site. |

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# APPENDIX C

## Referenced Well Records

HRL COMPLIANCE SOLUTIONS

**BORING LOG/MONITORING WELL COMPLETION DIAGRAM**

| | | | |
|---|---|---|---|
| Boring/Well Number: MW-1 | | Location: Ross Draw Unit #55 | |
| Date: 12/9/2020 | | Client: WPX Energy | |
| Drilling Method: Air Rotary | Sampling Method: None | Logged By: J. Linn, PG | Drilled By: Talon LPE |
| Gravel Pack Type: 10/20 Sand | Gravel Pack Depth Interval: 3 Bags | Seal Type: None / Seal Depth Interval: None | Latitude: 32.016165 |
| Casing Type: PVC / Diameter: 2-inch / Depth Interval: 0-101'7" | | Boring Total Depth (ft. BGS): 106'7" | Longitude: -103.86346 |
| Screen Type: PVC / Slot: 0.010-inch / Diameter: 2-inch / Depth Interval: 101'7" - 106'7" | | Well Total Depth (ft. BGS): 106'7" | Depth to Water (ft. BTOC): >106' 7" / DTW Date: 12/16/2020 |

| Depth Interval (ft) | Recovery (ft) | Plasticity | Moisture | Odor | Staining | PID (ppm) | USCS | Sample ID | Lithology/Remarks | Well Completion |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | NM | L | D | N | N | NM | SP | NS | Pale pink to buff colored poorly graded sand with minor silt | |
| 5 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | NM | L | D | N | N | NM | SW | NS | Pale tan orange well graded fine sand with minor medium and coarse sand | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |
| 35 | NM | L | D | N | N | NM | SP | NS | Pale orange brown poorly graded fine sand with minor gravel | |
| 40 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| 55 | | | | | | | | | | |
| 60 | | | | | | | | | | |
| 65 | NM | L | D | N | N | NM | SP | NS | Grey poorly graded fine sand with minor gravel | |
| 70 | | | | | | | | | | |
| 75 | | | | | | | | | | |
| 80 | | | | | | | | | | |
| 85 | | | | | | | | | | |
| 90 | NM | L | D | N | N | NM | SP | NS | Darker grey poorly graded fine sand with minor silt and minor medium sand | |
| 95 | | | | | | | | | | |
| 100 | NM | M | D | N | N | NM | SC | NS | Dark grey fine sand with moderate silt and clay - TD 106'7" | |
| 106'7" | | | | | | | | | | |

HRL COMPLIANCE SOLUTIONS

**BORING LOG/MONITORING WELL COMPLETION DIAGRAM**

| | | | |
|---|---|---|---|
| Boring/Well Number: MW-1 | | Location: Ross Draw Unit #57 | |
| Date: 12/9/2020 | | Client: WPX Energy | |
| Drilling Method: Air Rotary | Sampling Method: None | Logged By: J. Linn, PG | Drilled By: Talon LPE |
| Gravel Pack Type: 10/20 Sand | Gravel Pack Depth Interval: 3 Bags | Seal Type: None / Seal Depth Interval: None | Latitude: 32.01032 |
| Casing Type: PVC / Diameter: 2-inch / Depth Interval: 0-105 feet bgs | | Boring Total Depth (ft. BGS): 110 | Longitude: -103.87246 |
| Screen Type: PVC / Slot: 0.010-inch / Diameter: 2-inch / Depth Interval: 105-110 ft | | Well Total Depth (ft. BGS): 110 | Depth to Water (ft. BTOC): > 110 / DTW Date: 12/16/2020 |

| Depth Interval (ft) | Recovery (ft) | Plasticity | Moisture | Odor | Staining | PID (ppm) | USCS | Sample ID | Lithology/Remarks | Well Completion |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | NM | L/M | D | N | N | NM | SM | NS | Tan/pale orange/pale brown poorly graded fine sand | |
| 5 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 40 | NM | M | D | N | N | NM | SW | NS | Hard, dry pale pink orange well graded sand with gravel | |
| 45 | | | | | | | | | | |
| 50 | NM | M | D | N | N | NM | SM | NS | Pale orange red tan silty fine sand | |
| 55 | | | | | | | | | | |
| 60 | NM | L | D | N | N | NM | SW | NS | Dark brown greyish well graded sand | |
| 65 | | | | | | | | | | |
| 70 | NM | L/M | D to SL M | N | N | NM | SW | NS | Grey well graded sand | |
| 75 | | | | | | | | | | |
| 80 | | | | | | | | | | |
| 85 | | | | | | | | | | |
| 90 | | | | | | | | | | |
| 95 | | | | | | | | | | |
| 100 | NM | L/M | D | N | N | NM | SM | NS | Tan/pale orange/pale brown poorly graded fine sand - TD 110' bgs | |
| 105 | | | | | | | | | | |

HRL COMPLIANCE SOLUTIONS

**BORING LOG/MONITORING WELL COMPLETION DIAGRAM**

| | | | |
|---|---|---|---|
| Boring/Well Number: MW-1 | | Location: RDX Federal Com 21-43 | |
| Date: 12/9/2020 | | Client: WPX Energy | |
| Drilling Method: Air Rotary | Sampling Method: None | Logged By: J. Linn, P.G. | Drilled By: Talon LPE |
| Gravel Pack Type: 10/20 Sand | Gravel Pack Depth Interval: 3 Bags | Seal Type: None / Seal Depth Interval: None | Latitude: 32.022571 |
| Casing Type: PVC / Diameter: 2-inch / Depth Interval: 0-100 feet bgs | | Boring Total Depth (ft. BGS): 110 | Longitude: -103.884371 |
| Screen Type: PVC / Slot: 0.010-inch / Diameter: 2-inch / Depth Interval: 100 - 105 ft | | Well Total Depth (ft. BGS): 105 | Depth to Water (ft. BTOC): > 105 / DTW Date: 12/16/2020 |

| Depth Interval (ft) | Recovery (ft) | Plasticity | Moisture | Odor | Staining | PID (ppm) | USCS | Sample ID | Lithology/Remarks | Well Completion |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | NM | L | D | N | N | NM | SP | NS | Pale orange to tan poorly graded fine sand | |
| 5 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | NM | H | D | N | N | NM | CL | NS | Pale orange/tan/pale red clay, dry, with silt, fine sand, and minor caliche | |
| 25 | NM | L | D | N | N | NM | SP | NS | Pale orange to pale red poorly graded fine sand | |
| 30 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 40 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 50 | NM | L | D | N | N | NM | SP | NS | Golden yellow poorly graded fine sand with minor silt and clay | |
| 55 | | | | | | | | | | |
| 60 | | | | | | | | | | |
| 65 | NM | L | D | N | N | NM | SP | NS | Pale orange to pale red poorly graded fine sand with minor silt/clay | |
| 70 | | | | | | | | | | |
| 75 | | | | | | | | | | |
| 80 | NM | M | D | N | N | NM | SC | NS | Buff to orange color fine sand with medium sand and clay | |
| 85 | | | | | | | | | | |
| 90 | | | | | | | | | | |
| 95 | NM | H | D | N | N | NM | CL | NS | Brown orange clay with silt and fine sand | |
| 100 | NM | H | D | N | N | NM | SC | NS | Golden yellow and buff colored clay with fine sand - TD Boring: 110' BGS; Sand 110' - 105' BGS | |
| 105 | | | | | | | | | | |

HRL COMPLIANCE SOLUTIONS

**BORING LOG/MONITORING WELL COMPLETION DIAGRAM**

| | | | |
|---|---|---|---|
| Boring/Well Number: MW-1 | | Location: Ross Draw Unit #38 | |
| Date: 12/8/2020 | | Client: WPX Energy | |
| Drilling Method: Air Rotary | Sampling Method: None | Logged By: J. Linn, PG | Drilled By: Talon LPE |
| Gravel Pack Type: 10/20 Sand | Gravel Pack Depth Interval: 3 Bags | Seal Type: None / Seal Depth Interval: None | Latitude: 32.030300 |
| Casing Type: PVC / Diameter: 2-inch / Depth Interval: 0-100 feet bgs | | Boring Total Depth (ft. BGS): 105 | Longitude: -103.871338 |
| Screen Type: PVC / Slot: 0.010-inch / Diameter: 2-inch / Depth Interval: 100-105 ft | | Well Total Depth (ft. BGS): 105 | Depth to Water (ft. BTOC): > 105 / DTW Date: 12/16/2020 |

| Depth Interval (ft) | Recovery (ft) | Plasticity | Moisture | Odor | Staining | PID (ppm) | USCS | Sample ID | Lithology/Remarks | Well Completion |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | NM | L | D | N | N | NM | SW | NS | Pale orange/pale pink to buff colored fine sand with minor medium and coarse sand | |
| 5 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | NM | L | D | N | N | NM | SP | NS | Pale orange/pale pink poorly graded fine sand | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |
| 35 | NM | L | D | N | N | NM | SP | NS | Tan/pale brown/pale orange poorly graded fine sand | |
| 40 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| 55 | | | | | | | | | | |
| 60 | | | | | | | | | | |
| 65 | | | | | | | | | | |
| 70 | NM | L | D | N | N | NM | SP | NS | Brick red brown poorly graded fine sand | |
| 75 | | | | | | | | | | |
| 80 | | | | | | | | | | |
| 85 | | | | | | | | | | |
| 90 | | | | | | | | | | |
| 95 | | | | | | | | | | |
| 100 | NM | L | D | N | N | NM | SP | NS | Tan/pale brown/pale orange poorly graded fine sand - TD 105' BGS | |

# APPENDIX D

# BLM Correspondence

## Joseph Hernandez

**From:** Raley, Jim <Jim.Raley@dvn.com>
**Sent:** Thursday, May 11, 2023 3:30 PM
**To:** Arias, Arthur A
**Cc:** Joseph Hernandez; Anna Byers; Gilbert Moreno; Courtney Blair
**Subject:** RE: [EXTERNAL] RDU 54 - Request to not excavate

Arthur,
Thank you. We will submit closure request to NMOCD for this incident and attach this email chain to demonstrate BLM position on this matter. Will let you know if we have any issues.

Jim Raley | Environmental Professional - Permian Basin
5315 Buena Vista Dr., Carlsbad, NM 88220
C: (575)689-7597 | jim.raley@dvn.com

devon

---

**From:** Arias, Arthur A <aaarias@blm.gov>
**Sent:** Thursday, May 11, 2023 2:24 PM
**To:** Raley, Jim <Jim.Raley@dvn.com>
**Cc:** Joseph Hernandez <joseph@etechenv.com>; Anna Byers <anna@etechenv.com>; Gilbert Moreno <gilbert@etechenv.com>; Courtney Blair <CBlair@swca.com>
**Subject:** Re: [EXTERNAL] RDU 54 - Request to not excavate

Thanks Jim and all, we are in agreement of no further work being done on this spill due to concerns from our Archeologist in the Carlsbad Office,
No further information is needed at this point. These emails will provide all information we need for closure.

Thanks all.

---

**From:** Raley, Jim <Jim.Raley@dvn.com>
**Sent:** Thursday, May 11, 2023 10:37 AM
**To:** Arias, Arthur A <aaarias@blm.gov>
**Cc:** Joseph Hernandez <joseph@etechenv.com>; Anna Byers <anna@etechenv.com>; Gilbert Moreno <gilbert@etechenv.com>; Courtney Blair <CBlair@swca.com>
**Subject:** [EXTERNAL] RDU 54 - Request to not excavate

**This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.**

Art,

I wanted to circle back about the RDU 54 well pad. I guess Aaron spoke to you about it (see below email chain) and showed you some older soil sampling data we had for the site. Due to the cultural sensitivity of the area, he wanted to move towards proposing closure of the incident with no excavation. We agree with Aarons request and see no reason to excavate the area, there is no vegetative stress, no danger of impacting groundwater and no sensitive receptors (drainage, karst, etc.)

The incident was reported to NMOCD in 2017 and assigned incident NAB1722953239. You can view documents and details at the below link.
https://wwwapps.emnrd.nm.gov/OCD/OCDPermitting/Data/Incidents/IncidentDetails.aspx?id=nAB1722953239

We would be more than happy to provide any additional details or sampling if needed. But if you require nothing more, we will send in a closure request to NMOCD citing BLM request to not excavate this area, due to culturally significance and no threat to health and safety.

Jim Raley | Environmental Professional - Permian Basin
5315 Buena Vista Dr., Carlsbad, NM 88220
C: (575)689-7597 | jim.raley@dvn.com

devon

---

**From:** Joseph Hernandez <joseph@etechenv.com>
**Sent:** Wednesday, May 10, 2023 10:36 AM
**To:** Raley, Jim <Jim.Raley@dvn.com>
**Cc:** Anna Byers <anna@etechenv.com>
**Subject:** [EXTERNAL] FW: RDU 54

Jim,

You can probably just forward this email to Art and provide the incident number so he can verify it was reported to OCD (nAB1722953239)

Let me know if you need anything from us at this time or need more info for Art if he requests it.

**Joseph S. Hernandez**
Senior Managing Geologist
eTECH Environmental & Safety Solutions, Inc.
Work: (432) 305-6413
Cell: (281) 702-2329

---

**From:** Courtney Blair <CBlair@swca.com>
**Sent:** Wednesday, May 10, 2023 11:32 AM
**To:** Raley, Jim <Jim.Raley@dvn.com>; Joseph Hernandez <joseph@etechenv.com>; Anna Byers <anna@etechenv.com>
**Subject:** FW: RDU 54

Good morning all,

The levels are good with the RDU 54 area, but Aaron suggests that Jim reach out to Art directly to confirm this spill has been reported and no other information is needed. See Aaron's email below for Art's contact email. If everything is

squared away then Aaron will accept the cultural report and the spill will be left as is to avoid additional impact to the cultural site.

Let me know if you have any questions. This is just for the RDU 54 spill.

**Courtney Blair**
Cultural Specialist

**SWCA Environmental Consultants**
P: 505.254.1115 C: 617.435.2083
Cblair@swca.com

---

**From:** Whaley, Aaron W <awhaley@blm.gov>
**Sent:** Tuesday, May 9, 2023 4:39 PM
**To:** Courtney Blair <CBlair@swca.com>
**Subject:** RDU 54

Hey Courtney,

Have Jim reach out to Art (aaarias@blm.gov) to confirm the spill has been reported and that Art does not need any more information and then we can move forward with the formal decision on leaving it as is based on the significant impact to cultural it would have to clean it.

Best,

Aaorn

---

Aaron Whaley

Supervisory Archaeologist

Carlsbad Field Office

Bureau of Land Management

575 725 1623 (c)

575-234-5986 (o)

Confidentiality Warning: This message and any attachments are intended only for the use of the intended recipient(s), are confidential, and may be privileged. If you are not the intended recipient, you are hereby notified that any review,

retransmission, conversion to hard copy, copying, circulation or other use of all or any portion of this message and any attachments is strictly prohibited. If you are not the intended recipient, please notify the sender immediately by return e-mail, and delete this message and any attachments from your system.

# APPENDIX E

# Approved Remediation Work Plan

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

NM OIL CONSERVATION
ARTESIA DISTRICT
AUG 16 2017
RECEIVED

Form C-141
Revised August 8, 2011

Submit 1 copy to appropriate District Office in accordance with 19.15.29 NMAC.

# Release Notification and Corrective Action

nAB1722953239

## OPERATOR

☒ Initial Report ☐ Final Report

| | |
|---|---|
| Name of Company WPX Energy Inc/RKI 246289 | Contact Karolina Blaney |
| Address 5315 Buena Vista Dr. | Telephone No. 970 589 0743 |
| Facility Name: RDU 54 tank battery | Facility Type: Well Pad |

| | | |
|---|---|---|
| Surface Owner: Federal | Mineral Owner: Federal | API No. 30- 015-41975 |

## LOCATION OF RELEASE

| Unit Letter | Section | Township | Range | Feet from the | North/South Line | Feet from the | East/West Line | County |
|---|---|---|---|---|---|---|---|---|
| C | 27 | 26S | 30E | 778 | FNL | 1448 | FWL | Eddy |

**Latitude:** 32.018376N **Longitude:** -103.872455W

## NATURE OF RELEASE

| | | |
|---|---|---|
| Type of Release. Produced Water | Volume of Release: 15 Bbls | Volume Recovered: 3 Bbls |
| Source of Release<br>Flowline | Date and Hour of Occurrence<br>8/1/2017 | Date and Hour of Discovery<br>8/1/2017 - 1400 hrs MT |
| Was Immediate Notice Given?<br>☐ Yes ☐ No ☒ Not Required | If YES, To Whom?<br>NMOCD Crystal Weaver & Michael Bratcher, BLM Shelly Tucker | |
| By Whom? Karolina Blaney | Date and Hour: 8/2/17– 7:30 hrs MT | |
| Was a Watercourse Reached?<br>☐ Yes ☒ No | If YES, Volume Impacting the Watercourse.<br>N/A | |

If a Watercourse was Impacted, Describe Fully.* N/A

Describe Cause of Problem and Remedial Action Taken.*

The cause of this spill is equipment failure. The Section 5 injection facility went down and there is no automatic shut in system in place that would trigger the transfer pumps from individual facility to shut down. The water transfer line from the RDU 54 tank battery got over pressured and ruptured a hole on the side of the line (southwest of the tank battery location). Approximately 15 bbls of produced water migrated for about 70 yards into the pasture.

Describe Area Affected and Cleanup Action Taken.*

The impacted area was immediately mapped with a Trimble to establish horizontal extent of impacts. The impacted area was sampled for BTEX, TPH, and chlorides in accordance with NM OCD Guidelines for Remediation of Leaks, Spills, and Releases. Further remediation will be based on these results.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD 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 NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD 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: Karolina Blaney

Printed Name: Karolina Blaney

Title: Environmental Specialist

E-mail Address: Karolina.blaney@wpxenergy.com

Date: 8-16-17 Phone: 970-589-0743

## OIL CONSERVATION DIVISION

Approved by Environmental Specialist: Signed By

Approval Date: 8/17/17 Expiration Date: N/A

Conditions of Approval: See attached

Attached ☐ 2RP-4349

* Attach Additional Sheets If Necessary

www.emnrd.state.nm.us
Current forms are available on our website and should be used when filing regulatory documents.

State of New Mexico
Oil Conservation Division

| | |
|---|---|
| Incident ID | NAB1722953239 |
| District RP | |
| Facility ID | |
| Application ID | |

# Site Assessment/Characterization

*This information must be provided to the appropriate district office no later than 90 days after the release discovery date.*

| | |
|---|---|
| What is the shallowest depth to groundwater beneath the area affected by the release? | >110 (ft bgs) |
| Did this release impact groundwater or surface water? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 1000 feet of any other fresh water well or spring? | ☐ Yes ☒ No |
| Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field? | ☐ Yes ☒ No |
| Are the lateral extents of the release within 300 feet of a wetland? | ☐ Yes ☒ No |
| Are the lateral extents of the release overlying a subsurface mine? | ☐ Yes ☒ No |
| Are the lateral extents of the release overlying an unstable area such as karst geology? | ☐ Yes ☒ No |
| Are the lateral extents of the release within a 100-year floodplain? | ☐ Yes ☒ No |
| Did the release impact areas **not** on an exploration, development, production, or storage site? | ☒ Yes ☐ No |

Attach a comprehensive report (electronic submittals in .pdf format are preferred) demonstrating the lateral and vertical extents of soil contamination associated with the release have been determined. Refer to 19.15.29.11 NMAC for specifics.

**Characterization Report Checklist**: ***Each of the following items must be included in the report.***

☒ Scaled site map showing impacted area, surface features, subsurface features, delineation points, and monitoring wells.
☒ Field data
☒ Data table of soil contaminant concentration data
☒ Depth to water determination
☒ Determination of water sources and significant watercourses within ½-mile of the lateral extents of the release
☒ Boring or excavation logs
☒ Photographs including date and GIS information
☒ Topographic/Aerial maps
☒ Laboratory data including chain of custody

If the site characterization report does not include completed efforts at remediation of the release, the report must include a proposed remediation plan. That plan must include the estimated volume of material to be remediated, the proposed remediation technique, proposed sampling plan and methods, anticipated timelines for beginning and completing the remediation. The closure criteria for a release are contained in Table 1 of 19.15.29.12 NMAC, however, use of the table is modified by site- and release-specific parameters.

Form C-141
Page 4

State of New Mexico
Oil Conservation Division

| | |
|---|---|
| Incident ID | NAB1722953239 |
| District RP | |
| Facility ID | |
| Application ID | |

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD 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 OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD 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.

Printed Name: Jim Raley Title: Environmental Professional

Signature: Jim Raley Date: 9/23/2021

email: jim.raley@dvn.com Telephone: 575-689-7597

**OCD Only**

Received by: _____ Date: _____

State of New Mexico
Oil Conservation Division

| | |
|---|---|
| Incident ID | NAB1722953239 |
| District RP | |
| Facility ID | |
| Application ID | |

# Remediation Plan

**Remediation Plan Checklist**: ***Each of the following items must be included in the plan.***

- ☑ Detailed description of proposed remediation technique
- ☑ Scaled sitemap with GPS coordinates showing delineation points
- ☑ Estimated volume of material to be remediated
- ☑ Closure criteria is to Table 1 specifications subject to 19.15.29.12(C)(4) NMAC
- ☑ Proposed schedule for remediation (note if remediation plan timeline is more than 90 days OCD approval is required)

**Deferral Requests Only**: ***Each of the following items must be confirmed as part of any request for deferral of remediation.***

- ☐ Contamination must be in areas immediately under or around production equipment where remediation could cause a major facility deconstruction.
- ☐ Extents of contamination must be fully delineated.
- ☐ Contamination does not cause an imminent risk to human health, the environment, or groundwater.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD 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 OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD 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.

Printed Name: Jim Raley  Title: Environmental Professional

Signature: Jim Raley  Date: 9/23/2021

email: jim.raley@dvn.com  Telephone: 575-689-7597

**OCD Only**

Received by: _____  Date: _____

☐ Approved  ☑ Approved with Attached Conditions of Approval  ☐ Denied  ☐ Deferral Approved

Signature: Brittany Hall  Date: 10/5/2022

1. Sample results at S1 and S2 are listed in inches on the lab report. The results are listed in feet on the table, maps, and in the body of the report. Additional delineation may be needed at these points due to discrepancies. Vertical delineation at S2 is incomplete as the sample collected at the terminal depth was above the reclamation standard for chloride (600 mg/kg).
2. Delineation will need to be completed south of S2 and east of spill outline in addition to the proposed soil sample depicted on the enclosed Figure 2.
3. Include a figure with the soil boring's (MW-1) location illustrated.

WSP USA
3300 North "A" Street
Building 1, Unit 222
Midland, Texas 79705
432.704.5178

June 8, 2021

District II
New Mexico Oil Conservation Division
811 South First Street
Artesia, New Mexico 88210

**RE: Remediation Work Plan**
**RDU 54 Tank Battery**
**Incident Number nAB1722953239 (2RP-4349)**
**Eddy County, New Mexico**

To Whom it May Concern:

WSP USA (WSP), on behalf of WPX Energy Permian, LLC. (WPX), presents the following Remediation Work Plan detailing site assessment, previous soil sampling activities and an excavation plan at the RDU 54 Tank Battery (Site), located in Unit C, Section 27 Township 26 South, Range 30 East, Eddy County, New Mexico, as depicted on Figure 1. Based on field observations, field screening activities, and laboratory analytical results from soil sampling activities, WPX is submitting this Remediation Work Plan, describing the site assessment and soil sampling that has occurred and proposing remediation activities.

**RELEASE BACKGROUND**

On August 1, 2017, the over-pressurization of a water transfer line caused the release of approximately 15 barrels (bbls) of produced water into the adjacent pasture. A vacuum truck was dispatched to the Site to recover free-standing fluid; approximately 3 bbls of fluids were recovered. WPX reported the release to the New Mexico Oil Conservation Division (NMOCD) on a Release Notification and Corrective Action Form C-141 (Form C-141) on August 16, 2017 and was subsequently assigned Incident Number nAB1722953239 and Remediation Permit (RP) Number 2RP-4349.

**SITE CHARACTERIZATION**

WSP characterized the Site according to Table 1, *Closure Criteria for Soils Impacted by a Release*, of Title 19, Chapter 15, Part 29, Section 12 (19.15.29.12) of the New Mexico Administrative Code (NMAC). Depth to groundwater at the Site is estimated to be greater than 100 feet below ground surface (bgs) based a soil boring drilled by WPX on December 9, 2020, located approximately ½ mile south of the Site. Using a truck mounted drill rig equipped with hollow stem auger, the soil boring was advanced to a total depth of 110 feet bgs. Groundwater was not observed within the soil boring after at least 72 hours. Following the observation period, the boring was properly

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plugged and abandoned. All wells used for depth to groundwater determination are depicted on Figure 1. The referenced well record is included as Attachment 1.

The closest continuously flowing or significant watercourse to the Site is an intermittent stream, located approximately 420 feet southeast of the Site. The Site is greater than 200 feet from a lakebed, sinkhole, or playa lake and greater than 300 feet from an occupied residence, school, hospital, institution, church, or wetland. The Site is greater than 1,000 feet to a freshwater well or spring and is not within a 100-year floodplain or overlying a subsurface mine. The Site is not underlain by unstable geology (medium potential karst designation area). Site receptors are identified on Figure 1.

**CLOSURE CRITERIA**

Based on the results of the Site Characterization, the following NMOCD Table 1 Closure Criteria (Closure Criteria) apply:

- Benzene: 10 milligrams per kilogram (mg/kg)
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX): 50 mg/kg
- Total petroleum hydrocarbons (TPH)-gasoline range organics (GRO) and TPH-diesel range organics (DRO): 1,000 mg/kg
- TPH: 2,500 mg/kg
- Chloride: 20,000 mg/kg

The reclamation requirement for removal of waste containing soil with chloride and TPH concentrations of 600 mg/kg and 100 mg/kg, respectively, applies to the top 4 feet of the pasture to be reclaimed following remediation, per NMAC 19.15.29.13.D (1).

**DELINEATION SOIL SAMPLING ACTIVITIES**

On August 15, 2017, WPX personnel visited the Site to evaluate the extent of impacts from the release event. The release extent was mapped using a handheld Global Positioning System (GPS) unit, which is depicted on Figure 2. Two potholes (S1 and S2) were advanced to 3 feet bgs within the release footprint. The location of the potholes was mapped using a GPS unit and is depicted on Figure 2. Based on the laboratory analytical report, four soil samples were collected from every 1-foot interval starting at ground surface from each pothole. All samples were submitted to ALS Environmental (ALS) in Holland, Michigan for analysis of BTEX following United States Environmental Protection Agency (EPA) Method 8260B; TPH-GRO, TPH-DRO, and TPH-oil range organics (ORO) following EPA Method 8015C/D; and chloride following (NEMI) Method A4500-CL E-97. To confirm the presence or absence of hydrocarbons, WPX requested the evaluation of hydrocarbon concentrations from the ground surface only. Based on laboratory analytical reports form initial delineation activities, remediation of impacted soils appeared warranted.

Released to Imaging: 8/28/2023 9:55:09 AM

Received by OCD: 8/18/2023 7:05:03 AM




On May 22, 2019, WSP personnel visited the Site for further evaluation of the release extent based on information provided on the Form C-141 and proceeded to advance four delineation boreholes (BH01 through BH04) within the mapped release extent. Delineation depths were driven by field screening soil samples for chloride utilizing Hach® chloride QuanTab® test strips. WSP collected two discrete soil samples per borehole; one at 2 feet bgs in accordance with the highest field screening concentration and the other at 4 feet bgs at the borehole terminus. The borehole locations were mapped utilizing a handheld GPS unit and are depicted on Figure 2.

The delineation soil samples were placed directly into pre-cleaned glass jars, labeled with the location, date, time, sampler name, method of analysis, and immediately placed on ice. The soil samples were transported at or below 4 degrees Celsius (°C) under strict chain-of-custody (COC) procedures to Eurofins Laboratories (Eurofins) in Carlsbad, New Mexico, for analysis of BTEX following EPA Method 8021B; TPH-GRO, TPH-DRO, and TPH-ORO following EPA Method 8015M/D; and chloride following EPA Method 300.0.

**LABORATORY ANALYTICAL RESULTS**

Laboratory analytical results indicated benzene, BTEX, TPH-GRO/TPH-DRO and TPH concentrations were compliant with the reclamation standard for potholes S1 and S2. Chloride concentrations exceeded the reclamation in the top four feet for potholes S1 and S2 but exhibited a trend of decreasing of chloride concentrations with depth. Benzene, BTEX, TPH-GRO/TPH-DRO, TPH and chloride concentrations for borehole samples BH01 through BH04 were below Closure reclamation standard and/or Site standards. The laboratory analytical results are summarized on the attached Table 1 and complete laboratory analytical reports are included in Attachment 4.

**VEGETATION ASSESSMENT**

On April 28, 2021, WSP personnel returned to the Site to assess soil and vegetation impacts within the release extent. Vegetation appeared to be unhindered by residual soil impacts and impacted area is supporting new growth. There was no evidence of surficial staining throughout the release extent.

**PROPOSED WORK PLAN**

Impacts within the release have been generally defined but additional sampling is required to further explore potential impacts within the release area northwest of BH02. WPX proposes advancing one borehole in the most northern area of the release on-pad to confirm the presence or absence of remaining impacts to soil. The proposed soil sample location is depicted on Figure 2. Based on laboratory analytical results for delineation boreholes BH01 through BH04, no additional remediation efforts are required in those areas within the pasture affected by the subject release.

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Remediation associated with the sample locations S1 and S2 will be achieved through excavation confirmation sampling to extents compliant with reclamation standards and Closure Criteria.

**CONCLUSION**

Following successful removal of residual impacts as demonstrated through laboratory analytical results, a Closure Request or Deferral Request if soil impacts associated with the proposed borehole cannot be safely removed due to the configuration of the Site, will be provided to the NMOCD.

If you have any questions or comments, please do not hesitate to contact Mr. Daniel R. Moir at (303) 887-2946.

Sincerely,

WSP USA Inc.

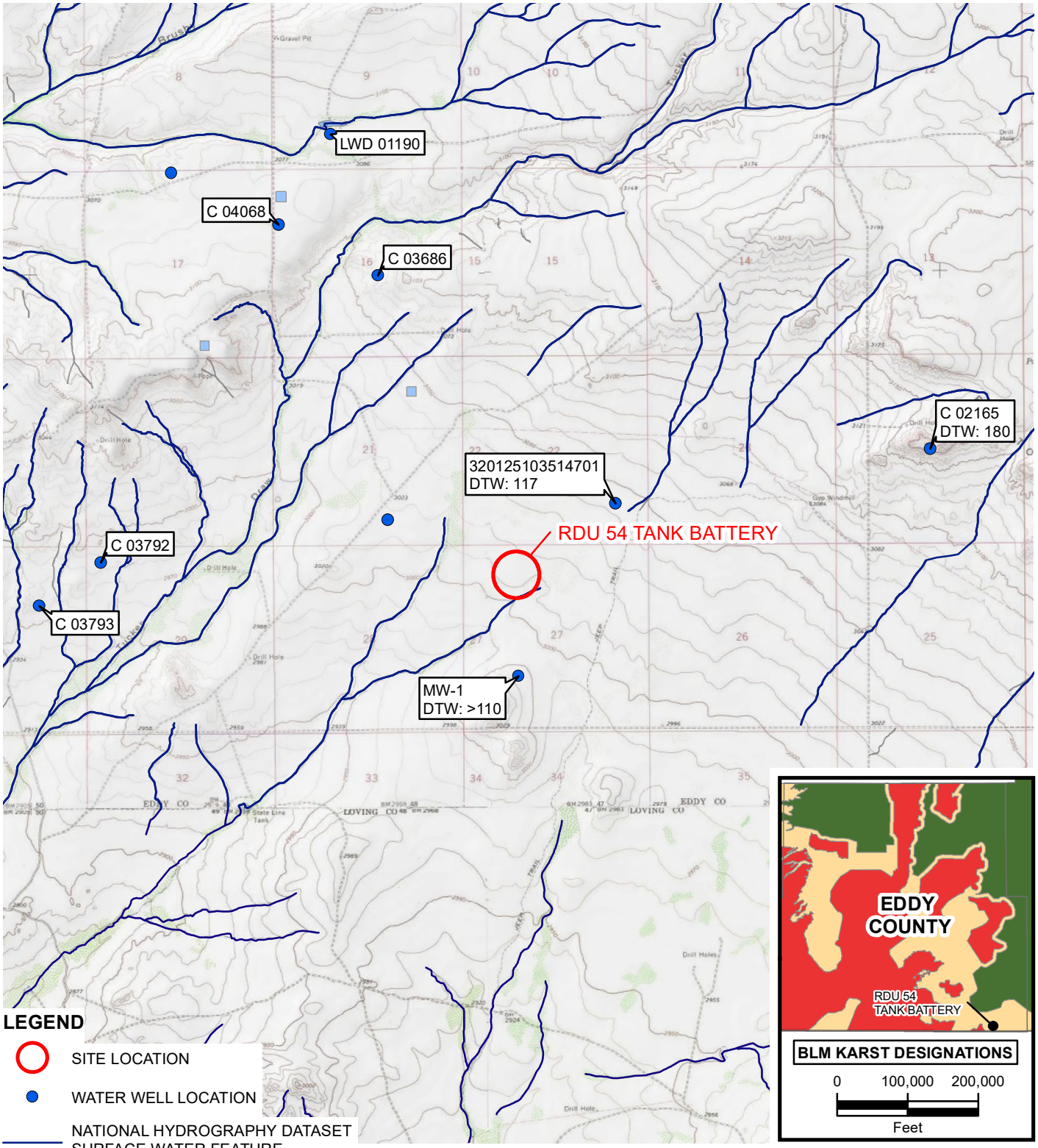
Anna Byers
Consultant, Geologist

Daniel R. Moir
Lead Consultant, Geologist

cc: Jim Raley, Devon
Bureau of Land Management

Attachments:

| | |
|---|---|
| Figure 1 | Site Location Map |
| Figure 2 | Delineation Soil Sample Locations |
| Table 1 | Soil Analytical Results |
| Attachment 1 | Referenced Well Record |
| Attachment 2 | Photographic Log |
| Attachment 3 | Lithologic/Soil Sampling Log |
| Attachment 4 | Laboratory Analytical Reports |



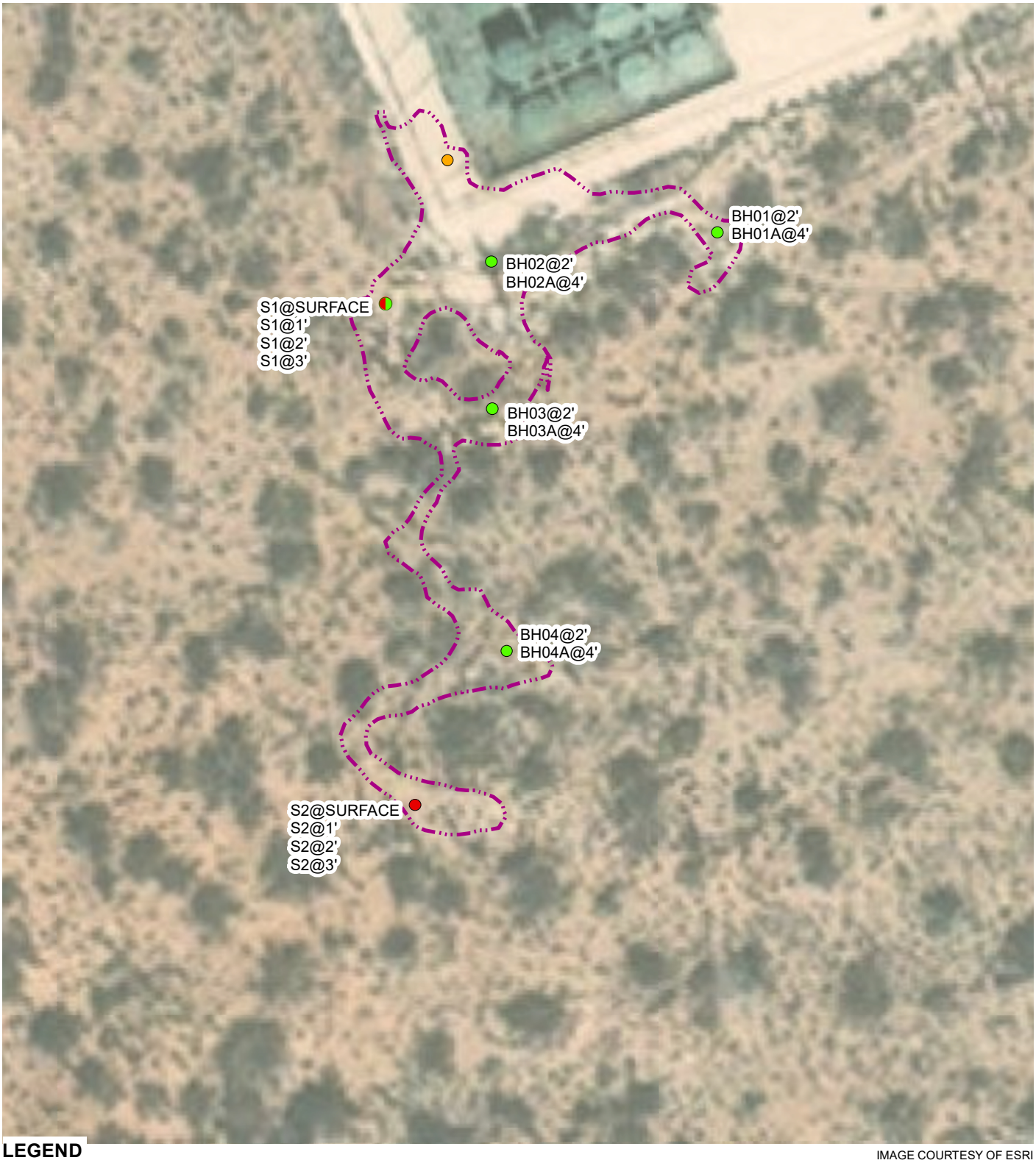

**LEGEND**

- SITE LOCATION
- WATER WELL LOCATION
- NATIONAL HYDROGRAPHY DATASET SURFACE WATER FEATURE
- NATIONAL WETLANDS INVENTORY SURFACE WATER FEATURE
- LOW KARST
- MEDIUM KARST
- HIGH KARST

DTW: DEPTH TO WATER IN FEET
BLM: BUREAU OF LAND MANAGEMENT
TD: TOTAL DEPTH IN FEET
NOTE: INCIDENT NUMBER NAB1722953239

FIGURE 1
SITE LOCATION MAP
RDU 54 TANK BATTERY
UNIT C SEC 22 T26S R30E
EDDY COUNTY, NEW MEXICO
**WPX ENERGY PERMIAN, LLC.**

P:\WPX-Devon\GIS\MXD\034821010_RDU 54\034821010_FIG01_SL_RECEPTOR_2021.mxd




**LEGEND**

- DELINEATION SOIL SAMPLE WITH CONCENTRATIONS EXCEEDING APPLICABLE CLOSURE CRITERIA
- DELINEATION SOIL SAMPLE WITH CONCENTRATIONS PREVIOUSLY EXCEEDING APPLICABLE CLOSURE CRITERIA
- PRELIMINARY SOIL SAMPLE IN COMPLIANCE WITH APPLICABLE STANDARDS
- PROPOSED SOIL SAMPLE
- RELEASE EXTENT (8,443 SQUARE FEET)

NOTE: REMEDIATION PERMIT NUMBER NAB1722953239
SAMPLE ID@DEPTH BELOW GROUND SURFACE (FEET)

IMAGE COURTESY OF ESRI

0 50 100
Feet

N

FIGURE 2
DELINEATION SOIL SAMPLE LOCATIONS
RDU 54 TANK BATTERY
UNIT C SEC 22 T26S R30E
EDDY COUNTY, NEW MEXICO
**WPX ENERGY PERMIAN, LLC.**

P:\WPX-Devon\GIS\MXD\034821010_RDU 54\034821010_FIG02_DELINEATION_2021.mxd

TABLES

**Table 1**

**Soil Analytical Results**
**RDU 54 Tank Battery**
**Incident Number nAB1722953239**
**WPX Energy Permian, LLC.**
**Eddy County, New Mexico**

| Sample ID | Sample Date | Sample Depth (ft bgs) | Benzene (mg/kg) | BTEX (mg/kg) | TPH-DRO (mg/kg) | TPH-GRO (mg/kg) | TPH-ORO (mg/kg) | Total GRO+DRO (mg/kg) | TPH (mg/kg) | Chloride (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **NMOCD Table 1 Closure Criteria (NMAC 19.15.29)** | | | **10** | **50** | **NE** | **NE** | **NE** | **1,000** | **2,500** | **20,000** |
| **Delineation Samples** | | | | | | | | | | |
| S1 | 08/15/2017 | 0 | <0.034 | <0.034 | 9.2 | <5.6 | 23 | 9.2 | 32.2 | 5,300* |
| S1 | 08/15/2017 | 1 | - | - | - | - | - | - | - | 20,000* |
| S1 | 08/15/2017 | 2 | - | - | - | - | - | - | - | 2,500* |
| S1 | 08/15/2017 | 3 | - | - | - | - | - | - | - | 330* |
| S2 | 08/15/2017 | 0 | <0.032 | <0.032 | 8.9 | <5.3 | 16 | 8.9 | 24.9 | 240 |
| S2 | 08/15/2017 | 1 | - | - | - | - | - | - | - | 14,000* |
| S2 | 08/15/2017 | 2 | - | - | - | - | - | - | - | 11,000* |
| S2 | 08/15/2017 | 3 | - | - | - | - | - | - | - | 1,400* |
| BH01 | 05/22/2019 | 2 | <0.00201 | <0.00201 | <15.0 | <15.0 | <15.0 | <15.0 | <15.0 | 25.1 |
| BH01A | 05/22/2019 | 4 | <0.00199 | <0.00199 | <15.0 | <15.0 | <15.0 | <15.0 | <15.0 | <49.6 |
| BH02 | 05/22/2019 | 2 | <0.00200 | <0.00200 | <15.0 | <15.0 | <15.0 | <15.0 | <15.0 | <5.02 |
| BH02A | 05/22/2019 | 4 | <0.00198 | <0.00198 | <15.0 | <15.0 | <15.0 | <15.0 | <15.0 | 183 |

**Table 1**

**Soil Analytical Results**
**RDU 54 Tank Battery**
**Incident Number nAB1722953239**
**WPX Energy Permian, LLC.**
**Eddy County, New Mexico**

| Sample ID | Sample Date | Sample Depth (ft bgs) | Benzene (mg/kg) | BTEX (mg/kg) | TPH-DRO (mg/kg) | TPH-GRO (mg/kg) | TPH-ORO (mg/kg) | Total GRO+DRO (mg/kg) | TPH (mg/kg) | Chloride (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **NMOCD Table 1 Closure Criteria (NMAC 19.15.29)** | | | **10** | **50** | **NE** | **NE** | **NE** | **1,000** | **2,500** | **20,000** |
| BH03 | 05/22/2019 | 2 | <0.00202 | <0.00202 | <15.0 | <15.0 | <15.0 | <15.0 | <15.0 | <4.99 |
| BH03A | 05/22/2019 | 4 | <0.00199 | <0.00199 | <15.0 | <15.0 | <15.0 | <15.0 | <15.0 | 5.37 |
| BH04 | 05/22/2019 | 2 | <0.00201 | <0.00201 | <15.0 | <15.0 | <15.0 | <15.0 | <15.0 | 7.82 |
| BH04A | 05/22/2019 | 4 | <0.00200 | <0.00200 | <15.0 | <15.0 | <15.0 | <15.0 | <15.0 | 2,950 |

**Notes**

ft - feet/foot
mg/kg - milligrams per kilograms
BTEX - benzene, toluene, ethylbenzene, and total xylenes
TPH - total petroleum hydrocarbons
DRO - diesel range organics
GRO - gasoline range organics
ORO - motor oil range organics
NMOCD - New Mexico Oil Conservation Division
NMAC - New Mexico Administrative Code
< - indicates result is less than the stated laboratory method practical quantitation limit
NE - Not Established
**BOLD -** indicates results exceed the higher of the background sample result or applicable regulatory standard
* - indicates sample was collected in area to be reclaimed after remediation is complete;
closure criteria for chloride concentration in the top 4 feet of soil is 600 mg/kg and 100 mg/kg for TPH

ATTACHMENT 1: REFERENCED WELL RECORD

HRL COMPLIANCE SOLUTIONS

**BORING LOG/MONITORING WELL COMPLETION DIAGRAM**

| | | | |
|---|---|---|---|
| Boring/Well Number: MW-1 | | Location: Ross Draw Unit #57 | |
| Date: 12/9/2020 | | Client: WPX Energy | |
| Drilling Method: Air Rotary | Sampling Method: None | Logged By: J. Linn, PG | Drilled By: Talon LPE |
| Gravel Pack Type: 10/20 Sand | Gravel Pack Depth Interval: 3 Bags | Seal Type: None / Seal Depth Interval: None | Latitude: 32.01032 |
| Casing Type: PVC / Diameter: 2-inch / Depth Interval: 0-105 feet bgs | | Boring Total Depth (ft. BGS): 110 | Longitude: -103.87246 |
| Screen Type: PVC / Slot: 0.010-inch / Diameter: 2-inch / Depth Interval: 105-110 ft | | Well Total Depth (ft. BGS): 110 | Depth to Water (ft. BTOC): > 110 / DTW Date: 12/16/2020 |

| Depth Interval (ft) | Recovery (ft) | Plasticity | Moisture | Odor | Staining | PID (ppm) | USCS | Sample ID | Lithology/Remarks | Well Completion |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | NM | L/M | D | N | N | NM | SM | NS | Tan/pale orange/pale brown poorly graded fine sand | |
| 5 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 40 | NM | M | D | N | N | NM | SW | NS | Hard, dry pale pink orange well graded sand with gravel | |
| 45 | | | | | | | | | | |
| 50 | NM | M | D | N | N | NM | SM | NS | Pale orange red tan silty fine sand | |
| 55 | | | | | | | | | | |
| 60 | NM | L | D | N | N | NM | SW | NS | Dark brown greyish well graded sand | |
| 65 | | | | | | | | | | |
| 70 | NM | L/M | D to SL M | N | N | NM | SW | NS | Grey well graded sand | |
| 75 | | | | | | | | | | |
| 80 | | | | | | | | | | |
| 85 | | | | | | | | | | |
| 90 | | | | | | | | | | |
| 95 | | | | | | | | | | |
| 100 | NM | L/M | D | N | N | NM | SM | NS | Tan/pale orange/pale brown poorly graded fine sand - TD 110' bgs | |
| 105 | | | | | | | | | | |

ATTACHMENT 2: PHOTOGRAPHIC LOG

| PHOTOGRAPHIC LOG | | |
|---|---|---|
| WPX Energy Permian, LLC. | RDU 54 Tank Battery<br>Eddy County, NM | TE034821010 |

| Photo No. | Date |
|---|---|
| 1 | August 1, 2017 |

Initial release within pasture facing northeast.

| Photo No. | Date |
|---|---|
| 2 | August 1, 2017 |

Initial release within pasture facing north

| PHOTOGRAPHIC LOG | | |
|---|---|---|
| WPX Energy Permian, LLC. | RDU 54 Tank Battery<br>Eddy County, NM | TE034821010 |

| Photo No. | Date |
|---|---|
| 3 | April 28, 2021 |

Vegetation Assessment viewing northeast.

| Photo No. | Date |
|---|---|
| 4 | April 28, 2021 |

Vegetation Assessment viewing northeast.

ATTACHMENT 3: LITHOLOGIC/SOIL SAMPLING LOG

WSP USA
508 West Stevens Street
Carlsbad, New Mexico 88220

| | |
|---|---|
| BH or PH Name: BH01 | Date: 05/22/2019 |
| Site Name: RDU 54 | |
| RP or Incident Number: 2RP-4349 | |
| WSP Job Number: TE034821010 | |
| Logged By: LL | Method: Hand auger |
| Lat/Long: 32.018277, -103.872926 | Field Screening: Hach chloride strips |
| Hole Diameter: 2.5 inches | Total Depth: 4 feet bgs |

**LITHOLOGIC / SOIL SAMPLING LOG**

Comments: All chloride field screenings include a 40% correction factor
M-moist; D-dry; Y-yes; N-no; NA-not applicable

| Moisture Content | Chloride (ppm) | Vapor (ppm) | Staining | Sample # | Sample Depth (ft bgs) | Depth (ft bgs) | USCS/Rock Symbol | Lithology/Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 0 | SP | SAND, moist, brown, poorly graded, fine-very fine grain, no stain, no odor |
| M | <192 | NA | N | BH01 | 2 | 2 | SP | color change change to light tan, slightly damp |
| M | <192 | NA | N | BH01A | 4 | 4 | SP | trace caliche gravel 1/8 inch diameter, poorly consolidated |

TD @ 4 feet bgs

| WSP USA<br>508 West Stevens Street<br>Carlsbad, New Mexico 88220 | BH or PH Name: BH02 | Date: 05/22/2019 |
|---|---|---|
| | Site Name: RDU 54 | |
| | RP or Incident Number: 2RP-4349 | |
| | WSP Job Number: TE034821010 | |
| **LITHOLOGIC / SOIL SAMPLING LOG** | Logged By: LL | Method: Hand auger |
| Lat/Long: 32.018236, -103.873159 | Field Screening:<br>Hach chloride strips | Hole Diameter: 2.5 inches | Total Depth: 4 feet bgs |

Comments: All chloride field screenings include a 40% correction factor
M-moist; D-dry; Y-yes; N-no; NA-not applicable

| Moisture Content | Chloride (ppm) | Vapor (ppm) | Staining | Sample # | Sample Depth (ft bgs) | Depth (ft bgs) | USCS/Rock Symbol | Lithology/Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 0 | SP | SAND, moist, brown, poorly graded, fine-very fine grain, no stain, no odor |
| D | <192 | NA | N | BH02 | 2 | 2 | SP | trace caliche gravel 0.5 - 1 inch diameter, poorly consolidated |
| D | <192 | NA | N | BH02A | 4 | 4 | SP | trace caliche gravel 1/8 inch diameter, poorly consolidated |

TD @ 4 feet bgs

WSP USA
508 West Stevens Street
Carlsbad, New Mexico 88220

| | |
|---|---|
| BH or PH Name: BH03 | Date: 05/22/2019 |
| Site Name: RDU 54 | |
| RP or Incident Number: 2RP-4349 | |
| WSP Job Number: TE034821010 | |

**LITHOLOGIC / SOIL SAMPLING LOG**

| | | | |
|---|---|---|---|
| Logged By: LL | Method: Hand auger | | |
| Lat/Long: 32.018106, -103.873181 | Field Screening: Hach chloride strips | Hole Diameter: 2.5 inches | Total Depth: 4 feet bgs |

Comments: All chloride field screenings include a 40% correction factor
M-moist; D-dry; Y-yes; N-no; SAA-same as above; NA-not applicable

| Moisture Content | Chloride (ppm) | Vapor (ppm) | Staining | Sample # | Sample Depth (ft bgs) | Depth (ft bgs) | USCS/Rock Symbol | Lithology/Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 0 | SP | SAND, moist, brown, poorly graded, fine-very fine grain, no stain, no odor |
| D | <192 | NA | N | BH03 | 2 | 2 | SP | SAA |
| D | <192 | NA | N | BH03A | 4 | 4 | SP | SAA |

TD @ 4 feet bgs

WSP USA

508 West Stevens Street
Carlsbad, New Mexico 88220

| | |
|---|---|
| BH or PH Name: BH04 | Date: 05/22/2019 |
| Site Name: RDU 54 | |
| RP or Incident Number: 2RP-4349 | |
| WSP Job Number: TE034821010 | |
| **LITHOLOGIC / SOIL SAMPLING LOG** | Logged By: LL / Method: Hand auger |
| Lat/Long: 32.017874, -103.873167 | Field Screening: Hach chloride strips / Hole Diameter: 2.5 inches / Total Depth: 4 feet bgs |

Comments: All chloride field screenings include a 40% correction factor
M-moist; D-dry; Y-yes; N-no; SAA-same as above; NA-not applicable

| Moisture Content | Chloride (ppm) | Vapor (ppm) | Staining | Sample # | Sample Depth (ft bgs) | Depth (ft bgs) | USCS/Rock Symbol | Lithology/Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 0 | SP | SAND, moist, brown, poorly graded, fine-very fine grain, no stain, no odor |
| D | <192 | NA | N | BH04 | 2 | 2 | SP | trace caliche gravel, off-white, poorly consolidated |
| D | <192 | NA | N | BH04A | 4 | 4 | SP | SAA |

TD @ 4 feet bgs

ATTACHMENT 4: LABORATORY ANALYTICAL RESULTS

25-Aug-2017

Karolina Blaney
WPX Energy
5315 Buena Vista Dr.
Carlsbad, NM 88220

Re: **RDU 54** Work Order: **17081042**

Dear Karolina,

ALS Environmental received 8 samples on 16-Aug-2017 09:00 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 20.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

Electronically approved by: Chad Whelton

Chad Whelton
Project Manager

Certificate No: MN 998501

**Report of Laboratory Analysis**

# ALS Group, USA

Date: 25-Aug-17

**Client:** WPX Energy
**Project:** RDU 54
**Work Order:** **17081042**

## Work Order Sample Summary

| Lab Samp ID | Client Sample ID | Matrix | Tag Number | Collection Date | Date Received | Hold |
|---|---|---|---|---|---|---|
| 17081042-01 | RDU 54 S1 0" | Soil | | 8/15/2017 12:00 | 8/16/2017 09:00 | ☐ |
| 17081042-02 | RDU 54 S1 1" | Soil | | 8/15/2017 12:05 | 8/16/2017 09:00 | ☐ |
| 17081042-03 | RDU 54 S1 2" | Soil | | 8/15/2017 12:10 | 8/16/2017 09:00 | ☐ |
| 17081042-04 | RDU 54 S1 3" | Soil | | 8/15/2017 12:20 | 8/16/2017 09:00 | ☐ |
| 17081042-05 | RDU 54 S2 0" | Soil | | 8/15/2017 12:30 | 8/16/2017 09:00 | ☐ |
| 17081042-06 | RDU 54 S2 1" | Soil | | 8/15/2017 12:35 | 8/16/2017 09:00 | ☐ |
| 17081042-07 | RDU 54 S2 2" | Soil | | 8/15/2017 12:40 | 8/16/2017 09:00 | ☐ |
| 17081042-08 | RDU 54 S2 3" | Soil | | 8/15/2017 12:45 | 8/16/2017 09:00 | ☐ |

# ALS Group, USA

Date: 25-Aug-17

**Client:** WPX Energy
**Project:** RDU 54
**WorkOrder:** **17081042**

## QUALIFIERS, ACRONYMS, UNITS

| Qualifier | Description |
|---|---|
| * | Value exceeds Regulatory Limit |
| ** | Estimated Value |
| a | Analyte is non-accredited |
| B | Analyte detected in the associated Method Blank above the Reporting Limit |
| E | Value above quantitation range |
| H | Analyzed outside of Holding Time |
| J | Analyte is present at an estimated concentration between the MDL and Report Limit |
| ND | Not Detected at the Reporting Limit |
| O | Sample amount is > 4 times amount spiked |
| P | Dual Column results percent difference > 40% |
| R | RPD above laboratory control limit |
| S | Spike Recovery outside laboratory control limits |
| U | Analyzed but not detected above the MDL |
| X | Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit background or reagent contamination at the observed level. |

| Acronym | Description |
|---|---|
| DUP | Method Duplicate |
| LCS | Laboratory Control Sample |
| LCSD | Laboratory Control Sample Duplicate |
| LOD | Limit of Detection (see MDL) |
| LOQ | Limit of Quantitation (see PQL) |
| MBLK | Method Blank |
| MDL | Method Detection Limit |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| PQL | Practical Quantitation Limit |
| RPD | Relative Percent Difference |
| TDL | Target Detection Limit |
| TNTC | Too Numerous To Count |
| A | APHA Standard Methods |
| D | ASTM |
| E | EPA |
| SW | SW-846 Update III |

| Units Reported | Description |
|---|---|
| % of sample | Percent of Sample |
| mg/Kg-dry | Milligrams per Kilogram Dry Weight |

# ALS Group, USA

**Date:** *25-Aug-17*

**Client:** WPX Energy
**Project:** RDU 54 **Work Order:** 17081042
**Sample ID:** RDU 54 S1 0" **Lab ID:** 17081042-01
**Collection Date:** 8/15/2017 12:00 PM **Matrix:** SOIL

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **DIESEL RANGE ORGANICS BY GC-FID** | | | **SW8015C** | Prep: SW3546 8/17/17 10:27 | | Analyst: **KB** |
| **DRO (C10-C28)** | **9.2** | | **5.1** | **mg/Kg-dry** | 1 | 8/17/2017 05:21 PM |
| **ORO (C28-C40)** | **23** | | **5.1** | **mg/Kg-dry** | 1 | 8/17/2017 05:21 PM |
| *Surr: 4-Terphenyl-d14* | *93.6* | | *34-130* | *%REC* | 1 | 8/17/2017 05:21 PM |
| **GASOLINE RANGE ORGANICS BY GC-FID** | | | **SW8015D** | Prep: SW5035 8/17/17 09:43 | | Analyst: **KB** |
| GRO (C6-C10) | ND | | 5.6 | mg/Kg-dry | 1 | 8/17/2017 06:40 PM |
| *Surr: Toluene-d8* | *97.6* | | *71-123* | *%REC* | 1 | 8/17/2017 06:40 PM |
| **VOLATILE ORGANIC COMPOUNDS** | | | **SW8260B** | Prep: SW5035 8/17/17 12:12 | | Analyst: **EMR** |
| Benzene | ND | | 0.034 | mg/Kg-dry | 1 | 8/20/2017 03:50 PM |
| Ethylbenzene | ND | | 0.034 | mg/Kg-dry | 1 | 8/20/2017 03:50 PM |
| m,p-Xylene | ND | | 0.068 | mg/Kg-dry | 1 | 8/20/2017 03:50 PM |
| o-Xylene | ND | | 0.034 | mg/Kg-dry | 1 | 8/20/2017 03:50 PM |
| Toluene | ND | | 0.034 | mg/Kg-dry | 1 | 8/20/2017 03:50 PM |
| Xylenes, Total | ND | | 0.10 | mg/Kg-dry | 1 | 8/20/2017 03:50 PM |
| *Surr: 1,2-Dichloroethane-d4* | *97.8* | | *70-130* | *%REC* | 1 | 8/20/2017 03:50 PM |
| *Surr: 4-Bromofluorobenzene* | *101* | | *70-130* | *%REC* | 1 | 8/20/2017 03:50 PM |
| *Surr: Dibromofluoromethane* | *85.8* | | *70-130* | *%REC* | 1 | 8/20/2017 03:50 PM |
| *Surr: Toluene-d8* | *96.8* | | *70-130* | *%REC* | 1 | 8/20/2017 03:50 PM |
| **CHLORIDE** | | | **A4500-CL E-97** | Prep: EXTRACT 8/23/17 23:30 | | Analyst: **ED** |
| **Chloride** | **5,300** | | **110** | **mg/Kg-dry** | 10 | 8/24/2017 02:00 PM |
| **MOISTURE** | | | **SW3550C** | | | Analyst: **BTG** |
| **Moisture** | **6.0** | | **0.050** | **% of sample** | 1 | 8/20/2017 06:45 PM |

**Note:** See Qualifiers page for a list of qualifiers and their definitions.

## ALS Group, USA

**Date:** *25-Aug-17*

**Client:** WPX Energy
**Project:** RDU 54
**Sample ID:** RDU 54 S1 1"
**Collection Date:** 8/15/2017 12:05 PM

**Work Order:** 17081042
**Lab ID:** 17081042-02
**Matrix:** SOIL

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **CHLORIDE** | | | **A4500-CL E-97** | Prep: EXTRACT 8/23/17 23:30 | | Analyst: **ED** |
| **Chloride** | **20,000** | | **330** | **mg/Kg-dry** | 30 | 8/24/2017 02:00 PM |
| **MOISTURE** | | | **SW3550C** | | | Analyst: **BTG** |
| **Moisture** | **11** | | **0.050** | **% of sample** | 1 | 8/20/2017 06:45 PM |

**Note:** See Qualifiers page for a list of qualifiers and their definitions.

## ALS Group, USA

**Date:** *25-Aug-17*

**Client:** WPX Energy
**Project:** RDU 54
**Sample ID:** RDU 54 S1 2"
**Collection Date:** 8/15/2017 12:10 PM

**Work Order:** 17081042
**Lab ID:** 17081042-03
**Matrix:** SOIL

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **CHLORIDE** | | | **A4500-CL E-97** | Prep: EXTRACT 8/23/17 23:30 | | Analyst: **ED** |
| **Chloride** | **2,500** | | **51** | **mg/Kg-dry** | 4 | 8/24/2017 02:00 PM |
| **MOISTURE** | | | **SW3550C** | | | Analyst: **BTG** |
| **Moisture** | **22** | | **0.050** | **% of sample** | 1 | 8/20/2017 06:45 PM |

**Note:** See Qualifiers page for a list of qualifiers and their definitions.

## ALS Group, USA

**Date:** *25-Aug-17*

**Client:** WPX Energy
**Project:** RDU 54
**Sample ID:** RDU 54 S1 3"
**Collection Date:** 8/15/2017 12:20 PM

**Work Order:** 17081042
**Lab ID:** 17081042-04
**Matrix:** SOIL

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **CHLORIDE** | | | **A4500-CL E-97** | Prep: EXTRACT 8/23/17 23:30 | | Analyst: **ED** |
| **Chloride** | **330** | | **13** | **mg/Kg-dry** | 1 | 8/24/2017 02:00 PM |
| **MOISTURE** | | | **SW3550C** | | | Analyst: **BTG** |
| **Moisture** | **24** | | **0.050** | **% of sample** | 1 | 8/20/2017 06:45 PM |

**Note:** See Qualifiers page for a list of qualifiers and their definitions.

# ALS Group, USA

**Date:** *25-Aug-17*

**Client:** WPX Energy
**Project:** RDU 54
**Sample ID:** RDU 54 S2 0"
**Collection Date:** 8/15/2017 12:30 PM

**Work Order:** 17081042
**Lab ID:** 17081042-05
**Matrix:** SOIL

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **DIESEL RANGE ORGANICS BY GC-FID** | | | **SW8015C** | Prep: SW3546 8/17/17 10:27 | | Analyst: **KB** |
| **DRO (C10-C28)** | **8.9** | | **5.1** | **mg/Kg-dry** | 1 | 8/17/2017 05:50 PM |
| **ORO (C28-C40)** | **16** | | **5.1** | **mg/Kg-dry** | 1 | 8/17/2017 05:50 PM |
| *Surr: 4-Terphenyl-d14* | *91.1* | | *34-130* | *%REC* | 1 | 8/17/2017 05:50 PM |
| **GASOLINE RANGE ORGANICS BY GC-FID** | | | **SW8015D** | Prep: SW5035 8/17/17 09:43 | | Analyst: **KB** |
| GRO (C6-C10) | ND | | 5.3 | mg/Kg-dry | 1 | 8/17/2017 07:10 PM |
| *Surr: Toluene-d8* | *99.3* | | *71-123* | *%REC* | 1 | 8/17/2017 07:10 PM |
| **VOLATILE ORGANIC COMPOUNDS** | | | **SW8260B** | Prep: SW5035 8/17/17 12:12 | | Analyst: **EMR** |
| Benzene | ND | | 0.032 | mg/Kg-dry | 1 | 8/20/2017 04:13 PM |
| Ethylbenzene | ND | | 0.032 | mg/Kg-dry | 1 | 8/20/2017 04:13 PM |
| m,p-Xylene | ND | | 0.064 | mg/Kg-dry | 1 | 8/20/2017 04:13 PM |
| o-Xylene | ND | | 0.032 | mg/Kg-dry | 1 | 8/20/2017 04:13 PM |
| Toluene | ND | | 0.032 | mg/Kg-dry | 1 | 8/20/2017 04:13 PM |
| Xylenes, Total | ND | | 0.096 | mg/Kg-dry | 1 | 8/20/2017 04:13 PM |
| *Surr: 1,2-Dichloroethane-d4* | *99.2* | | *70-130* | *%REC* | 1 | 8/20/2017 04:13 PM |
| *Surr: 4-Bromofluorobenzene* | *102* | | *70-130* | *%REC* | 1 | 8/20/2017 04:13 PM |
| *Surr: Dibromofluoromethane* | *87.0* | | *70-130* | *%REC* | 1 | 8/20/2017 04:13 PM |
| *Surr: Toluene-d8* | *93.3* | | *70-130* | *%REC* | 1 | 8/20/2017 04:13 PM |
| **CHLORIDE** | | | **A4500-CL E-97** | Prep: EXTRACT 8/23/17 23:30 | | Analyst: **ED** |
| **Chloride** | **240** | | **10** | **mg/Kg-dry** | 1 | 8/24/2017 02:00 PM |
| **MOISTURE** | | | **SW3550C** | | | Analyst: **BTG** |
| **Moisture** | **3.0** | | **0.050** | **% of sample** | 1 | 8/20/2017 06:45 PM |

**Note:** See Qualifiers page for a list of qualifiers and their definitions.

## ALS Group, USA

**Date:** *25-Aug-17*

**Client:** WPX Energy
**Project:** RDU 54
**Sample ID:** RDU 54 S2 1"
**Collection Date:** 8/15/2017 12:35 PM

**Work Order:** 17081042
**Lab ID:** 17081042-06
**Matrix:** SOIL

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **CHLORIDE** | | | **A4500-CL E-97** | Prep: EXTRACT 8/23/17 23:30 | | Analyst: **ED** |
| **Chloride** | **14,000** | | **320** | **mg/Kg-dry** | 30 | 8/24/2017 02:00 PM |
| **MOISTURE** | | | **SW3550C** | | | Analyst: **BTG** |
| **Moisture** | **8.0** | | **0.050** | **% of sample** | 1 | 8/20/2017 06:45 PM |

**Note:** See Qualifiers page for a list of qualifiers and their definitions.

## ALS Group, USA

**Date:** *25-Aug-17*

**Client:** WPX Energy
**Project:** RDU 54
**Sample ID:** RDU 54 S2 2"
**Collection Date:** 8/15/2017 12:40 PM

**Work Order:** 17081042
**Lab ID:** 17081042-07
**Matrix:** SOIL

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **CHLORIDE** | | | **A4500-CL E-97** | Prep: EXTRACT 8/23/17 23:30 | | Analyst: **ED** |
| **Chloride** | **11,000** | | **120** | **mg/Kg-dry** | 10 | 8/24/2017 02:00 PM |
| **MOISTURE** | | | **SW3550C** | | | Analyst: **BTG** |
| **Moisture** | **15** | | **0.050** | **% of sample** | 1 | 8/20/2017 06:45 PM |

**Note:** See Qualifiers page for a list of qualifiers and their definitions.

## ALS Group, USA

**Date:** *25-Aug-17*

**Client:** WPX Energy
**Project:** RDU 54
**Sample ID:** RDU 54 S2 3"
**Collection Date:** 8/15/2017 12:45 PM

**Work Order:** 17081042
**Lab ID:** 17081042-08
**Matrix:** SOIL

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **CHLORIDE** | | | **A4500-CL E-97** | Prep: EXTRACT 8/23/17 23:30 | | Analyst: **ED** |
| **Chloride** | **1,400** | | **45** | **mg/Kg-dry** | 4 | 8/24/2017 02:00 PM |
| **MOISTURE** | | | **SW3550C** | | | Analyst: **BTG** |
| **Moisture** | **13** | | **0.050** | **% of sample** | 1 | 8/20/2017 06:45 PM |

**Note:** See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 25-Aug-17

**Client:** WPX Energy
**Work Order:** 17081042
**Project:** RDU 54

# QC BATCH REPORT

Batch ID: **106027** Instrument ID **GC8** Method: **SW8015C**

| **MBLK** | Sample ID: **DBLKS1-106027-106027** | | | Units: **mg/Kg** | | | Analysis Date: **8/17/2017 11:40 AM** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Client ID: | Run ID: **GC8_170816A** | | | SeqNo: **4588571** | | Prep Date: **8/17/2017** | | DF: **1** | | |
| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| DRO (C10-C28) | ND | 5.0 | | | | | | | | |
| ORO (C28-C40) | ND | 5.0 | | | | | | | | |
| *Surr: 4-Terphenyl-d14* | *1.917* | 0 | *3.33* | 0 | *57.6* | *34-130* | 0 | | | |

| **LCS** | Sample ID: **DLCSS1-106027-106027** | | | Units: **mg/Kg** | | | Analysis Date: **8/17/2017 12:09 PM** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Client ID: | Run ID: **GC8_170816A** | | | SeqNo: **4588572** | | Prep Date: **8/17/2017** | | DF: **1** | | |
| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| DRO (C10-C28) | 366.4 | 5.0 | 333 | 0 | 110 | 65-122 | 0 | | | |
| ORO (C28-C40) | 374.7 | 5.0 | 333 | 0 | 113 | 81-116 | 0 | | | |
| *Surr: 4-Terphenyl-d14* | *3.233* | 0 | *3.33* | 0 | *97.1* | *34-130* | 0 | | | |

| **MS** | Sample ID: **17081003-01B MS** | | | Units: **mg/Kg** | | | Analysis Date: **8/17/2017 03:54 PM** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Client ID: | Run ID: **GC8_170817A** | | | SeqNo: **4590276** | | Prep Date: **8/17/2017** | | DF: **1** | | |
| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| DRO (C10-C28) | 233.6 | 4.8 | 322.8 | 21.64 | 65.7 | 65-122 | 0 | | | |
| ORO (C28-C40) | 301.8 | 4.8 | 322.8 | 0 | 93.5 | 81-116 | 0 | | | |
| *Surr: 4-Terphenyl-d14* | *1.891* | 0 | *3.228* | 0 | *58.6* | *34-130* | 0 | | | |

| **MSD** | Sample ID: **17081003-01B MSD** | | | Units: **mg/Kg** | | | Analysis Date: **8/17/2017 04:23 PM** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Client ID: | Run ID: **GC8_170817A** | | | SeqNo: **4590278** | | Prep Date: **8/17/2017** | | DF: **1** | | |
| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| DRO (C10-C28) | 232.1 | 4.8 | 322 | 21.64 | 65.4 | 65-122 | 233.6 | 0.653 | 30 | |
| ORO (C28-C40) | 293.9 | 4.8 | 322 | 0 | 91.3 | 81-116 | 301.8 | 2.65 | 30 | |
| *Surr: 4-Terphenyl-d14* | *1.724* | 0 | *3.22* | 0 | *53.6* | *34-130* | 1.891 | *9.19* | *30* | |

**The following samples were analyzed in this batch:** 17081042-01A 17081042-05A

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

**Client:** WPX Energy
**Work Order:** 17081042
**Project:** RDU 54

# QC BATCH REPORT

Batch ID: **106043** Instrument ID **GC9** Method: **SW8015D**

**MBLK** Sample ID: **MBLK-106043-106043** Units: **µg/Kg-dry** Analysis Date: **8/17/2017 04:10 PM**
Client ID: Run ID: **GC9_170817A** SeqNo: **4589877** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| GRO (C6-C10) | ND | 5,000 | | | | | | | | |
| *Surr: Toluene-d8* | *4866* | 0 | *5000* | 0 | *97.3* | *71-123* | 0 | | | |

**LCS** Sample ID: **LCS-106043-106043** Units: **µg/Kg-dry** Analysis Date: **8/17/2017 03:11 PM**
Client ID: Run ID: **GC9_170817A** SeqNo: **4589874** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| GRO (C6-C10) | 567600 | 5,000 | 500000 | 0 | 114 | 71-123 | 0 | | | |
| *Surr: Toluene-d8* | *5172* | 0 | *5000* | 0 | *103* | *71-123* | 0 | | | |

**MS** Sample ID: **17081045-01A MS** Units: **µg/Kg-dry** Analysis Date: **8/17/2017 10:40 PM**
Client ID: Run ID: **GC9_170817A** SeqNo: **4589900** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| GRO (C6-C10) | 1567000 | 9,500 | 949300 | 342300 | 129 | 71-123 | 0 | | | S |
| *Surr: Toluene-d8* | *12350* | 0 | *9493* | 0 | *130* | *71-123* | 0 | | | *S* |

**MSD** Sample ID: **17081045-01A MSD** Units: **µg/Kg-dry** Analysis Date: **8/17/2017 11:10 PM**
Client ID: Run ID: **GC9_170817A** SeqNo: **4589902** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| GRO (C6-C10) | 1704000 | 9,500 | 949300 | 342300 | 143 | 71-123 | 1567000 | 8.34 | 30 | S |
| *Surr: Toluene-d8* | *12630* | 0 | *9493* | 0 | *133* | *71-123* | 12350 | *2.27* | *30* | *S* |

**The following samples were analyzed in this batch:**

| | |
|---|---|
| 17081042-01A | 17081042-05A |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

**Client:** WPX Energy
**Work Order:** 17081042
**Project:** RDU 54

# QC BATCH REPORT

Batch ID: **106054** Instrument ID **VMS8** Method: **SW8260B**

**MBLK** Sample ID: **MBLK-106054-106054** Units: **µg/Kg-dry** Analysis Date: **8/18/2017 12:09 PM**
Client ID: Run ID: **VMS8_170818A** SeqNo: **4592188** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | ND | 30 | 0 | 0 | 0 | 0-0 | 0 | | | |
| Ethylbenzene | ND | 30 | 0 | 0 | 0 | 0-0 | 0 | | | |
| m,p-Xylene | ND | 60 | 0 | 0 | 0 | 0-0 | 0 | | | |
| o-Xylene | ND | 30 | 0 | 0 | 0 | 0-0 | 0 | | | |
| Toluene | ND | 30 | 0 | 0 | 0 | 0-0 | 0 | | | |
| Xylenes, Total | ND | 90 | 0 | 0 | 0 | 0-0 | 0 | | | |
| *Surr: 1,2-Dichloroethane-d4* | *991.5* | 0 | *1000* | 0 | *99.2* | *70-130* | 0 | | | |
| *Surr: 4-Bromofluorobenzene* | *947* | 0 | *1000* | 0 | *94.7* | *70-130* | 0 | | | |
| *Surr: Dibromofluoromethane* | *800* | 0 | *1000* | 0 | *80* | *70-130* | 0 | | | |
| *Surr: Toluene-d8* | *969* | 0 | *1000* | 0 | *96.9* | *70-130* | 0 | | | |

**MBLK** Sample ID: **MBLK-106054-106054** Units: **µg/Kg-dry** Analysis Date: **8/18/2017 11:39 PM**
Client ID: Run ID: **VMS10_170818A** SeqNo: **4592319** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | ND | 30 | 0 | 0 | 0 | 0-0 | 0 | | | |
| Ethylbenzene | ND | 30 | 0 | 0 | 0 | 0-0 | 0 | | | |
| m,p-Xylene | ND | 60 | 0 | 0 | 0 | 0-0 | 0 | | | |
| o-Xylene | ND | 30 | 0 | 0 | 0 | 0-0 | 0 | | | |
| Toluene | ND | 30 | 0 | 0 | 0 | 0-0 | 0 | | | |
| Xylenes, Total | ND | 90 | 0 | 0 | 0 | 0-0 | 0 | | | |
| *Surr: 1,2-Dichloroethane-d4* | *1020* | 0 | *1000* | 0 | *102* | *70-130* | 0 | | | |
| *Surr: 4-Bromofluorobenzene* | *929* | 0 | *1000* | 0 | *92.9* | *70-130* | 0 | | | |
| *Surr: Dibromofluoromethane* | *944.5* | 0 | *1000* | 0 | *94.4* | *70-130* | 0 | | | |
| *Surr: Toluene-d8* | *990.5* | 0 | *1000* | 0 | *99* | *70-130* | 0 | | | |

**LCS** Sample ID: **LCS-106054-106054** Units: **µg/Kg-dry** Analysis Date: **8/18/2017 10:59 AM**
Client ID: Run ID: **VMS8_170818A** SeqNo: **4592187** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 941.5 | 30 | 1000 | 0 | 94.2 | 75-125 | 0 | | | |
| Ethylbenzene | 919 | 30 | 1000 | 0 | 91.9 | 75-125 | 0 | | | |
| m,p-Xylene | 1854 | 60 | 2000 | 0 | 92.7 | 80-125 | 0 | | | |
| o-Xylene | 923.5 | 30 | 1000 | 0 | 92.4 | 75-125 | 0 | | | |
| Toluene | 900 | 30 | 1000 | 0 | 90 | 70-125 | 0 | | | |
| Xylenes, Total | 2778 | 90 | 3000 | 0 | 92.6 | 75-125 | 0 | | | |
| *Surr: 1,2-Dichloroethane-d4* | *978* | 0 | *1000* | 0 | *97.8* | *70-130* | 0 | | | |
| *Surr: 4-Bromofluorobenzene* | *1006* | 0 | *1000* | 0 | *101* | *70-130* | 0 | | | |
| *Surr: Dibromofluoromethane* | *1000* | 0 | *1000* | 0 | *100* | *70-130* | 0 | | | |
| *Surr: Toluene-d8* | *1012* | 0 | *1000* | 0 | *101* | *70-130* | 0 | | | |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

**Client:** WPX Energy
**Work Order:** 17081042
**Project:** RDU 54

# QC BATCH REPORT

Batch ID: **106054** Instrument ID **VMS8** Method: **SW8260B**

**LCS** Sample ID: **LCS-106054-106054** Units: **µg/Kg-dry** Analysis Date: **8/18/2017 09:39 PM**
Client ID: Run ID: **VMS10_170818A** SeqNo: **4592318** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 993 | 30 | 1000 | 0 | 99.3 | 75-125 | 0 | | | |
| Ethylbenzene | 1008 | 30 | 1000 | 0 | 101 | 75-125 | 0 | | | |
| m,p-Xylene | 2120 | 60 | 2000 | 0 | 106 | 80-125 | 0 | | | |
| o-Xylene | 1058 | 30 | 1000 | 0 | 106 | 75-125 | 0 | | | |
| Toluene | 990.5 | 30 | 1000 | 0 | 99 | 70-125 | 0 | | | |
| Xylenes, Total | 3178 | 90 | 3000 | 0 | 106 | 75-125 | 0 | | | |
| *Surr: 1,2-Dichloroethane-d4* | *985.5* | 0 | *1000* | 0 | *98.6* | *70-130* | 0 | | | |
| *Surr: 4-Bromofluorobenzene* | *1045* | 0 | *1000* | 0 | *104* | *70-130* | 0 | | | |
| *Surr: Dibromofluoromethane* | *1006* | 0 | *1000* | 0 | *101* | *70-130* | 0 | | | |
| *Surr: Toluene-d8* | *1020* | 0 | *1000* | 0 | *102* | *70-130* | 0 | | | |

**MS** Sample ID: **17081044-04A MS** Units: **µg/Kg-dry** Analysis Date: **8/20/2017 06:33 AM**
Client ID: Run ID: **VMS9_170819A** SeqNo: **4593188** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 907.5 | 30 | 1000 | 0 | 90.8 | 75-125 | 0 | | | |
| Ethylbenzene | 872 | 30 | 1000 | 0 | 87.2 | 75-125 | 0 | | | |
| m,p-Xylene | 1767 | 60 | 2000 | 0 | 88.4 | 80-125 | 0 | | | |
| o-Xylene | 896 | 30 | 1000 | 0 | 89.6 | 75-125 | 0 | | | |
| Toluene | 872 | 30 | 1000 | 0 | 87.2 | 70-125 | 0 | | | |
| Xylenes, Total | 2663 | 90 | 3000 | 0 | 88.8 | 75-125 | 0 | | | |
| *Surr: 1,2-Dichloroethane-d4* | *983* | 0 | *1000* | 0 | *98.3* | *70-130* | 0 | | | |
| *Surr: 4-Bromofluorobenzene* | *1028* | 0 | *1000* | 0 | *103* | *70-130* | 0 | | | |
| *Surr: Dibromofluoromethane* | *980* | 0 | *1000* | 0 | *98* | *70-130* | 0 | | | |
| *Surr: Toluene-d8* | *970* | 0 | *1000* | 0 | *97* | *70-130* | 0 | | | |

**MSD** Sample ID: **17081044-04A MSD** Units: **µg/Kg-dry** Analysis Date: **8/20/2017 06:55 AM**
Client ID: Run ID: **VMS9_170819A** SeqNo: **4593189** Prep Date: **8/17/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 1024 | 30 | 1000 | 0 | 102 | 75-125 | 907.5 | 12.1 | 30 | |
| Ethylbenzene | 970 | 30 | 1000 | 0 | 97 | 75-125 | 872 | 10.6 | 30 | |
| m,p-Xylene | 1960 | 60 | 2000 | 0 | 98 | 80-125 | 1767 | 10.3 | 30 | |
| o-Xylene | 998 | 30 | 1000 | 0 | 99.8 | 75-125 | 896 | 10.8 | 30 | |
| Toluene | 977.5 | 30 | 1000 | 0 | 97.8 | 70-125 | 872 | 11.4 | 30 | |
| Xylenes, Total | 2958 | 90 | 3000 | 0 | 98.6 | 75-125 | 2663 | 10.5 | 30 | |
| *Surr: 1,2-Dichloroethane-d4* | *999.5* | 0 | *1000* | 0 | *100* | *70-130* | 983 | *1.66* | *30* | |
| *Surr: 4-Bromofluorobenzene* | *1052* | 0 | *1000* | 0 | *105* | *70-130* | 1028 | *2.36* | *30* | |
| *Surr: Dibromofluoromethane* | *1004* | 0 | *1000* | 0 | *100* | *70-130* | 980 | *2.47* | *30* | |
| *Surr: Toluene-d8* | *975.5* | 0 | *1000* | 0 | *97.6* | *70-130* | 970 | *0.565* | *30* | |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

**Client:** WPX Energy
**Work Order:** 17081042
**Project:** RDU 54

# QC BATCH REPORT

Batch ID: **106054** Instrument ID **VMS8** Method: **SW8260B**

**The following samples were analyzed in this batch:**

| | |
|---|---|
| 17081042-01A | 17081042-05A |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

**Client:** WPX Energy
**Work Order:** 17081042
**Project:** RDU 54

# QC BATCH REPORT

Batch ID: **106424** Instrument ID **GALLERY** Method: **A4500-Cl E-97**

**MBLK** Sample ID: **MBLK-106424-106424** Units: **mg/Kg** Analysis Date: **8/24/2017 02:00 PM**
Client ID: Run ID: **GALLERY_170824A** SeqNo: **4601525** Prep Date: **8/23/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | ND | 10 | | | | | | | | |

**MS** Sample ID: **17081038-01A MS** Units: **mg/Kg** Analysis Date: **8/24/2017 02:00 PM**
Client ID: Run ID: **GALLERY_170824A** SeqNo: **4601528** Prep Date: **8/23/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 475.2 | 10 | 499 | 12.46 | 92.7 | 75-125 | 0 | | | |

**MSD** Sample ID: **17081038-01A MSD** Units: **mg/Kg** Analysis Date: **8/24/2017 02:00 PM**
Client ID: Run ID: **GALLERY_170824A** SeqNo: **4601529** Prep Date: **8/23/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 473.4 | 9.9 | 496 | 12.46 | 92.9 | 75-125 | 475.2 | 0.387 | 25 | |

**LCS1** Sample ID: **LCS1-106424-106424** Units: **mg/Kg** Analysis Date: **8/24/2017 02:00 PM**
Client ID: Run ID: **GALLERY_170824A** SeqNo: **4601545** Prep Date: **8/23/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 96.83 | 10 | 100 | 0 | 96.8 | 80-120 | 0 | | | |

**LCS2** Sample ID: **LCS2-106424-106424** Units: **mg/Kg** Analysis Date: **8/24/2017 02:00 PM**
Client ID: Run ID: **GALLERY_170824A** SeqNo: **4601546** Prep Date: **8/23/2017** DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 442 | 10 | 500 | 0 | 88.4 | 80-120 | 0 | | | |

**The following samples were analyzed in this batch:**

| | | |
|---|---|---|
| 17081042-01A | 17081042-02A | 17081042-03A |
| 17081042-04A | 17081042-05A | 17081042-06A |
| 17081042-07A | 17081042-08A | |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

**Client:** WPX Energy
**Work Order:** 17081042
**Project:** RDU 54

# QC BATCH REPORT

Batch ID: **R218228** Instrument ID **MOIST** Method: **SW3550C**

| **MBLK** | Sample ID: **WBLKS-R218228** | | | | Units: **% of sample** | | | Analysis Date: **8/20/2017 06:45 PM** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Client ID: | Run ID: **MOIST_170820B** | | | | SeqNo: **4593715** | | Prep Date: | | DF: **1** | |
| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| Moisture | ND | 0.050 | | | | | | | | |

| **LCS** | Sample ID: **LCS-R218228** | | | | Units: **% of sample** | | | Analysis Date: **8/20/2017 06:45 PM** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Client ID: | Run ID: **MOIST_170820B** | | | | SeqNo: **4593714** | | Prep Date: | | DF: **1** | |
| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| Moisture | 100 | 0.050 | 100 | 0 | 100 | 99.5-100.5 | 0 | | | |

| **DUP** | Sample ID: **17081036-05A DUP** | | | | Units: **% of sample** | | | Analysis Date: **8/20/2017 06:45 PM** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Client ID: | Run ID: **MOIST_170820B** | | | | SeqNo: **4593700** | | Prep Date: | | DF: **1** | |
| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| Moisture | 16.5 | 0.050 | 0 | 0 | 0 | 0-0 | 17.7 | 7.02 | 5 | R |

| **DUP** | Sample ID: **17081042-07A DUP** | | | | Units: **% of sample** | | | Analysis Date: **8/20/2017 06:45 PM** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Client ID: **RDU 54 S2 2"** | Run ID: **MOIST_170820B** | | | | SeqNo: **4593709** | | Prep Date: | | DF: **1** | |
| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| Moisture | 15.1 | 0.050 | 0 | 0 | 0 | 0-0 | 15.32 | 1.45 | 5 | |

**The following samples were analyzed in this batch:**

| | | |
|---|---|---|
| 17081042-01A | 17081042-02A | 17081042-03A |
| 17081042-04A | 17081042-05A | 17081042-06A |
| 17081042-07A | 17081042-08A | |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

Received by OCD: 8/18/2023 7:05:03 AM


ALS Laboratory Group
HOLLAND, Michigan 49424

# Chain-of-Custody

Form 202r5

WORKORDER # 17081042

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT NAME | RDU 54 | SAMPLER | | DATE | 8/15/2017 | PAGE | 1 of 1 |
| PROJECT No. | | SITE ID | RDU 54 | TURNAROUND | 5 days | DISPOSAL | By Lab or Return to Client |
| | | EDD FORMAT | | | | | |
| | | PURCHASE ORDER | | | | | |
| COMPANY NAME | WPX Energy | BILL TO COMPANY | WPX Energy | | | | |
| SEND REPORT TO | Blaney | INVOICE ATTN TO | Karolina Blaney | | | | |
| ADDRESS | | ADDRESS | 5315 Buena Vista Dr | | | | |
| CITY / STATE / ZIP | | CITY / STATE / ZIP | Carlsbad, NM 88220 | | | | |
| PHONE | | PHONE | 970 589 0743 | | | | |
| FAX | | FAX | | | | | |
| E-MAIL | Karolina.blaney@wpxenergy.com; james.raley@wpxenergy.com | E-MAIL | Karolina.blaney@wpxenergy.com; James.Raley@wpxenergy.com | | | | |

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | DRO GRO ORO | BTEX | Chloride |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | RDU 54 S1 0" | S | 8/15/2017 | 12:00 | 2 | 8 | x | x | x | x |
| 2 | RDU 54 S1 1" | S | 8/15/2017 | 12:05 | 1 | 8 | x | | | x |
| 3 | RDU 54 S1 2" | S | 8/15/2017 | 12:10 | 1 | 8 | x | | | x |
| 4 | RDU 54 S1 3" | S | 8/15/2017 | 12:20 | 1 | 8 | x | | | x |
| 5 | RDU 54 S2 0" | S | 8/15/2017 | 12:30 | 2 | 8 | x | x | x | x |
| 6 | RDU 54 S2 1" | S | 8/15/2017 | 12:35 | 1 | 8 | x | | | x |
| 7 | RDU 54 S2 2" | S | 8/15/2017 | 12:40 | 1 | 8 | x | | | x |
| 8 | RDU 54 S2 3" | S | 8/15/2017 | 12:45 | 1 | 8 | x | | | x |
| | | | | | | | | | | |
| | | | | | | | | | | |

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

SR2 4.0 C

| QC PACKAGE (check below) | |
|---|---|
| X | LEVEL II (Standard QC) |
| | LEVEL III (Std QC + forms) |
| | LEVEL IV (Std QC + forms + raw data) |
| | |

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | Karolina Blaney | Karolina Blaney | 8/15/2017 | 15:00 |
| RECEIVED BY | | Diane F. Shea | 8/16/17 | 0900 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

Released to Imaging: 8/28/2023 9:55:09 AM

ALS Group, USA

## Sample Receipt Checklist

Client Name: **WPX - NM** Date/Time Received: **16-Aug-17 09:00**

Work Order: **17081042** Received by: **DS**

Checklist completed by Diane Shaw (eSignature) 16-Aug-17 (Date) Reviewed by: Chad Whelton (eSignature) 17-Aug-17 (Date)

Matrices: Soil

Carrier name: FedEx

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shipping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | |
| Sample(s) received on ice? | Yes ☑ | No ☐ | |
| Temperature(s)/Thermometer(s): | 4.0/4.0 c | SR2 | |
| Cooler(s)/Kit(s): | | | |
| Date/Time sample(s) sent to storage: | 8/16/2017 4:32:32 PM | | |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH acceptable upon receipt? | Yes ☐ | No ☐ | N/A ☑ |
| pH adjusted? | Yes ☐ | No ☐ | N/A ☑ |
| pH adjusted by: | _ | | |

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

SRC Page 1 of 1

# Analytical Report 625484

## for

## LT Environmental, Inc.

**Project Manager: Chris McKisson**

**RDU 54**

**34819016**

**03-JUN-19**

Collected By: Client



**1211 W. Florida Ave**
**Midland TX 79701**

Xenco-Houston (EPA Lab Code: TX00122):
Texas (T104704215-19-29), Arizona (AZ0765), Florida (E871002-24), Louisiana (03054)
Oklahoma (2017-142)

Xenco-Dallas (EPA Lab Code: TX01468):
Texas (T104704295-19-19), Arizona (AZ0809), Arkansas (17-063-0)

Xenco-El Paso (EPA Lab Code: TX00127): Texas (T104704221-18-14)
Xenco-Lubbock (EPA Lab Code: TX00139): Texas (T104704219-19-20)
Xenco-Midland (EPA Lab Code: TX00158): Texas (T104704400-18-18)
Xenco-San Antonio (EPA Lab Code: TNI02385): Texas (T104704534-18-4)
Xenco Phoenix (EPA Lab Code: AZ00901): Arizona (AZ0757)
Xenco-Atlanta (LELAP Lab ID #04176)
Xenco-Tampa: Florida (E87429), North Carolina (483)

03-JUN-19

Project Manager: **Chris McKisson**
**LT Environmental, Inc.**
4600 W. 60th Avenue
Arvada, CO 80003

Reference: XENCO Report No(s): **625484**
**RDU 54**
Project Address:

**Chris McKisson**:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number(s) 625484. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. The uncertainty of measurement associated with the results of analysis reported is available upon request. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 625484 will be filed for 45 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Jessica Kramer

**Jessica Kramer**
Project Assistant

***Recipient of the Prestigious Small Business Administration Award of Excellence in 1994.***
*Certified and approved by numerous States and Agencies.*
*A Small Business and Minority Status Company that delivers SERVICE and QUALITY*

Houston - Dallas - Midland - San Antonio - Phoenix - Oklahoma - Latin America

# Sample Cross Reference 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| Sample Id | Matrix | Date Collected | Sample Depth | Lab Sample Id |
|---|---|---|---|---|
| BH01 | S | 05-22-19 14:10 | 2 ft | 625484-001 |
| BH01A | S | 05-22-19 14:20 | 4 ft | 625484-002 |
| BH02 | S | 05-22-19 14:40 | 2 ft | 625484-003 |
| BH02A | S | 05-22-19 15:00 | 4 ft | 625484-004 |
| BH03 | S | 05-22-19 15:20 | 2 ft | 625484-005 |
| BH03A | S | 05-22-19 15:40 | 4 ft | 625484-006 |
| BH04 | S | 05-22-19 16:00 | 2 ft | 625484-007 |
| BH04A | S | 05-22-19 16:20 | 4 ft | 625484-008 |

# CASE NARRATIVE

***Client Name: LT Environmental, Inc.***
***Project Name: RDU 54***

Project ID: *34819016*
Work Order Number(s): *625484*

Report Date: *03-JUN-19*
Date Received: *05/24/2019*

**Sample receipt non conformances and comments:**

None

**Sample receipt non conformances and comments per sample:**

None

**Analytical non conformances and comments:**

Batch: LBA-3090883 BTEX by EPA 8021B
Surrogate 4-Bromofluorobenzene recovered above QC limits. Matrix interferences is suspected.
Samples affected are: 625484-001.
Soil samples were not received in Terracore kits and therefore were prepared by method 5030.

Batch: LBA-3090887 BTEX by EPA 8021B
Soil samples were not received in Terracore kits and therefore were prepared by method 5030.

# Certificate of Analysis Summary 625484

## LT Environmental, Inc., Arvada, CO

## Project Name: RDU 54

**Project Id:** 34819016
**Contact:** Chris McKisson
**Project Location:**

**Date Received in Lab:** Fri May-24-19 10:50 am
**Report Date:** 03-JUN-19
**Project Manager:** Jessica Kramer

| Analysis Requested | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Lab Id:*** | 625484-001 | | 625484-002 | | 625484-003 | | 625484-004 | | 625484-005 | | 625484-006 | |
| | ***Field Id:*** | BH01 | | BH01A | | BH02 | | BH02A | | BH03 | | BH03A | |
| | ***Depth:*** | 2- ft | | 4- ft | | 2- ft | | 4- ft | | 2- ft | | 4- ft | |
| | ***Matrix:*** | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| | ***Sampled:*** | May-22-19 14:10 | | May-22-19 14:20 | | May-22-19 14:40 | | May-22-19 15:00 | | May-22-19 15:20 | | May-22-19 15:40 | |
| **BTEX by EPA 8021B** | ***Extracted:*** | May-31-19 14:20 | | May-31-19 14:20 | | May-31-19 14:20 | | May-31-19 14:20 | | May-31-19 14:20 | | May-31-19 15:00 | |
| | ***Analyzed:*** | Jun-01-19 01:43 | | Jun-01-19 02:02 | | Jun-01-19 02:21 | | Jun-01-19 02:40 | | Jun-01-19 02:59 | | Jun-01-19 05:47 | |
| | ***Units/RL:*** | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL |
| Benzene | | <0.00201 | 0.00201 | <0.00199 | 0.00199 | <0.00200 | 0.00200 | <0.00198 | 0.00198 | <0.00202 | 0.00202 | <0.00199 | 0.00199 |
| Toluene | | <0.00201 | 0.00201 | <0.00199 | 0.00199 | <0.00200 | 0.00200 | <0.00198 | 0.00198 | <0.00202 | 0.00202 | <0.00199 | 0.00199 |
| Ethylbenzene | | <0.00201 | 0.00201 | <0.00199 | 0.00199 | <0.00200 | 0.00200 | <0.00198 | 0.00198 | <0.00202 | 0.00202 | <0.00199 | 0.00199 |
| m,p-Xylenes | | <0.00402 | 0.00402 | <0.00398 | 0.00398 | <0.00401 | 0.00401 | <0.00397 | 0.00397 | <0.00403 | 0.00403 | <0.00398 | 0.00398 |
| o-Xylene | | <0.00201 | 0.00201 | <0.00199 | 0.00199 | <0.00200 | 0.00200 | <0.00198 | 0.00198 | <0.00202 | 0.00202 | <0.00199 | 0.00199 |
| Total Xylenes | | <0.00201 | 0.00201 | <0.00199 | 0.00199 | <0.00200 | 0.00200 | <0.00198 | 0.00198 | <0.00202 | 0.00202 | <0.00199 | 0.00199 |
| Total BTEX | | <0.00201 | 0.00201 | <0.00199 | 0.00199 | <0.00200 | 0.00200 | <0.00198 | 0.00198 | <0.00202 | 0.00202 | <0.00199 | 0.00199 |
| **Inorganic Anions by EPA 300** | ***Extracted:*** | May-24-19 16:30 | | May-24-19 16:30 | | May-24-19 16:30 | | May-25-19 12:45 | | May-25-19 12:45 | | May-25-19 12:45 | |
| | ***Analyzed:*** | May-25-19 17:49 | | May-25-19 17:56 | | May-25-19 18:03 | | May-25-19 14:48 | | May-25-19 14:27 | | May-25-19 18:55 | |
| | ***Units/RL:*** | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL |
| Chloride | | 25.1 | 5.05 | <49.6 | 49.6 | <5.02 | 5.02 | 183 | 50.4 | <4.99 | 4.99 | 5.37 | 5.01 |
| **TPH by SW8015 Mod** | ***Extracted:*** | May-27-19 08:00 | | May-27-19 08:00 | | May-27-19 08:00 | | May-27-19 08:00 | | May-27-19 08:00 | | May-27-19 08:00 | |
| | ***Analyzed:*** | May-27-19 21:47 | | May-27-19 22:37 | | May-27-19 23:01 | | May-27-19 23:26 | | May-27-19 23:51 | | May-28-19 00:16 | |
| | ***Units/RL:*** | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL | mg/kg | RL |
| Gasoline Range Hydrocarbons (GRO) | | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 |
| Diesel Range Organics (DRO) | | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 |
| Motor Oil Range Hydrocarbons (MRO) | | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 |
| Total TPH | | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 |
| Total GRO-DRO | | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 | <15.0 | 15.0 |

This analytical report, and the entire data package it represents, has been made for your exclusive and confidential use.
The interpretations and results expressed throughout this analytical report represent the best judgment of XENCO Laboratories.
XENCO Laboratories assumes no responsibility and makes no warranty to the end use of the data hereby presented.
Our liability is limited to the amount invoiced for this work order unless otherwise agreed to in writing.

Houston - Dallas - Midland - Tampa - Phoenix - Lubbock - San Antonio - El Paso - Atlanta - New Mexico

Jessica Kramer
Project Assistant



Final 1.000

# Certificate of Analysis Summary 625484

## LT Environmental, Inc., Arvada, CO

## Project Name: RDU 54

**Project Id:** 34819016
**Contact:** Chris McKisson
**Project Location:**

**Date Received in Lab:** Fri May-24-19 10:50 am
**Report Date:** 03-JUN-19
**Project Manager:** Jessica Kramer

| *Analysis Requested* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | ***Lab Id:*** | 625484-007 | | 625484-008 | | | | | |
| | ***Field Id:*** | BH04 | | BH04A | | | | | |
| | ***Depth:*** | 2- ft | | 4- ft | | | | | |
| | ***Matrix:*** | SOIL | | SOIL | | | | | |
| | ***Sampled:*** | May-22-19 16:00 | | May-22-19 16:20 | | | | | |
| **BTEX by EPA 8021B** | ***Extracted:*** | May-31-19 15:00 | | May-31-19 15:00 | | | | | |
| | ***Analyzed:*** | Jun-01-19 06:06 | | Jun-01-19 06:25 | | | | | |
| | ***Units/RL:*** | mg/kg | RL | mg/kg | RL | | | | |
| Benzene | | <0.00201 | 0.00201 | <0.00200 | 0.00200 | | | | |
| Toluene | | <0.00201 | 0.00201 | <0.00200 | 0.00200 | | | | |
| Ethylbenzene | | <0.00201 | 0.00201 | <0.00200 | 0.00200 | | | | |
| m,p-Xylenes | | <0.00402 | 0.00402 | <0.00401 | 0.00401 | | | | |
| o-Xylene | | <0.00201 | 0.00201 | <0.00200 | 0.00200 | | | | |
| Total Xylenes | | <0.00201 | 0.00201 | <0.00200 | 0.00200 | | | | |
| Total BTEX | | <0.00201 | 0.00201 | <0.00200 | 0.00200 | | | | |
| **Inorganic Anions by EPA 300** | ***Extracted:*** | May-25-19 12:45 | | May-25-19 12:45 | | | | | |
| | ***Analyzed:*** | May-25-19 19:00 | | May-25-19 15:13 | | | | | |
| | ***Units/RL:*** | mg/kg | RL | mg/kg | RL | | | | |
| Chloride | | 7.82 | 4.97 | 2950 | 50.4 | | | | |
| **TPH by SW8015 Mod** | ***Extracted:*** | May-27-19 08:00 | | May-27-19 08:00 | | | | | |
| | ***Analyzed:*** | May-28-19 00:41 | | May-28-19 01:06 | | | | | |
| | ***Units/RL:*** | mg/kg | RL | mg/kg | RL | | | | |
| Gasoline Range Hydrocarbons (GRO) | | <15.0 | 15.0 | <15.0 | 15.0 | | | | |
| Diesel Range Organics (DRO) | | <15.0 | 15.0 | <15.0 | 15.0 | | | | |
| Motor Oil Range Hydrocarbons (MRO) | | <15.0 | 15.0 | <15.0 | 15.0 | | | | |
| Total TPH | | <15.0 | 15.0 | <15.0 | 15.0 | | | | |
| Total GRO-DRO | | <15.0 | 15.0 | <15.0 | 15.0 | | | | |

This analytical report, and the entire data package it represents, has been made for your exclusive and confidential use.
The interpretations and results expressed throughout this analytical report represent the best judgment of XENCO Laboratories.
XENCO Laboratories assumes no responsibility and makes no warranty to the end use of the data hereby presented.
Our liability is limited to the amount invoiced for this work order unless otherwise agreed to in writing.

Houston - Dallas - Midland - Tampa - Phoenix - Lubbock - San Antonio - El Paso - Atlanta - New Mexico

Jessica Kramer
Project Assistant



Final 1.000

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH01** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-001 | Date Collected: | 05.22.19 14.10 | Sample Depth: | 2 ft |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | Inorganic Anions by EPA 300 | | | Prep Method: | E300P |
| Tech: | CHE | | | % Moisture: | |
| Analyst: | CHE | Date Prep: | 05.24.19 16.30 | Basis: | Wet Weight |
| Seq Number: | 3090217 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| **Chloride** | 16887-00-6 | **25.1** | 5.05 | mg/kg | 05.25.19 17.49 | | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | TPH by SW8015 Mod | | | Prep Method: | TX1005P |
| Tech: | ARM | | | % Moisture: | |
| Analyst: | ARM | Date Prep: | 05.27.19 08.00 | Basis: | Wet Weight |
| Seq Number: | 3090429 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | PHC610 | <15.0 | 15.0 | mg/kg | 05.27.19 21.47 | U | 1 |
| Diesel Range Organics (DRO) | C10C28DRO | <15.0 | 15.0 | mg/kg | 05.27.19 21.47 | U | 1 |
| Motor Oil Range Hydrocarbons (MRO) | PHCG2835 | <15.0 | 15.0 | mg/kg | 05.27.19 21.47 | U | 1 |
| Total TPH | PHC635 | <15.0 | 15.0 | mg/kg | 05.27.19 21.47 | U | 1 |
| Total GRO-DRO | PHC628 | <15.0 | 15.0 | mg/kg | 05.27.19 21.47 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111-85-3 | 122 | % | 70-135 | 05.27.19 21.47 | |
| o-Terphenyl | 84-15-1 | 113 | % | 70-135 | 05.27.19 21.47 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH01** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-001 | Date Collected: | 05.22.19 14.10 | Sample Depth: | 2 ft |
| Analytical Method: | BTEX by EPA 8021B | | | Prep Method: | SW5030B |
| Tech: | SCM | | | % Moisture: | |
| Analyst: | SCM | Date Prep: | 05.31.19 14.20 | Basis: | Wet Weight |
| Seq Number: | 3090883 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Benzene | 71-43-2 | <0.00201 | 0.00201 | mg/kg | 06.01.19 01.43 | U | 1 |
| Toluene | 108-88-3 | <0.00201 | 0.00201 | mg/kg | 06.01.19 01.43 | U | 1 |
| Ethylbenzene | 100-41-4 | <0.00201 | 0.00201 | mg/kg | 06.01.19 01.43 | U | 1 |
| m,p-Xylenes | 179601-23-1 | <0.00402 | 0.00402 | mg/kg | 06.01.19 01.43 | U | 1 |
| o-Xylene | 95-47-6 | <0.00201 | 0.00201 | mg/kg | 06.01.19 01.43 | U | 1 |
| Total Xylenes | 1330-20-7 | <0.00201 | 0.00201 | mg/kg | 06.01.19 01.43 | U | 1 |
| Total BTEX | | <0.00201 | 0.00201 | mg/kg | 06.01.19 01.43 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1,4-Difluorobenzene | 540-36-3 | 91 | % | 70-130 | 06.01.19 01.43 | |
| 4-Bromofluorobenzene | 460-00-4 | 132 | % | 70-130 | 06.01.19 01.43 | ** |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH01A** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-002 | Date Collected: | 05.22.19 14.20 | Sample Depth: | 4 ft |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | Inorganic Anions by EPA 300 | | | Prep Method: | E300P |
| Tech: | CHE | | | % Moisture: | |
| Analyst: | CHE | Date Prep: | 05.24.19 16.30 | Basis: | Wet Weight |
| Seq Number: | 3090217 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Chloride | 16887-00-6 | <49.6 | 49.6 | mg/kg | 05.25.19 17.56 | U | 10 |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | TPH by SW8015 Mod | | | Prep Method: | TX1005P |
| Tech: | ARM | | | % Moisture: | |
| Analyst: | ARM | Date Prep: | 05.27.19 08.00 | Basis: | Wet Weight |
| Seq Number: | 3090429 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | PHC610 | <15.0 | 15.0 | mg/kg | 05.27.19 22.37 | U | 1 |
| Diesel Range Organics (DRO) | C10C28DRO | <15.0 | 15.0 | mg/kg | 05.27.19 22.37 | U | 1 |
| Motor Oil Range Hydrocarbons (MRO) | PHCG2835 | <15.0 | 15.0 | mg/kg | 05.27.19 22.37 | U | 1 |
| Total TPH | PHC635 | <15.0 | 15.0 | mg/kg | 05.27.19 22.37 | U | 1 |
| Total GRO-DRO | PHC628 | <15.0 | 15.0 | mg/kg | 05.27.19 22.37 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111-85-3 | 123 | % | 70-135 | 05.27.19 22.37 | |
| o-Terphenyl | 84-15-1 | 114 | % | 70-135 | 05.27.19 22.37 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH01A** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-002 | Date Collected: | 05.22.19 14.20 | Sample Depth: | 4 ft |
| Analytical Method: | BTEX by EPA 8021B | | | Prep Method: | SW5030B |
| Tech: | SCM | | | % Moisture: | |
| Analyst: | SCM | Date Prep: | 05.31.19 14.20 | Basis: | Wet Weight |
| Seq Number: | 3090883 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Benzene | 71-43-2 | <0.00199 | 0.00199 | mg/kg | 06.01.19 02.02 | U | 1 |
| Toluene | 108-88-3 | <0.00199 | 0.00199 | mg/kg | 06.01.19 02.02 | U | 1 |
| Ethylbenzene | 100-41-4 | <0.00199 | 0.00199 | mg/kg | 06.01.19 02.02 | U | 1 |
| m,p-Xylenes | 179601-23-1 | <0.00398 | 0.00398 | mg/kg | 06.01.19 02.02 | U | 1 |
| o-Xylene | 95-47-6 | <0.00199 | 0.00199 | mg/kg | 06.01.19 02.02 | U | 1 |
| Total Xylenes | 1330-20-7 | <0.00199 | 0.00199 | mg/kg | 06.01.19 02.02 | U | 1 |
| Total BTEX | | <0.00199 | 0.00199 | mg/kg | 06.01.19 02.02 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1,4-Difluorobenzene | 540-36-3 | 97 | % | 70-130 | 06.01.19 02.02 | |
| 4-Bromofluorobenzene | 460-00-4 | 113 | % | 70-130 | 06.01.19 02.02 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH02** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-003 | Date Collected: | 05.22.19 14.40 | Sample Depth: | 2 ft |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | Inorganic Anions by EPA 300 | | | Prep Method: | E300P |
| Tech: | CHE | | | % Moisture: | |
| Analyst: | CHE | Date Prep: | 05.24.19 16.30 | Basis: | Wet Weight |
| Seq Number: | 3090217 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Chloride | 16887-00-6 | <5.02 | 5.02 | mg/kg | 05.25.19 18.03 | U | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | TPH by SW8015 Mod | | | Prep Method: | TX1005P |
| Tech: | ARM | | | % Moisture: | |
| Analyst: | ARM | Date Prep: | 05.27.19 08.00 | Basis: | Wet Weight |
| Seq Number: | 3090429 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | PHC610 | <15.0 | 15.0 | mg/kg | 05.27.19 23.01 | U | 1 |
| Diesel Range Organics (DRO) | C10C28DRO | <15.0 | 15.0 | mg/kg | 05.27.19 23.01 | U | 1 |
| Motor Oil Range Hydrocarbons (MRO) | PHCG2835 | <15.0 | 15.0 | mg/kg | 05.27.19 23.01 | U | 1 |
| Total TPH | PHC635 | <15.0 | 15.0 | mg/kg | 05.27.19 23.01 | U | 1 |
| Total GRO-DRO | PHC628 | <15.0 | 15.0 | mg/kg | 05.27.19 23.01 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111-85-3 | 129 | % | 70-135 | 05.27.19 23.01 | |
| o-Terphenyl | 84-15-1 | 122 | % | 70-135 | 05.27.19 23.01 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH02** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-003 | Date Collected: | 05.22.19 14.40 | Sample Depth: | 2 ft |
| Analytical Method: | BTEX by EPA 8021B | | | Prep Method: | SW5030B |
| Tech: | SCM | | | % Moisture: | |
| Analyst: | SCM | Date Prep: | 05.31.19 14.20 | Basis: | Wet Weight |
| Seq Number: | 3090883 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Benzene | 71-43-2 | <0.00200 | 0.00200 | mg/kg | 06.01.19 02.21 | U | 1 |
| Toluene | 108-88-3 | <0.00200 | 0.00200 | mg/kg | 06.01.19 02.21 | U | 1 |
| Ethylbenzene | 100-41-4 | <0.00200 | 0.00200 | mg/kg | 06.01.19 02.21 | U | 1 |
| m,p-Xylenes | 179601-23-1 | <0.00401 | 0.00401 | mg/kg | 06.01.19 02.21 | U | 1 |
| o-Xylene | 95-47-6 | <0.00200 | 0.00200 | mg/kg | 06.01.19 02.21 | U | 1 |
| Total Xylenes | 1330-20-7 | <0.00200 | 0.00200 | mg/kg | 06.01.19 02.21 | U | 1 |
| Total BTEX | | <0.00200 | 0.00200 | mg/kg | 06.01.19 02.21 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1,4-Difluorobenzene | 540-36-3 | 95 | % | 70-130 | 06.01.19 02.21 | |
| 4-Bromofluorobenzene | 460-00-4 | 117 | % | 70-130 | 06.01.19 02.21 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH02A** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-004 | Date Collected: | 05.22.19 15.00 | Sample Depth: | 4 ft |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | Inorganic Anions by EPA 300 | | | Prep Method: | E300P |
| Tech: | SPC | | | % Moisture: | |
| Analyst: | SPC | Date Prep: | 05.25.19 12.45 | Basis: | Wet Weight |
| Seq Number: | 3090232 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| **Chloride** | 16887-00-6 | **183** | 50.4 | mg/kg | 05.25.19 14.48 | | 10 |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | TPH by SW8015 Mod | | | Prep Method: | TX1005P |
| Tech: | ARM | | | % Moisture: | |
| Analyst: | ARM | Date Prep: | 05.27.19 08.00 | Basis: | Wet Weight |
| Seq Number: | 3090429 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | PHC610 | <15.0 | 15.0 | mg/kg | 05.27.19 23.26 | U | 1 |
| Diesel Range Organics (DRO) | C10C28DRO | <15.0 | 15.0 | mg/kg | 05.27.19 23.26 | U | 1 |
| Motor Oil Range Hydrocarbons (MRO) | PHCG2835 | <15.0 | 15.0 | mg/kg | 05.27.19 23.26 | U | 1 |
| Total TPH | PHC635 | <15.0 | 15.0 | mg/kg | 05.27.19 23.26 | U | 1 |
| Total GRO-DRO | PHC628 | <15.0 | 15.0 | mg/kg | 05.27.19 23.26 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111-85-3 | 117 | % | 70-135 | 05.27.19 23.26 | |
| o-Terphenyl | 84-15-1 | 112 | % | 70-135 | 05.27.19 23.26 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH02A** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-004 | Date Collected: | 05.22.19 15.00 | Sample Depth: | 4 ft |
| Analytical Method: | BTEX by EPA 8021B | | | Prep Method: | SW5030B |
| Tech: | SCM | | | % Moisture: | |
| Analyst: | SCM | Date Prep: | 05.31.19 14.20 | Basis: | Wet Weight |
| Seq Number: | 3090883 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Benzene | 71-43-2 | <0.00198 | 0.00198 | mg/kg | 06.01.19 02.40 | U | 1 |
| Toluene | 108-88-3 | <0.00198 | 0.00198 | mg/kg | 06.01.19 02.40 | U | 1 |
| Ethylbenzene | 100-41-4 | <0.00198 | 0.00198 | mg/kg | 06.01.19 02.40 | U | 1 |
| m,p-Xylenes | 179601-23-1 | <0.00397 | 0.00397 | mg/kg | 06.01.19 02.40 | U | 1 |
| o-Xylene | 95-47-6 | <0.00198 | 0.00198 | mg/kg | 06.01.19 02.40 | U | 1 |
| Total Xylenes | 1330-20-7 | <0.00198 | 0.00198 | mg/kg | 06.01.19 02.40 | U | 1 |
| Total BTEX | | <0.00198 | 0.00198 | mg/kg | 06.01.19 02.40 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 4-Bromofluorobenzene | 460-00-4 | 117 | % | 70-130 | 06.01.19 02.40 | |
| 1,4-Difluorobenzene | 540-36-3 | 96 | % | 70-130 | 06.01.19 02.40 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH03** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-005 | Date Collected: | 05.22.19 15.20 | Sample Depth: | 2 ft |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | Inorganic Anions by EPA 300 | | | Prep Method: | E300P |
| Tech: | SPC | | | % Moisture: | |
| Analyst: | SPC | Date Prep: | 05.25.19 12.45 | Basis: | Wet Weight |
| Seq Number: | 3090232 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Chloride | 16887-00-6 | <4.99 | 4.99 | mg/kg | 05.25.19 14.27 | U | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | TPH by SW8015 Mod | | | Prep Method: | TX1005P |
| Tech: | ARM | | | % Moisture: | |
| Analyst: | ARM | Date Prep: | 05.27.19 08.00 | Basis: | Wet Weight |
| Seq Number: | 3090429 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | PHC610 | <15.0 | 15.0 | mg/kg | 05.27.19 23.51 | U | 1 |
| Diesel Range Organics (DRO) | C10C28DRO | <15.0 | 15.0 | mg/kg | 05.27.19 23.51 | U | 1 |
| Motor Oil Range Hydrocarbons (MRO) | PHCG2835 | <15.0 | 15.0 | mg/kg | 05.27.19 23.51 | U | 1 |
| Total TPH | PHC635 | <15.0 | 15.0 | mg/kg | 05.27.19 23.51 | U | 1 |
| Total GRO-DRO | PHC628 | <15.0 | 15.0 | mg/kg | 05.27.19 23.51 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111-85-3 | 121 | % | 70-135 | 05.27.19 23.51 | |
| o-Terphenyl | 84-15-1 | 103 | % | 70-135 | 05.27.19 23.51 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH03** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-005 | Date Collected: | 05.22.19 15.20 | Sample Depth: | 2 ft |
| Analytical Method: | BTEX by EPA 8021B | | | Prep Method: | SW5030B |
| Tech: | SCM | | | % Moisture: | |
| Analyst: | SCM | Date Prep: | 05.31.19 14.20 | Basis: | Wet Weight |
| Seq Number: | 3090883 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Benzene | 71-43-2 | <0.00202 | 0.00202 | mg/kg | 06.01.19 02.59 | U | 1 |
| Toluene | 108-88-3 | <0.00202 | 0.00202 | mg/kg | 06.01.19 02.59 | U | 1 |
| Ethylbenzene | 100-41-4 | <0.00202 | 0.00202 | mg/kg | 06.01.19 02.59 | U | 1 |
| m,p-Xylenes | 179601-23-1 | <0.00403 | 0.00403 | mg/kg | 06.01.19 02.59 | U | 1 |
| o-Xylene | 95-47-6 | <0.00202 | 0.00202 | mg/kg | 06.01.19 02.59 | U | 1 |
| Total Xylenes | 1330-20-7 | <0.00202 | 0.00202 | mg/kg | 06.01.19 02.59 | U | 1 |
| Total BTEX | | <0.00202 | 0.00202 | mg/kg | 06.01.19 02.59 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 4-Bromofluorobenzene | 460-00-4 | 129 | % | 70-130 | 06.01.19 02.59 | |
| 1,4-Difluorobenzene | 540-36-3 | 92 | % | 70-130 | 06.01.19 02.59 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH03A** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-006 | Date Collected: | 05.22.19 15.40 | Sample Depth: | 4 ft |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | Inorganic Anions by EPA 300 | | | Prep Method: | E300P |
| Tech: | SPC | | | % Moisture: | |
| Analyst: | SPC | Date Prep: | 05.25.19 12.45 | Basis: | Wet Weight |
| Seq Number: | 3090232 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| **Chloride** | 16887-00-6 | **5.37** | 5.01 | mg/kg | 05.25.19 18.55 | | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | TPH by SW8015 Mod | | | Prep Method: | TX1005P |
| Tech: | ARM | | | % Moisture: | |
| Analyst: | ARM | Date Prep: | 05.27.19 08.00 | Basis: | Wet Weight |
| Seq Number: | 3090429 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | PHC610 | <15.0 | 15.0 | mg/kg | 05.28.19 00.16 | U | 1 |
| Diesel Range Organics (DRO) | C10C28DRO | <15.0 | 15.0 | mg/kg | 05.28.19 00.16 | U | 1 |
| Motor Oil Range Hydrocarbons (MRO) | PHCG2835 | <15.0 | 15.0 | mg/kg | 05.28.19 00.16 | U | 1 |
| Total TPH | PHC635 | <15.0 | 15.0 | mg/kg | 05.28.19 00.16 | U | 1 |
| Total GRO-DRO | PHC628 | <15.0 | 15.0 | mg/kg | 05.28.19 00.16 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111-85-3 | 122 | % | 70-135 | 05.28.19 00.16 | |
| o-Terphenyl | 84-15-1 | 105 | % | 70-135 | 05.28.19 00.16 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH03A** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-006 | Date Collected: | 05.22.19 15.40 | Sample Depth: | 4 ft |
| Analytical Method: | BTEX by EPA 8021B | | | Prep Method: | SW5030B |
| Tech: | SCM | | | % Moisture: | |
| Analyst: | SCM | Date Prep: | 05.31.19 15.00 | Basis: | Wet Weight |
| Seq Number: | 3090887 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Benzene | 71-43-2 | <0.00199 | 0.00199 | mg/kg | 06.01.19 05.47 | U | 1 |
| Toluene | 108-88-3 | <0.00199 | 0.00199 | mg/kg | 06.01.19 05.47 | U | 1 |
| Ethylbenzene | 100-41-4 | <0.00199 | 0.00199 | mg/kg | 06.01.19 05.47 | U | 1 |
| m,p-Xylenes | 179601-23-1 | <0.00398 | 0.00398 | mg/kg | 06.01.19 05.47 | U | 1 |
| o-Xylene | 95-47-6 | <0.00199 | 0.00199 | mg/kg | 06.01.19 05.47 | U | 1 |
| Total Xylenes | 1330-20-7 | <0.00199 | 0.00199 | mg/kg | 06.01.19 05.47 | U | 1 |
| Total BTEX | | <0.00199 | 0.00199 | mg/kg | 06.01.19 05.47 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1,4-Difluorobenzene | 540-36-3 | 93 | % | 70-130 | 06.01.19 05.47 | |
| 4-Bromofluorobenzene | 460-00-4 | 120 | % | 70-130 | 06.01.19 05.47 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH04** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-007 | Date Collected: | 05.22.19 16.00 | Sample Depth: | 2 ft |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | Inorganic Anions by EPA 300 | | | Prep Method: | E300P |
| Tech: | SPC | | | % Moisture: | |
| Analyst: | SPC | Date Prep: | 05.25.19 12.45 | Basis: | Wet Weight |
| Seq Number: | 3090232 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| **Chloride** | 16887-00-6 | **7.82** | 4.97 | mg/kg | 05.25.19 19.00 | | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | TPH by SW8015 Mod | | | Prep Method: | TX1005P |
| Tech: | ARM | | | % Moisture: | |
| Analyst: | ARM | Date Prep: | 05.27.19 08.00 | Basis: | Wet Weight |
| Seq Number: | 3090429 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | PHC610 | <15.0 | 15.0 | mg/kg | 05.28.19 00.41 | U | 1 |
| Diesel Range Organics (DRO) | C10C28DRO | <15.0 | 15.0 | mg/kg | 05.28.19 00.41 | U | 1 |
| Motor Oil Range Hydrocarbons (MRO) | PHCG2835 | <15.0 | 15.0 | mg/kg | 05.28.19 00.41 | U | 1 |
| Total TPH | PHC635 | <15.0 | 15.0 | mg/kg | 05.28.19 00.41 | U | 1 |
| Total GRO-DRO | PHC628 | <15.0 | 15.0 | mg/kg | 05.28.19 00.41 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111-85-3 | 126 | % | 70-135 | 05.28.19 00.41 | |
| o-Terphenyl | 84-15-1 | 120 | % | 70-135 | 05.28.19 00.41 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH04** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-007 | Date Collected: | 05.22.19 16.00 | Sample Depth: | 2 ft |
| Analytical Method: | BTEX by EPA 8021B | | | Prep Method: | SW5030B |
| Tech: | SCM | | | % Moisture: | |
| Analyst: | SCM | Date Prep: | 05.31.19 15.00 | Basis: | Wet Weight |
| Seq Number: | 3090887 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Benzene | 71-43-2 | <0.00201 | 0.00201 | mg/kg | 06.01.19 06.06 | U | 1 |
| Toluene | 108-88-3 | <0.00201 | 0.00201 | mg/kg | 06.01.19 06.06 | U | 1 |
| Ethylbenzene | 100-41-4 | <0.00201 | 0.00201 | mg/kg | 06.01.19 06.06 | U | 1 |
| m,p-Xylenes | 179601-23-1 | <0.00402 | 0.00402 | mg/kg | 06.01.19 06.06 | U | 1 |
| o-Xylene | 95-47-6 | <0.00201 | 0.00201 | mg/kg | 06.01.19 06.06 | U | 1 |
| Total Xylenes | 1330-20-7 | <0.00201 | 0.00201 | mg/kg | 06.01.19 06.06 | U | 1 |
| Total BTEX | | <0.00201 | 0.00201 | mg/kg | 06.01.19 06.06 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 4-Bromofluorobenzene | 460-00-4 | 115 | % | 70-130 | 06.01.19 06.06 | |
| 1,4-Difluorobenzene | 540-36-3 | 97 | % | 70-130 | 06.01.19 06.06 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH04A** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-008 | Date Collected: | 05.22.19 16.20 | Sample Depth: | 4 ft |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | Inorganic Anions by EPA 300 | | | Prep Method: | E300P |
| Tech: | SPC | | | % Moisture: | |
| Analyst: | SPC | Date Prep: | 05.25.19 12.45 | Basis: | Wet Weight |
| Seq Number: | 3090232 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| **Chloride** | 16887-00-6 | **2950** | 50.4 | mg/kg | 05.25.19 15.13 | | 10 |

| | | | | | |
|---|---|---|---|---|---|
| Analytical Method: | TPH by SW8015 Mod | | | Prep Method: | TX1005P |
| Tech: | ARM | | | % Moisture: | |
| Analyst: | ARM | Date Prep: | 05.27.19 08.00 | Basis: | Wet Weight |
| Seq Number: | 3090429 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | PHC610 | <15.0 | 15.0 | mg/kg | 05.28.19 01.06 | U | 1 |
| Diesel Range Organics (DRO) | C10C28DRO | <15.0 | 15.0 | mg/kg | 05.28.19 01.06 | U | 1 |
| Motor Oil Range Hydrocarbons (MRO) | PHCG2835 | <15.0 | 15.0 | mg/kg | 05.28.19 01.06 | U | 1 |
| Total TPH | PHC635 | <15.0 | 15.0 | mg/kg | 05.28.19 01.06 | U | 1 |
| Total GRO-DRO | PHC628 | <15.0 | 15.0 | mg/kg | 05.28.19 01.06 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111-85-3 | 115 | % | 70-135 | 05.28.19 01.06 | |
| o-Terphenyl | 84-15-1 | 98 | % | 70-135 | 05.28.19 01.06 | |

# Certificate of Analytical Results 625484

## LT Environmental, Inc., Arvada, CO

RDU 54

| | | | | | |
|---|---|---|---|---|---|
| Sample Id: | **BH04A** | Matrix: | Soil | Date Received: | 05.24.19 10.50 |
| Lab Sample Id: | 625484-008 | Date Collected: | 05.22.19 16.20 | Sample Depth: | 4 ft |
| Analytical Method: | BTEX by EPA 8021B | | | Prep Method: | SW5030B |
| Tech: | SCM | | | % Moisture: | |
| Analyst: | SCM | Date Prep: | 05.31.19 15.00 | Basis: | Wet Weight |
| Seq Number: | 3090887 | | | | |

| Parameter | Cas Number | Result | RL | Units | Analysis Date | Flag | Dil |
|---|---|---|---|---|---|---|---|
| Benzene | 71-43-2 | <0.00200 | 0.00200 | mg/kg | 06.01.19 06.25 | U | 1 |
| Toluene | 108-88-3 | <0.00200 | 0.00200 | mg/kg | 06.01.19 06.25 | U | 1 |
| Ethylbenzene | 100-41-4 | <0.00200 | 0.00200 | mg/kg | 06.01.19 06.25 | U | 1 |
| m,p-Xylenes | 179601-23-1 | <0.00401 | 0.00401 | mg/kg | 06.01.19 06.25 | U | 1 |
| o-Xylene | 95-47-6 | <0.00200 | 0.00200 | mg/kg | 06.01.19 06.25 | U | 1 |
| Total Xylenes | 1330-20-7 | <0.00200 | 0.00200 | mg/kg | 06.01.19 06.25 | U | 1 |
| Total BTEX | | <0.00200 | 0.00200 | mg/kg | 06.01.19 06.25 | U | 1 |

| Surrogate | Cas Number | % Recovery | Units | Limits | Analysis Date | Flag |
|---|---|---|---|---|---|---|
| 4-Bromofluorobenzene | 460-00-4 | 117 | % | 70-130 | 06.01.19 06.25 | |
| 1,4-Difluorobenzene | 540-36-3 | 97 | % | 70-130 | 06.01.19 06.25 | |

# Flagging Criteria

**X** In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to affect the recovery of the spike concentration. This condition could also affect the relative percent difference in the MS/MSD.

**B** A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

**D** The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

**E** The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

**F** RPD exceeded lab control limits.

**J** The target analyte was positively identified below the quantitation limit and above the detection limit.

**U** Analyte was not detected.

**L** The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

**H** The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

**K** Sample analyzed outside of recommended hold time.

**JN** A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

** Surrogate recovered outside laboratory control limit.

**BRL** Below Reporting Limit.

**RL** Reporting Limit

**MDL** Method Detection Limit **SDL** Sample Detection Limit **LOD** Limit of Detection

**PQL** Practical Quantitation Limit **MQL** Method Quantitation Limit **LOQ** Limit of Quantitation

**DL** Method Detection Limit

**NC** Non-Calculable

**SMP** Client Sample **BLK** Method Blank

**BKS/LCS** Blank Spike/Laboratory Control Sample **BKSD/LCSD** Blank Spike Duplicate/Laboratory Control Sample Duplicate

**MD/SD** Method Duplicate/Sample Duplicate **MS** Matrix Spike **MSD:** Matrix Spike Duplicate

+ NELAC certification not offered for this compound.

***** (Next to analyte name or method description) = Outside XENCO's scope of NELAC accreditation

# QC Summary 625484

## LT Environmental, Inc.

RDU 54

**Analytical Method:** **Inorganic Anions by EPA 300** Prep Method: E300P
Seq Number: 3090217 Matrix: Solid Date Prep: 05.24.19
MB Sample Id: 7678584-1-BLK LCS Sample Id: 7678584-1-BKS LCSD Sample Id: 7678584-1-BSD

| Parameter | MB Result | Spike Amount | LCS Result | LCS %Rec | LCSD Result | LCSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.858 | 250 | 243 | 97 | 242 | 97 | 90-110 | 0 | 20 | mg/kg | 05.25.19 14:17 | |

**Analytical Method:** **Inorganic Anions by EPA 300** Prep Method: E300P
Seq Number: 3090232 Matrix: Solid Date Prep: 05.25.19
MB Sample Id: 7678586-1-BLK LCS Sample Id: 7678586-1-BKS LCSD Sample Id: 7678586-1-BSD

| Parameter | MB Result | Spike Amount | LCS Result | LCS %Rec | LCSD Result | LCSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <5.00 | 250 | 256 | 102 | 257 | 103 | 90-110 | 0 | 20 | mg/kg | 05.25.19 13:05 | |

**Analytical Method:** **Inorganic Anions by EPA 300** Prep Method: E300P
Seq Number: 3090217 Matrix: Soil Date Prep: 05.24.19
Parent Sample Id: 625476-001 MS Sample Id: 625476-001 S MSD Sample Id: 625476-001 SD

| Parameter | Parent Result | Spike Amount | MS Result | MS %Rec | MSD Result | MSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 28.3 | 251 | 271 | 97 | 271 | 97 | 90-110 | 0 | 20 | mg/kg | 05.25.19 14:39 | |

**Analytical Method:** **Inorganic Anions by EPA 300** Prep Method: E300P
Seq Number: 3090217 Matrix: Soil Date Prep: 05.24.19
Parent Sample Id: 625483-006 MS Sample Id: 625483-006 S MSD Sample Id: 625483-006 SD

| Parameter | Parent Result | Spike Amount | MS Result | MS %Rec | MSD Result | MSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 29.9 | 252 | 276 | 98 | 281 | 100 | 90-110 | 2 | 20 | mg/kg | 05.25.19 16:20 | |

**Analytical Method:** **Inorganic Anions by EPA 300** Prep Method: E300P
Seq Number: 3090232 Matrix: Soil Date Prep: 05.25.19
Parent Sample Id: 625484-005 MS Sample Id: 625484-005 S MSD Sample Id: 625484-005 SD

| Parameter | Parent Result | Spike Amount | MS Result | MS %Rec | MSD Result | MSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | <0.857 | 250 | 269 | 108 | 270 | 108 | 90-110 | 0 | 20 | mg/kg | 05.25.19 14:32 | |

MS/MSD Percent Recovery [D] = 100*(C-A) / B LCS = Laboratory Control Sample MS = Matrix Spike
Relative Percent Difference RPD = 200* | (C-E) / (C+E) | A = Parent Result B = Spike Added
LCS/LCSD Recovery [D] = 100 * (C) / [B] C = MS/LCS Result D = MSD/LCSD % Rec
Log Difference Log Diff. = Log(Sample Duplicate) - Log(Original Sample) E = MSD/LCSD Result

# QC Summary 625484

## LT Environmental, Inc.

RDU 54

**Analytical Method:** **Inorganic Anions by EPA 300** Prep Method: E300P

Seq Number: 3090232 Matrix: Soil Date Prep: 05.25.19

Parent Sample Id: 625517-001 MS Sample Id: 625517-001 S MSD Sample Id: 625517-001 SD

| Parameter | Parent Result | Spike Amount | MS Result | MS %Rec | MSD Result | MSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 233 | 250 | 494 | 104 | 495 | 105 | 90-110 | 0 | 20 | mg/kg | 05.25.19 13:20 | |

**Analytical Method:** **TPH by SW8015 Mod** Prep Method: TX1005P

Seq Number: 3090429 Matrix: Solid Date Prep: 05.27.19

MB Sample Id: 7678729-1-BLK LCS Sample Id: 7678729-1-BKS LCSD Sample Id: 7678729-1-BSD

| Parameter | MB Result | Spike Amount | LCS Result | LCS %Rec | LCSD Result | LCSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | 11.8 | 1000 | 1230 | 123 | 1250 | 125 | 70-135 | 2 | 20 | mg/kg | 05.27.19 16:26 | |
| Diesel Range Organics (DRO) | 11.0 | 1000 | 1210 | 121 | 1240 | 124 | 70-135 | 2 | 20 | mg/kg | 05.27.19 16:26 | |

| Surrogate | MB %Rec | MB Flag | LCS %Rec | LCS Flag | LCSD %Rec | LCSD Flag | Limits | Units | Analysis Date |
|---|---|---|---|---|---|---|---|---|---|
| 1-Chlorooctane | 127 | | 112 | | 123 | | 70-135 | % | 05.27.19 16:26 |
| o-Terphenyl | 123 | | 123 | | 127 | | 70-135 | % | 05.27.19 16:26 |

**Analytical Method:** **TPH by SW8015 Mod** Prep Method: TX1005P

Seq Number: 3090429 Matrix: Soil Date Prep: 05.27.19

Parent Sample Id: 625483-001 MS Sample Id: 625483-001 S MSD Sample Id: 625483-001 SD

| Parameter | Parent Result | Spike Amount | MS Result | MS %Rec | MSD Result | MSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gasoline Range Hydrocarbons (GRO) | 13.4 | 998 | 1140 | 113 | 1020 | 101 | 70-135 | 11 | 20 | mg/kg | 05.27.19 17:39 | |
| Diesel Range Organics (DRO) | 14.6 | 998 | 1110 | 110 | 894 | 88 | 70-135 | 22 | 20 | mg/kg | 05.27.19 17:39 | F |

| Surrogate | MS %Rec | MS Flag | MSD %Rec | MSD Flag | Limits | Units | Analysis Date |
|---|---|---|---|---|---|---|---|
| 1-Chlorooctane | 111 | | 89 | | 70-135 | % | 05.27.19 17:39 |
| o-Terphenyl | 110 | | 77 | | 70-135 | % | 05.27.19 17:39 |

MS/MSD Percent Recovery [D] = 100*(C-A) / B LCS = Laboratory Control Sample MS = Matrix Spike

Relative Percent Difference RPD = 200* | (C-E) / (C+E) | A = Parent Result B = Spike Added

LCS/LCSD Recovery [D] = 100 * (C) / [B] C = MS/LCS Result D = MSD/LCSD % Rec

Log Difference Log Diff. = Log(Sample Duplicate) - Log(Original Sample) E = MSD/LCSD Result

# QC Summary 625484

## LT Environmental, Inc.

RDU 54

**Analytical Method:** BTEX by EPA 8021B — Prep Method: SW5030B
Seq Number: 3090883 — Matrix: Solid — Date Prep: 05.31.19
MB Sample Id: 7679050-1-BLK — LCS Sample Id: 7679050-1-BKS — LCSD Sample Id: 7679050-1-BSD

| Parameter | MB Result | Spike Amount | LCS Result | LCS %Rec | LCSD Result | LCSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | <0.00200 | 0.0998 | 0.102 | 102 | 0.104 | 103 | 70-130 | 2 | 35 | mg/kg | 05.31.19 18:11 | |
| Toluene | <0.00200 | 0.0998 | 0.104 | 104 | 0.105 | 104 | 70-130 | 1 | 35 | mg/kg | 05.31.19 18:11 | |
| Ethylbenzene | <0.00200 | 0.0998 | 0.115 | 115 | 0.116 | 115 | 70-130 | 1 | 35 | mg/kg | 05.31.19 18:11 | |
| m,p-Xylenes | <0.00399 | 0.200 | 0.245 | 123 | 0.247 | 122 | 70-130 | 1 | 35 | mg/kg | 05.31.19 18:11 | |
| o-Xylene | <0.00200 | 0.0998 | 0.117 | 117 | 0.119 | 118 | 70-130 | 2 | 35 | mg/kg | 05.31.19 18:11 | |

| Surrogate | MB %Rec | MB Flag | LCS %Rec | LCS Flag | LCSD %Rec | LCSD Flag | Limits | Units | Analysis Date |
|---|---|---|---|---|---|---|---|---|---|
| 1,4-Difluorobenzene | 104 | | 90 | | 91 | | 70-130 | % | 05.31.19 18:11 |
| 4-Bromofluorobenzene | 101 | | 99 | | 102 | | 70-130 | % | 05.31.19 18:11 |

**Analytical Method:** BTEX by EPA 8021B — Prep Method: SW5030B
Seq Number: 3090887 — Matrix: Solid — Date Prep: 05.31.19
MB Sample Id: 7679055-1-BLK — LCS Sample Id: 7679055-1-BKS — LCSD Sample Id: 7679055-1-BSD

| Parameter | MB Result | Spike Amount | LCS Result | LCS %Rec | LCSD Result | LCSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | <0.00198 | 0.0992 | 0.0929 | 94 | 0.0911 | 91 | 70-130 | 2 | 35 | mg/kg | 06.01.19 03:55 | |
| Toluene | <0.00198 | 0.0992 | 0.0982 | 99 | 0.0974 | 97 | 70-130 | 1 | 35 | mg/kg | 06.01.19 03:55 | |
| Ethylbenzene | <0.00198 | 0.0992 | 0.110 | 111 | 0.109 | 109 | 70-130 | 1 | 35 | mg/kg | 06.01.19 03:55 | |
| m,p-Xylenes | <0.00397 | 0.198 | 0.232 | 117 | 0.232 | 115 | 70-130 | 0 | 35 | mg/kg | 06.01.19 03:55 | |
| o-Xylene | <0.00198 | 0.0992 | 0.112 | 113 | 0.113 | 113 | 70-130 | 1 | 35 | mg/kg | 06.01.19 03:55 | |

| Surrogate | MB %Rec | MB Flag | LCS %Rec | LCS Flag | LCSD %Rec | LCSD Flag | Limits | Units | Analysis Date |
|---|---|---|---|---|---|---|---|---|---|
| 1,4-Difluorobenzene | 103 | | 88 | | 88 | | 70-130 | % | 06.01.19 03:55 |
| 4-Bromofluorobenzene | 106 | | 103 | | 106 | | 70-130 | % | 06.01.19 03:55 |

**Analytical Method:** BTEX by EPA 8021B — Prep Method: SW5030B
Seq Number: 3090883 — Matrix: Soil — Date Prep: 05.31.19
Parent Sample Id: 625483-001 — MS Sample Id: 625483-001 S — MSD Sample Id: 625483-001 SD

| Parameter | Parent Result | Spike Amount | MS Result | MS %Rec | MSD Result | MSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | <0.00200 | 0.100 | 0.0738 | 74 | 0.0720 | 72 | 70-130 | 2 | 35 | mg/kg | 05.31.19 18:49 | |
| Toluene | <0.00200 | 0.100 | 0.0946 | 95 | 0.0845 | 85 | 70-130 | 11 | 35 | mg/kg | 05.31.19 18:49 | |
| Ethylbenzene | <0.00200 | 0.100 | 0.107 | 107 | 0.0934 | 94 | 70-130 | 14 | 35 | mg/kg | 05.31.19 18:49 | |
| m,p-Xylenes | <0.00400 | 0.200 | 0.230 | 115 | 0.203 | 102 | 70-130 | 12 | 35 | mg/kg | 05.31.19 18:49 | |
| o-Xylene | <0.00200 | 0.100 | 0.112 | 112 | 0.0991 | 99 | 70-130 | 12 | 35 | mg/kg | 05.31.19 18:49 | |

| Surrogate | MS %Rec | MS Flag | MSD %Rec | MSD Flag | Limits | Units | Analysis Date |
|---|---|---|---|---|---|---|---|
| 1,4-Difluorobenzene | 86 | | 87 | | 70-130 | % | 05.31.19 18:49 |
| 4-Bromofluorobenzene | 122 | | 117 | | 70-130 | % | 05.31.19 18:49 |

MS/MSD Percent Recovery — [D] = 100*(C-A) / B — LCS = Laboratory Control Sample — MS = Matrix Spike
Relative Percent Difference — RPD = 200* | (C-E) / (C+E) | — A = Parent Result — B = Spike Added
LCS/LCSD Recovery — [D] = 100 * (C) / [B] — C = MS/LCS Result — D = MSD/LCSD % Rec
Log Difference — Log Diff. = Log(Sample Duplicate) - Log(Original Sample) — E = MSD/LCSD Result

# QC Summary 625484

## LT Environmental, Inc.

RDU 54

**Analytical Method:** **BTEX by EPA 8021B** Prep Method: SW5030B

Seq Number: 3090887 Matrix: Soil Date Prep: 05.31.19

Parent Sample Id: 625484-006 MS Sample Id: 625484-006 S MSD Sample Id: 625484-006 SD

| Parameter | Parent Result | Spike Amount | MS Result | MS %Rec | MSD Result | MSD %Rec | Limits | %RPD | RPD Limit | Units | Analysis Date | Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | <0.00200 | 0.100 | 0.0862 | 86 | 0.0880 | 88 | 70-130 | 2 | 35 | mg/kg | 06.01.19 04:33 | |
| Toluene | <0.00200 | 0.100 | 0.0912 | 91 | 0.0942 | 94 | 70-130 | 3 | 35 | mg/kg | 06.01.19 04:33 | |
| Ethylbenzene | <0.00200 | 0.100 | 0.102 | 102 | 0.105 | 105 | 70-130 | 3 | 35 | mg/kg | 06.01.19 04:33 | |
| m,p-Xylenes | <0.00400 | 0.200 | 0.217 | 109 | 0.223 | 112 | 70-130 | 3 | 35 | mg/kg | 06.01.19 04:33 | |
| o-Xylene | <0.00200 | 0.100 | 0.106 | 106 | 0.108 | 108 | 70-130 | 2 | 35 | mg/kg | 06.01.19 04:33 | |

| Surrogate | MS %Rec | MS Flag | MSD %Rec | MSD Flag | Limits | Units | Analysis Date |
|---|---|---|---|---|---|---|---|
| 1,4-Difluorobenzene | 90 | | 89 | | 70-130 | % | 06.01.19 04:33 |
| 4-Bromofluorobenzene | 107 | | 108 | | 70-130 | % | 06.01.19 04:33 |

| | | | |
|---|---|---|---|
| MS/MSD Percent Recovery | [D] = 100*(C-A) / B | LCS = Laboratory Control Sample | MS = Matrix Spike |
| Relative Percent Difference | RPD = 200* \| (C-E) / (C+E) \| | A = Parent Result | B = Spike Added |
| LCS/LCSD Recovery | [D] = 100 * (C) / [B] | C = MS/LCS Result | D = MSD/LCSD % Rec |
| Log Difference | Log Diff. = Log(Sample Duplicate) - Log(Original Sample) | E = MSD/LCSD Result | |

Page 160 of 164

# Chain of Custody

Work Order No: E054814

XENCO LABORATORIES
Houston,TX (281) 240-4200 Dallas,TX (214) 902-0300 San Antonio,TX (210) 509-3334
Midland,TX (432-704-5440) EL Paso,TX (915)585-3443 Lubbock,TX (806)794-1296
Hobbs,NM (575-392-7550) Phoenix,AZ (480-355-0900) Atlanta,GA (770-449-8800) Tampa,FL (813-620-2000)
www.xenco.com



| | | | |
|---|---|---|---|
| Project Manager: | Chris McKisson | Bill to: (if different) | Chris McKisson |
| Company Name: | LT Environmental, Inc., Permian office | Company Name: | LT Environmental |
| Address: | 820 Megan Avenue, Unit B | Address: | |
| City, State ZIP: | Rifle, CO 81650 | City, State ZIP: | |
| Phone: | (970)285-9985 | Email: | llaumbach@ltenv.com, cmckisson@ltenv.com, asmith@ltenv.com |

**Work Order Comments**

Program: UST/PST ☐ RP ☐ Brownfields ☐ RC ☐ Superfund ☐
State of Project:
Reporting:Level II ☐ Level III ☐ PST/UST ☐ TRRP ☐ Level IV ☐
Deliverables: EDD ☐ ADaPT ☐ Other:

| | | | |
|---|---|---|---|
| Project Name: | RDU 54 | Turn Around | |
| Project Number: | 34819016 | Routine | X |
| P.O. Number: | 2RP-4349 | Rush: | |
| Sampler's Name: | Lynda Laumbach | Due Date: | |

| SAMPLE RECEIPT | | | |
|---|---|---|---|
| Temp Blank: | Yes (No) | Wet Ice: | (Yes) No |
| Temperature (°C): | 0.5 \| 0.3 | Thermometer ID: | IR2 |
| Received Intact: | (Yes) No | | |
| Cooler Custody Seals: | Yes (No) N/A | Correction Factor: | -0.2 |
| Sample Custody Seals: | Yes (No) N/A | Total Containers: | |

| Sample Identification | Matrix | Date Sampled | Time Sampled | Depth | Number of Containers | TPH (EPA 8015) | BTEX (EPA 8021) | Chloride (EPA 300.0) |
|---|---|---|---|---|---|---|---|---|
| BH01 | S | 05/22/2019 | 14:10 | 2' | 1 | X | X | X |
| BH01A | S | | 14:20 | 4' | 1 | X | X | X |
| BH02 | S | | 14:40 | 2' | 1 | X | X | X |
| BH02A | S | | 15:00 | 4' | 1 | X | X | X |
| BH03 | S | | 15:20 | 2' | 1 | X | X | X |
| BH03A | S | | 15:40 | 4' | 1 | X | X | X |
| BH04 | S | | 16:00 | 2' | 1 | X | X | X |
| BH04A | S | | 16:20 | 4' | 1 | X | X | X |

**Work Order Notes**

TAT starts the day recevied by the lab, if received by 4:30pm

**Sample Comments**

**Total 200.7 / 6010 200.8 / 6020:** 8RCRA 13PPM Texas 11 Al Sb As Ba Be B Cd Ca Cr Co Cu Fe Pb Mg Mn Mo Ni K Se Ag SiO2 Na Sr Tl Sn U V Zn

*Circle Method(s) and Metal(s) to be analyzed* **TCLP / SPLP 6010**: 8RCRA Sb As Ba Be Cd Cr Co Cu Pb Mn Mo Ni Se Ag Tl U **1631 / 245.1 / 7470 / 7471** : Hg

**Notice: Signature of this document and relinquishment of samples constitutes a valid purchase order from client company to Xenco, its affiliates and subcontractors. It assigns standard terms and conditions of service. Xenco will be liable only for the cost of samples and shall not assume any responsibility for any losses or expenses incurred by the client if such losses are due to circumstances beyond the control of Xenco. A minimum charge of $75.00 will be applied to each project and a charge of $5 for each sample submitted to Xenco, but not analyzed. These terms will be enforced unless previously negotiated.**

| | Relinquished by: (Signature) | Received by: (Signature) | Date/Time | Relinquished by: (Signature) | Received by: (Signature) | Date/Time |
|---|---|---|---|---|---|---|
| 1 | | | 05/23/19 10:30 | 2 | | 5/24/19 1030 |
| 3 | | | | 4 | | |
| 5 | | | | 6 | | |

Revised Date 051418 Rev. 2018.1

Received by OCD: 8/18/2023 7:05:03 AM
Released to Imaging: 8/28/2023 9:55:09 AM
Final 1.000
Page 28 of 30

Received by OCD: 8/18/2023 7:05:03 AM


ORIGIN ID:CAOA (281) 240-4200
SAMPLE CUSTODY
XENCO LABORATORIES NM
1089 N CANAL ST
CARLSBAD, NM 88220
UNITED STATES US

SHIP DATE: 23MAY19
ACTWGT: 29.00 LB
CAD: 11448676/INET4100
DIMS: 13x9x9 IN

BILL SENDER

TO SAMPLE RECEIVING

3600 S COUNTY ROAD 1276

MIDLAND TX 79706

(432) 704-5440

INV:
PO:
REF:
DEPT:

565J1/D66C/23AD

J19101901076luv

FedEx Express

FRI - 24 MAY HOLD

PRIORITY OVERNIGHT

HLD

79706

LBB

TX-US

41 MAFA

TRK# 0201 7752 9946 9399

**After printing this label**:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

**Warning**: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.
Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com.FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

Released to Imaging: 8/28/2023 9:55:09 AM

# XENCO Laboratories

## Prelogin/Nonconformance Report- Sample Log-In

**Client:** LT Environmental, Inc.

**Date/ Time Received:** 05/24/2019 10:50:00 AM

**Work Order #:** 625484

**Acceptable Temperature Range: 0 - 6 degC**
**Air and Metal samples Acceptable Range: Ambient**

**Temperature Measuring device used : R8**

| Sample Receipt Checklist | Comments |
|---|---|
| #1 *Temperature of cooler(s)? | .3 |
| #2 *Shipping container in good condition? | **Yes** |
| #3 *Samples received on ice? | **Yes** |
| #4 *Custody Seals intact on shipping container/ cooler? | **N/A** |
| #5 Custody Seals intact on sample bottles? | **N/A** |
| #6*Custody Seals Signed and dated? | **N/A** |
| #7 *Chain of Custody present? | **Yes** |
| #8 Any missing/extra samples? | **No** |
| #9 Chain of Custody signed when relinquished/ received? | **Yes** |
| #10 Chain of Custody agrees with sample labels/matrix? | **Yes** |
| #11 Container label(s) legible and intact? | **Yes** |
| #12 Samples in proper container/ bottle? | **Yes** |
| #13 Samples properly preserved? | **Yes** |
| #14 Sample container(s) intact? | **Yes** |
| #15 Sufficient sample amount for indicated test(s)? | **Yes** |
| #16 All samples received within hold time? | **Yes** |
| #17 Subcontract of sample(s)? | **N/A** |
| #18 Water VOC samples have zero headspace? | **N/A** |

*** Must be completed for after-hours delivery of samples prior to placing in the refrigerator**

Analyst: PH Device/Lot#:

**Checklist completed by:** Brianna Teel Date: 05/24/2019

Brianna Teel

**Checklist reviewed by:** Jessica Kramer Date: 05/27/2019

Jessica Kramer

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

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

CONDITIONS

Action 51536

## CONDITIONS

| | |
|---|---|
| Operator:<br>WPX Energy Permian, LLC<br>Devon Energy - Regulatory<br>Oklahoma City, OK 73102 | OGRID:<br>246289 |
| | Action Number:<br>51536 |
| | Action Type:<br>[C-141] Release Corrective Action (C-141) |

**CONDITIONS**

| Created By | Condition | Condition Date |
|---|---|---|
| bhall | Sample results at S1 and S2 are listed in inches on the lab report. The results are listed in feet on the table, maps, and in the body of the report. Additional delineation may be needed at these points due to discrepancies. Vertical delineation at S2 is incomplete as the sample collected at the terminal depth was above the reclamation standard for chloride (600 mg/kg). | 10/5/2022 |
| bhall | Delineation will need to be completed south of S2 and east of spill outline in addition to the proposed soil sample depicted on the enclosed Figure 2. | 10/5/2022 |
| bhall | Include a figure with the soil boring's (MW-1) location illustrated. | 10/5/2022 |
| bhall | Submit a complete closure report through the OCD Permitting website by 1/6/2023. | 10/5/2022 |

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

CONDITIONS

Action 253772

## CONDITIONS

| | |
|---|---|
| Operator:<br>WPX Energy Permian, LLC<br>Devon Energy - Regulatory<br>Oklahoma City, OK 73102 | OGRID:<br>246289 |
| | Action Number:<br>253772 |
| | Action Type:<br>[C-141] Release Corrective Action (C-141) |

**CONDITIONS**

| Created By | Condition | Condition Date |
|---|---|---|
| bhall | Variance and closure request approved. | 8/28/2023 |