Incident Number: nAPP2210967015

Release Assessment and Closure

Gem #4 Water Transfer Line

Section 2, Township 20 South, Range 33 East

County: Lea

Vertex File Number: 22E-02120

Prepared for:

BTA Oil Producers, LLC

Prepared by:

Vertex Resource Services Inc.

Date:

October 2023

Release Assessment and Closure
Gem #4 Water Transfer Line
Section 2, Township 20 South, Range 33 East
County: Lea

Prepared for:
BTA Oil Producers, LLC
104 S. Pecos Street
Midland, Texas 79701

New Mexico Oil Conservation Division – District 1
1625 N. French Drive
Hobbs, New Mexico 88240

Prepared by:
Vertex Resource Services Inc.
3101 Boyd Drive
Carlsbad, New Mexico 88220

10/5/2023

Angela Mohle, B.Sc., B.A.
ENVIRONMENTAL FIELD TECHNICIAN, REPORTING

Date

Chance Dixon

10/5/2023

Chance Dixon, B.Sc.
PROJECT MANAGER, REPORT REVIEW

Date

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1.0 Introduction

BTA Oil Producers, LLC (BTA) retained Vertex Resource Services Inc. (Vertex) to conduct a Release Assessment and Closure for a produced water release that occurred on April 18, 2022, at Gem #4 Water Transfer Line (hereafter referred to as the "site"). BTA submitted an initial C-141 Release Notification (Appendix A) to New Mexico Oil Conservation Division (NMOCD) District 1 on May 2, 2022. Incident ID number nAPP2210967015 was assigned to this incident.

This report provides a description of the release assessment and remediation activities associated with the site. The information presented demonstrates that closure criteria established in Table I of 19.15.29.12 of the *New Mexico Administrative Code* (NMAC; New Mexico Oil Conservation Division, 2018) related to NMOCD has been met and all applicable regulations are being followed. This document is intended to serve as a final report to obtain approval from NMOCD for closure of this release, with the understanding that the top 4 feet of the release area meets NMOCD's strictest closure criteria and will be restored as an access road following backfill activities as per NMAC 19.15.29.13. The site currently remains open at 4 feet below ground surface (bgs) with a 1-foot berm and a barbed wire fence surrounding it until the Remediation Plan that was submitted on August 15, 2023, receives approval from NMOCD.

2.0 Incident Description

The release occurred on April 18, 2022, due to a rupture in a poly flowline used to transfer produced water between tank batteries. The incident was reported on April 19, 2022, and involved the release of approximately 20 barrels (bbl.) of produced water on the pipeline right-of-way. Approximately 10 bbl. of free fluid was removed during the initial clean-up. Additional details relevant to the release are presented in the C-141 Report. Daily Field Reports (DFRs) with site photographs are included in Appendix C.

3.0 Site Characteristics

The site is located approximately 28 miles west of Hobbs, New Mexico (Google Inc., 2023). The legal location for the site is Section 2, Township 20 South and Range 33 East in Lea County, New Mexico. The release area is located on State property. An aerial photograph and site schematic are presented on Figure 1.

The Geological Map of New Mexico (New Mexico Bureau of Geology and Mineral Resources, 2023) indicates the site's surface geology primarily comprises Qep - Eolian and piedmont deposits (Holocene to middle Pleistocene) and is characterized as eolian sand. The predominant soil texture on the site is gravelly loamy sand.

The location is typical of oil and gas exploration and production lines in the Permian Basin and is currently used for oil and gas production and transport. The following sections specifically describe the release area of the pipeline right-of-way on or in proximity to the constructed pad (Figure 1).

The surrounding landscape is associated with upland plains with elevations ranging between 2,840 and 4,500 feet. The climate is semiarid with average annual precipitation ranging between 11 and 15 inches. Using information from the United States Department of Agriculture, the dominant vegetation was determined to be black grama-dominated grassland. Grasses with shrubs dominate the historic plant community (United States Department of Agriculture,

Natural Resources Conservation Service, 2023). Limited to no vegetation is allowed to grow on the compacted production pad, right-of-way, and access road.

The surface geology at the site primarily comprises Qep – Eolian and piedmont deposits (Holocene to middle Pleistocene; New Mexico Bureau of Geology and Mineral Resources, 2023) and the soil at the site is characterized as gravelly fine sandy loam (United States Department of Agriculture, Natural Resources Conservation Service, 2023). Additional soil characteristics include a drainage class of excessively drained with a runoff class of very high. The karst geology potential for the site is low (United States Department of the Interior, Bureau of Land Management, 2018).

4.0 Closure Criteria Determination

The nearest active well to the site is a New Mexico Office of the State Engineer (NMOSE) monitoring well located approximately 0.45 miles northwest of the location (United States Geological Survey, 2023). Data from 2023 show the NMOSE borehole was recorded as a dry hole at 105 feet bgs. Information pertaining to the depth to groundwater determination is included in Appendix B.

There is no surface water present at the site. The nearest significant watercourse, as defined in Subsection P of 19.15.17.7 NMAC, is an intermittent stream located approximately 2.3 miles southeast of the site (United States Fish and Wildlife Service, 2023).

At the site, there are no continuously flowing watercourses or significant watercourses, lakebeds, sinkholes, playa lakes, or other critical water or community features as outlined in Paragraph (4) of Subsection C of 19.15.29.12 NMAC.

Table 1. Closure Criteria Worksheet			
Site Name: Gem #4 Water Transfer Line			
Spill Coordinates: 32.59651, -103.63531		**X:**	**Y:**
Site Specific Conditions		**Value**	**Unit**
1	Depth to Groundwater	**>105**	feet
2	Within 300 feet of any continuously flowing watercourse or any other significant watercourse	193,948	feet
3	Within 200 feet of any lakebed, sinkhole or playa lake (measured from the ordinary high-water mark)	12,793	feet
4	Within 300 feet from an occupied residence, school, hospital, institution or church	12,139	feet
5	i) Within 500 feet of a spring or a private, domestic fresh water well used by less than five households for domestic or stock watering purposes, **or**	2,377	feet
	ii) Within 1000 feet of any fresh water well or spring	2,377	feet
6	Within incorporated municipal boundaries or within a defined municipal fresh water field covered under a municipal ordinance adopted pursuant to Section 3-27-3 NMSA 1978 as amended, unless the municipality specifically approves	No	(Y/N)
7	Within 300 feet of a wetland	18,788	feet
8	Within the area overlying a subsurface mine	No	(Y/N)
9	Within an unstable area (Karst Map)	Low	Critical High Medium Low
10	Within a 100-year Floodplain	500	year
11	Soil Type	KM, PU	
12	Ecological Classification	Sandhills and Loamy sand	
13	Geology	Qep	
	NMAC 19.15.29.12 E (Table 1) Closure Criteria	>100'	<50' 51-100' >100'

The closure criteria determined for the site are associated with the following constituent concentration limits as presented in Table 2.

Table 2. Closure Criteria for Soils Impacted by a Release

Minimum depth below any point within the horizontal boundary of the release to groundwater less than 10,000 mg/l TDS	Constituent	Limit
> 100 feet	Chloride	20,000 mg/kg
	TPH (GRO+DRO+MRO)	2,500 mg/kg
	GRO+DRO	1,000 mg/kg
	BTEX	50 mg/kg
	Benzene	10 mg/kg

TDS – total dissolved solids

TPH – total petroleum hydrocarbons, GRO – gas range organics, DRO – diesel range organics, MRO – motor oil range organics

BTEX – benzene, toluene, ethylbenzene and xylenes

5.0 Remedial Actions Taken

An initial site inspection of the release area was completed on June 21, 2023, which identified the area of the release specified in the initial C-141 Report. The impacted area was determined to be approximately 60 feet long and 10 feet wide; the total affected area was 600 square feet. The DFR associated with the site inspection is included in Appendix C.

Remediation efforts began on September 18, 2023, and were finalized on September 21, 2023. Vertex personnel supervised the excavation of impacted soils. Field screening was completed to guide the excavation and consisted of analysis utilizing Dexsil Petroflag using EPA SW-846 Method 9074 (extractable hydrocarbons) and Quantabs (chlorides). Field screening results were used to identify areas requiring further remediation. Soils were removed to a depth of 0 to 4 feet bgs. Impacted soil was transported by a licensed waste hauler and disposed of at an approved waste management facility. The final DFR with photographs documenting the final excavation before the backfill is included in Appendix C.

Notification that confirmatory samples were being collected was provided to the NMOCD on September 14, 2023, and is included in Appendix D. Confirmatory composite samples were collected from the base and walls of the excavation in 200-square-foot increments. A total of 14 samples were collected for laboratory analysis following NMOCD soil sampling procedures. Samples were submitted to Cardinal Laboratories under chain-of-custody protocols and analyzed for BTEX (EPA Method 8021B), total petroleum hydrocarbons (GRO, DRO, MRO – EPA Method 8015D) and total chlorides (EPA Method 300.0). Laboratory results are presented in Table 3, and the laboratory data reports are included in Appendix E. All confirmatory samples collected and analyzed were below the closure criteria for the site.

6.0 Closure Request

Vertex recommends no additional remediation to address the release at the site. Laboratory analyses of confirmation samples collected show final confirmatory values below NMOCD closure criteria for areas where depth to groundwater

is more than 100 feet bgs, with the top 4 feet meeting reclamation requirements of 19.15.29.13 NMAC. There are no anticipated risks to human, ecological, or hydrological receptors at the site.

The excavation will be backfilled with non-waste-containing, uncontaminated, earthen material sourced locally and placed to meet the site's existing grade after the Remediation Work Plan receives approval from NMOCD.

Vertex requests that this incident (nAPP2210967015) be closed as all closure requirements set forth in Subsection E of 19.15.29.12 have been met. BTA certifies that all information in this report and the appendices are correct and that they have complied with all applicable closure requirements and conditions specified in Division rules and directives to meet NMOCD requirements to obtain closure on the release.

Should you have any questions or concerns, please do not hesitate to contact Chance Dixon at 575-988-1472 or cdixon@vertex.ca.

7.0 References

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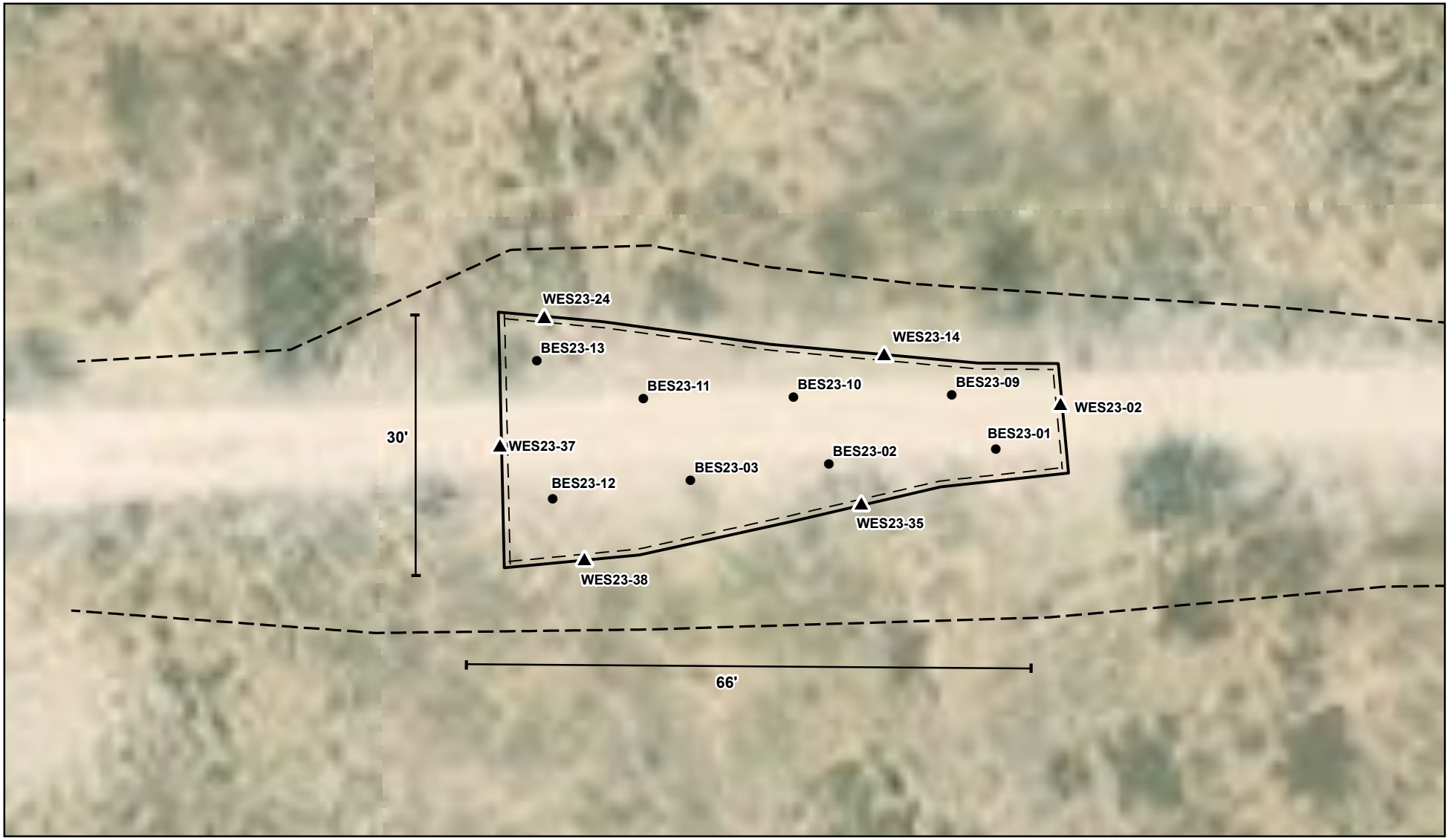
8.0 Limitations

This report has been prepared for the sole benefit of BTA Oil Producers, LLC. This document may not be used by any other person or entity, with the exception of the New Mexico Oil Conservation Division and the New Mexico State Land Office, without the express written consent of Vertex Resource Services Inc. (Vertex) and BTA Oil Producers, LLC. Any use of this report by a third party, or any reliance on decisions made based on it, or damages suffered as a result of the use of this report are the sole responsibility of the user.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgment of Vertex based on the data collected during the assessment. Due to the nature of the assessment and the data available, Vertex cannot warrant against undiscovered environmental liabilities. Conclusions and recommendations presented in this report should not be considered legal advice.

FIGURES



● Base Sample ▲ Wall Sample — — Pipeline (Aboveground) Approximate Excavation to 4' bgs (~1, 380 sq.ft.)

VERTEX

0 10 20 Ft

Map Center:
Lat/Long: 32.596505, -103.635266

NAD 1983 UTM Zone 13N
Date: Sep 27/23

N

Confirmation Schematic
Gem #4 Water Line

FIGURE:
1

BTA

Geospatial data presented in this figure may be derived from external sources and Vertex does not assume any liability for inaccuracies. This figure is intended for reference use only and is not certified for legal, survey, or engineering purposes.

Note: Georeferenced image from ESRI, 2022. Site features from GPS by Vertex Professional Services Ltd., 2023.

VERSATILITY. EXPERTISE.

Document Path: G:\1-Projects_US PROJECT\BTA Oil Producers LLC\2022\22E-02120 - Gem #4 Water Line\Figure 2 Confirmation Schematic (22E-02120).mxd

TABLES

Client Name: BTA Oil Producers LLC
Site Name: Gem #4 Water Line
NMOCD Tracking #: nAPP2210967015
Project #: 22E-02120
Lab Reports: H235128, H235148

Table 3. Confirmatory Sample Field Screen and Laboratory Results - Depth to Groundwater >100 feet bgs

Sample Description			Field Screening			Petroleum Hydrocarbons							Inorganic
						Volatile		Extractable					
Sample ID	Depth (ft)	Sample Date	Volatile Organic Compounds (PID)	Extractable Organic Compounds (PetroFlag)	Chloride Concentration	Benzene	BTEX (Total)	Gasoline Range Organics (GRO)	Diesel Range Organics (DRO)	Motor Oil Range Organics (MRO)	(GRO + DRO)	Total Petroleum Hydrocarbons (TPH)	Chloride Concentration
			(ppm)	(ppm)	(ppm)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
BES23-01	4	2023-09-20	-	117	938	ND	ND	ND	ND	ND	ND	ND	112
BES23-02	4	2023-09-18	-	129	1,150	ND	ND	ND	ND	ND	ND	ND	1,440
BES23-03	4	2023-09-18	-	110	2,250	ND	ND	ND	ND	ND	ND	ND	5,840
BES23-09	4	2023-09-18	-	113	5,750	ND	ND	ND	ND	ND	ND	ND	4,000
BES23-10	4	2023-09-20	-	114	5,050	ND	ND	ND	ND	ND	ND	ND	5,040
BES23-11	4	2023-09-20	-	105	2,175	ND	ND	ND	ND	ND	ND	ND	2,240
BES23-12	4	2023-09-20	-	112	5,500	ND	ND	ND	ND	ND	ND	ND	5,040
BES23-13	4	2023-09-21	-	112	5,250	ND	ND	ND	ND	ND	ND	ND	5,520
WES23-02	0-4	2023-09-18	-	43	225	ND	ND	ND	ND	ND	ND	ND	144
WES23-14	0-4	2023-09-19	-	55	250	ND	ND	ND	ND	ND	ND	ND	48
WES23-24	0-4	2023-09-19	-	66	288	ND	ND	ND	ND	ND	ND	ND	48
WES23-35	0-4	2023-09-19	-	78	250	ND	ND	ND	ND	ND	ND	ND	32
WES23-37	0-4	2023-09-20	-	48	450	ND	ND	ND	ND	ND	ND	ND	80
WES23-38	0-4	2023-09-21	-	70	140	ND	ND	ND	ND	ND	ND	ND	96

"ND" Not Detected at the Reporting Limit
"-" indicates not analyzed/assessed

APPENDIX A - NMOCD C-141 Report

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 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	nAPP2210967015
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party: BTA Oil Producers, LLC	OGRID: 260297
Contact Name: Bob Hall	Contact Telephone: 432-682-3753
Contact email: bhall@btaoil.com	Incident # (assigned by OCD) nAPP2210967015
Contact mailing address: 104 S. Pecos St., Midland, TX 79701	

Location of Release Source

Latitude: 32.59651 Longitude: -103.63531
(NAD 83 in decimal degrees to 5 decimal places)

Site Name: Gem #4 Water Transfer Line	Site Type: Pipeline ROW
Date Release Discovered: 4/18/2022	API# *(if applicable)* Nearest well: 30-025-31209

Unit Letter	Section	Township	Range	County
N	2	20S	33E	Lea

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) 20 BBL	Volume Recovered (bbls) 10 BBL
	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

Rupture in a poly flowline used to transfer produced water between tank batteries.

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2210967015
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: Kelton Beaird Title: Environmental Manager

Signature: _____ Date: 10-6-23

email: KBeaird@btaoil.com Telephone: 575-312-2203

OCD Only

Received by: _____ Date: _____

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.

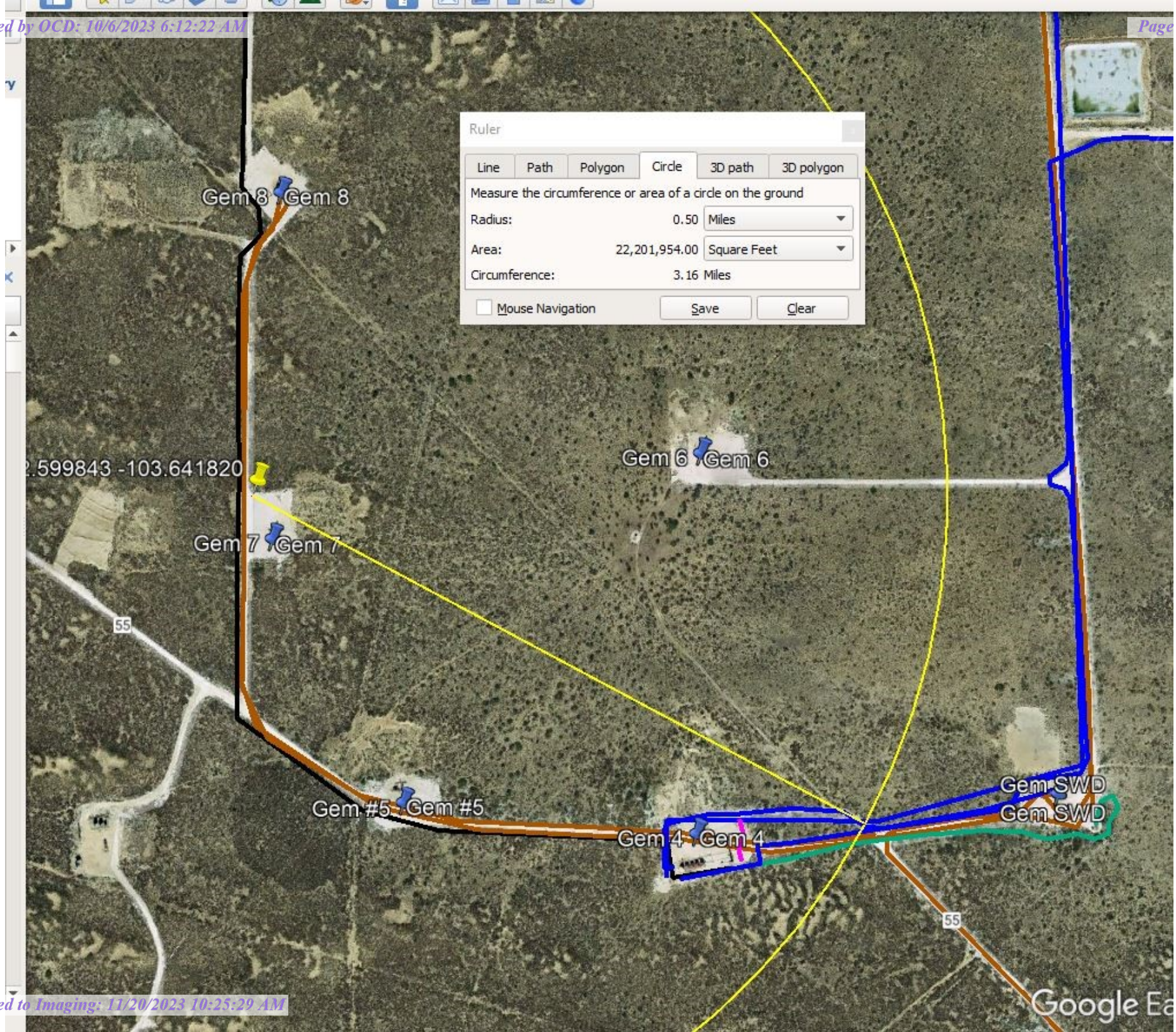
Closure Approved by: Nelson Velez Date: 11/20/2023

Printed Name: Nelson Velez Title: Environmental Specialist - Adv

APPENDIX B – Closure Criteria Research Documentation

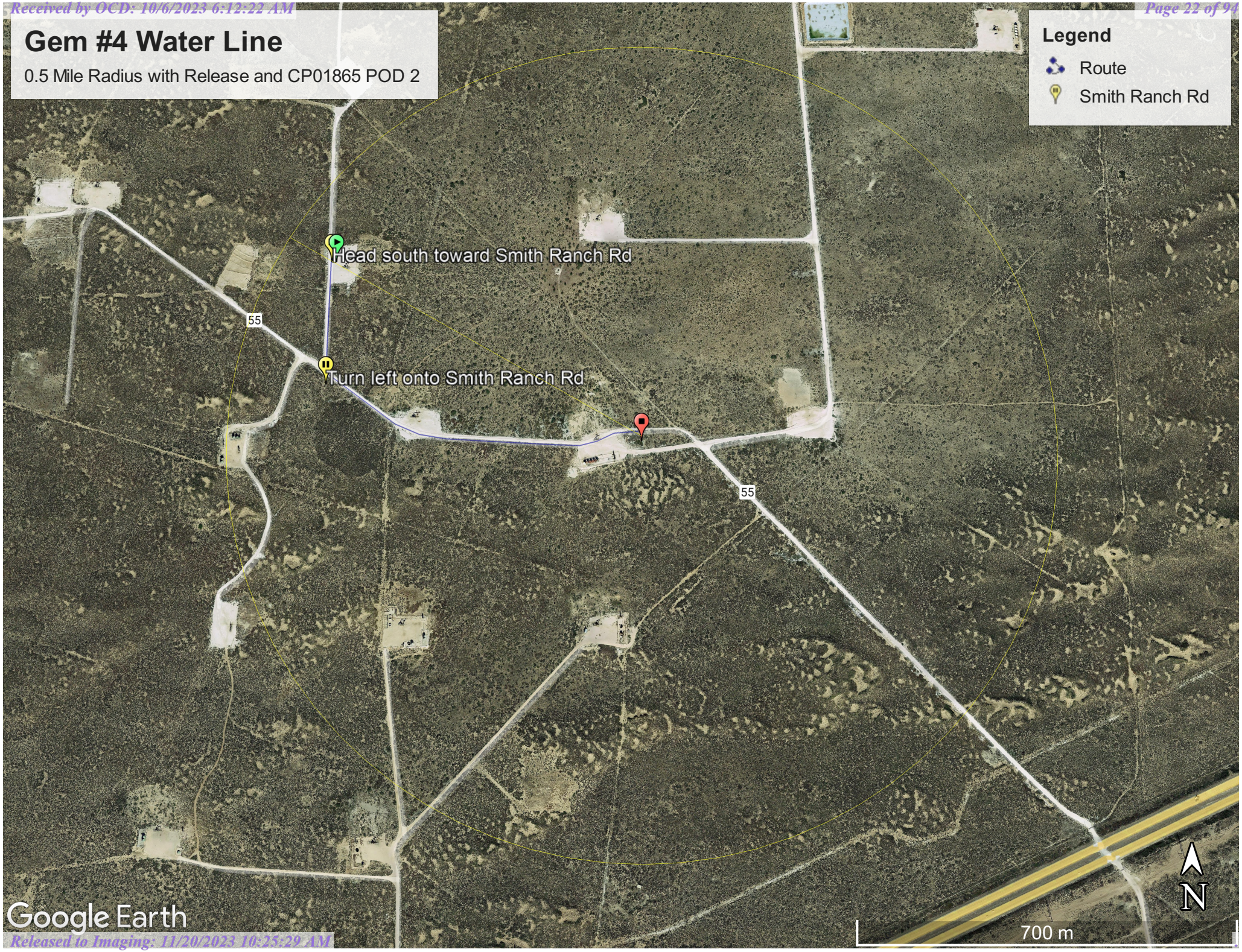
Gem #4 Water Line

Nearest Water Well 0.45 Miles (2,377 Feet)


Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the circumference or area of a circle on the ground
Radius: 0.50 Miles
Area: 22,201,954.00 Square Feet
Circumference: 3.16 Miles
Mouse Navigation
Save
Clear
Gem 8
Gem 8
.599843 -103.641820
Gem 6
Gem 6
Gem 7
Gem 7
55
Gem #5
Gem #5
Gem 4
Gem 4
Gem SWD
Gem SWD
55
Google Ea

Gem #4 Water Line

0.5 Mile Radius with Release and CP01865 POD 2



New Mexico Office of the State Engineer
Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters)

Well Tag	POD Number	Q64	Q16	Q4	Sec	Tws	Rng	X	Y
NA	CP 01865 POD1	4	3	2	02	20S	33E	628390	3608155

Driller License: 1753 **Driller Company:** VANGUARD WATER WELLS

Driller Name: FRIESSEN, JACOBOIEL.NER

Drill Start Date: 02/08/2021 **Drill Finish Date:** 02/08/2021 **Plug Date:**

Log File Date: 07/22/2021 **PCW Rcv Date:** **Source:**

Pump Type: **Pipe Discharge Size:** **Estimated Yield:** 0 GPM

Casing Size: 2.00 **Depth Well:** 105 feet **Depth Water:** 0 feet

New Mexico Office of the State Engineer
Water Column/Average Depth to Water

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters) (In feet)

POD Number	Code	POD Sub-basin	County	Q 64	Q 16	Q 4	Sec	Tws	Rng	X	Y	Distance	Depth Well	Depth Water	Water Column
CP 01865 POD2		CP	LE	3	1	3	02	20S	33E	627454	3607733	706	105	0	105
CP 01865 POD1		CP	LE	4	3	2	02	20S	33E	628390	3608155	841	105	0	105
CP 00748 POD1		CP	LE			2	01	20S	33E	630197	3608428*	2375			
CP 00653 POD1		CP	LE		4	4	04	20S	33E	625573	3607367*	2492	60		
CP 00798 POD1		CP	LE	2	1	1	24	20S	33E	629348	3603892*	3715	850		
CP 00658 POD1		CP	LE	2	2	4	26	19S	33E	628857	3611125*	3828	100		
CP 00750 POD1		CP	LE		3	4	07	20S	34E	631639	3605834*	3892	320		
L 07213		L	LE	4	1	4	31	19S	34E	631700	3609351*	4134	160	110	50

Average Depth to Water: **36 feet**
Minimum Depth: **0 feet**
Maximum Depth: **110 feet**

Record Count: 8

UTMNAD83 Radius Search (in meters):

Easting (X): 628065.87 **Northing (Y):** 3607379.18 **Radius:** 5000

***UTM location was derived from PLSS - see Help**

6/15/22 11:04 AM

WATER COLUMN/ AVERAGE DEPTH TO WATER

U.S. Fish and Wildlife Service

National Wetlands Inventory

Nearest Continuously Flowing Watercourse

October 5, 2023

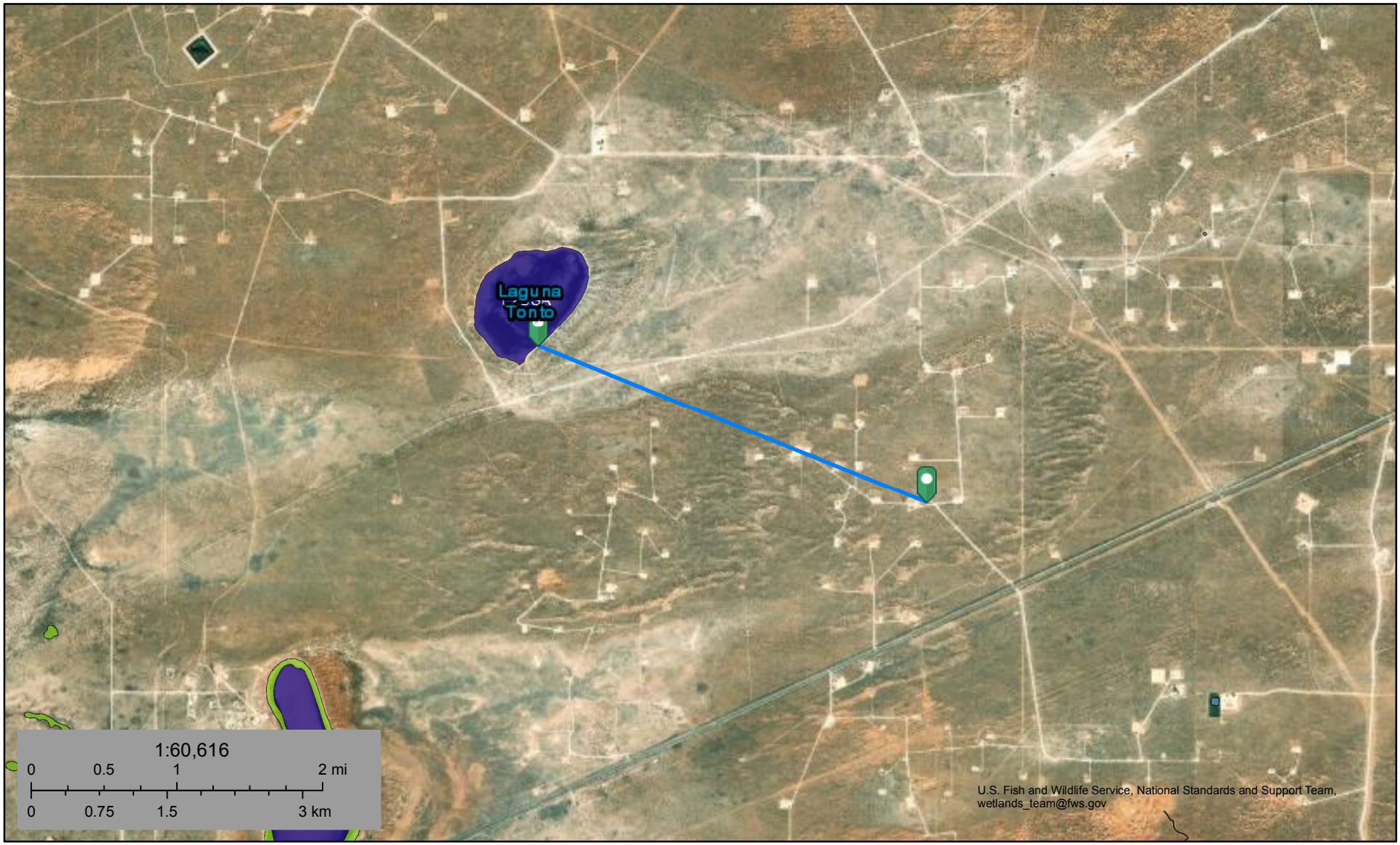
Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

U.S. Fish and Wildlife Service
National Wetlands Inventory

Laguna Tonto 2.42 Miles (12,793 Feet)



June 15, 2022

Wetlands

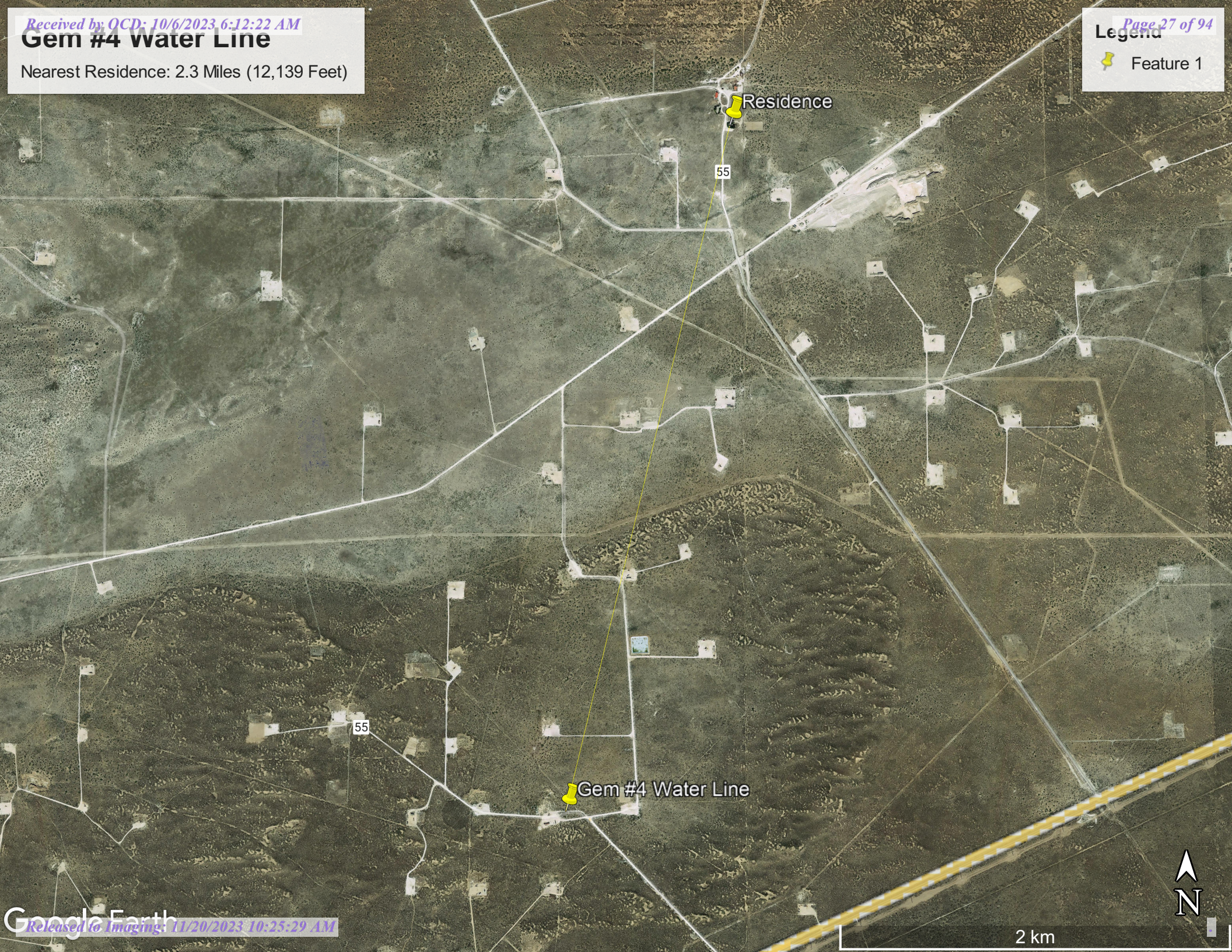
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Gem #4 Water Line

Nearest Residence: 2.3 Miles (12,139 Feet)



U.S. Fish and Wildlife Service
National Wetlands Inventory

Nearest Wetland 3.56 Miles (18,788 Feet)

June 15, 2022

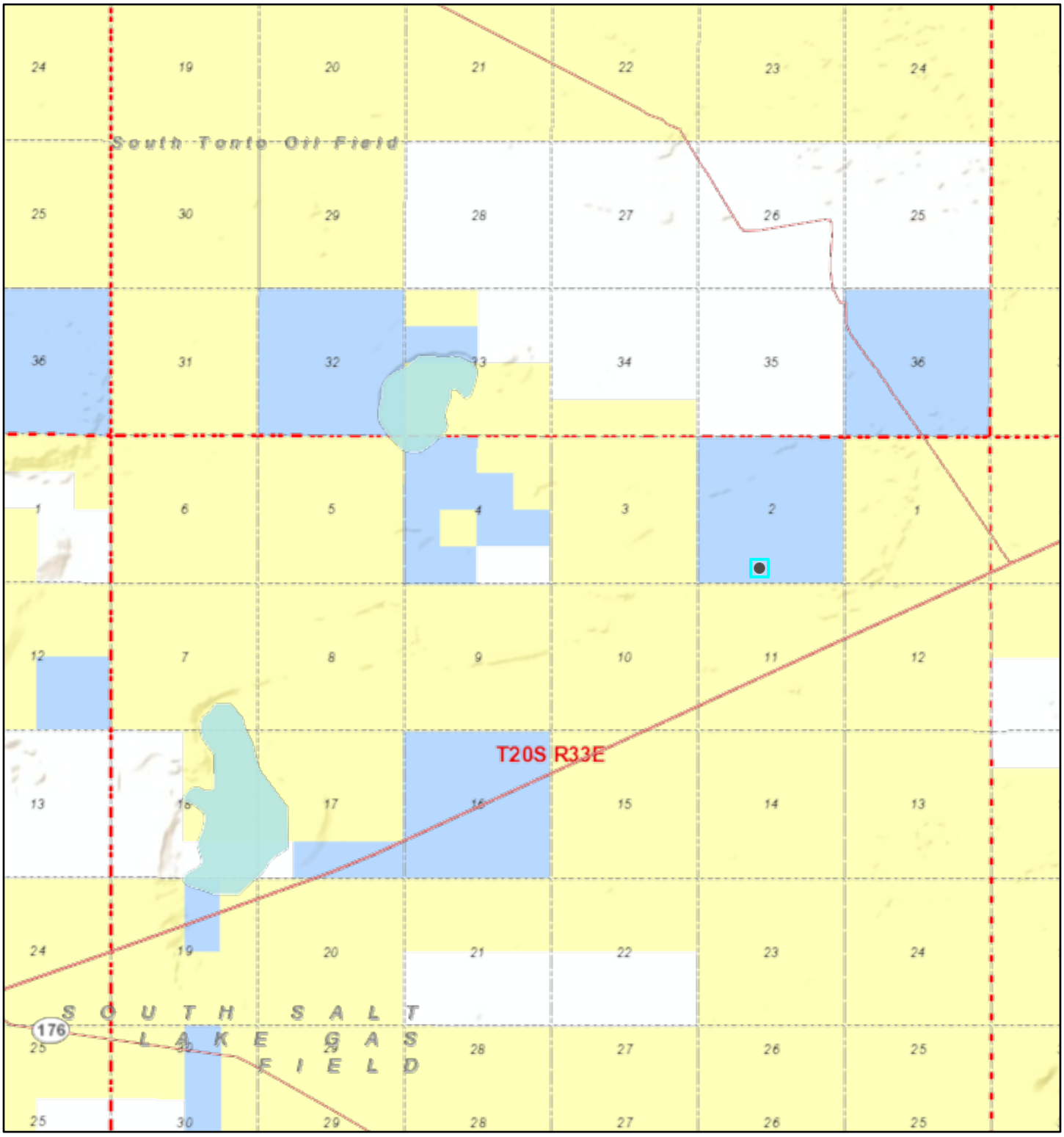
Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Active Mines in New Mexico



6/15/2022, 1:06:47 PM

1:72,224

0 0.5 1 2 mi

0 0.75 1.5 3 km

Township / Range
Sections

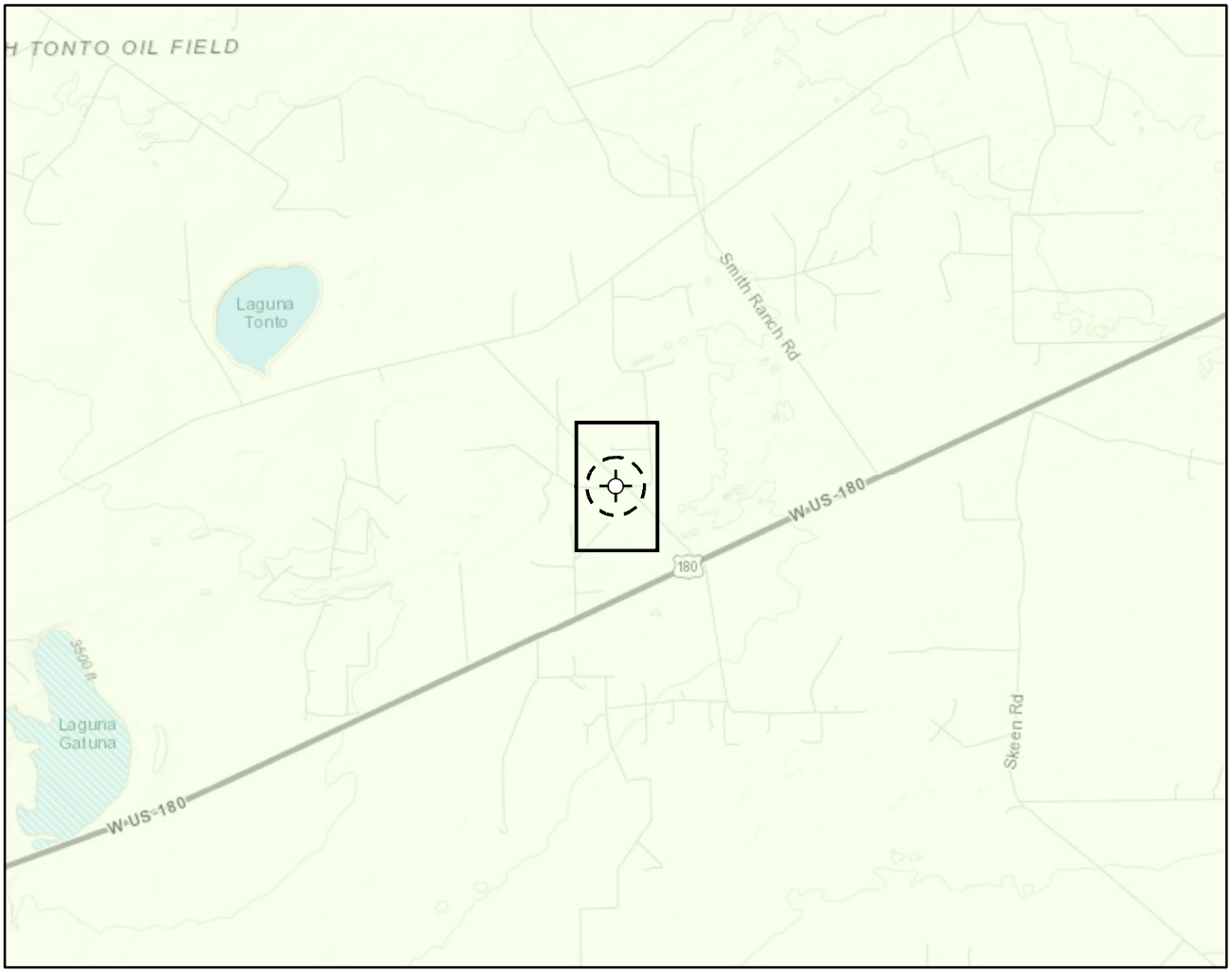
Land Ownership

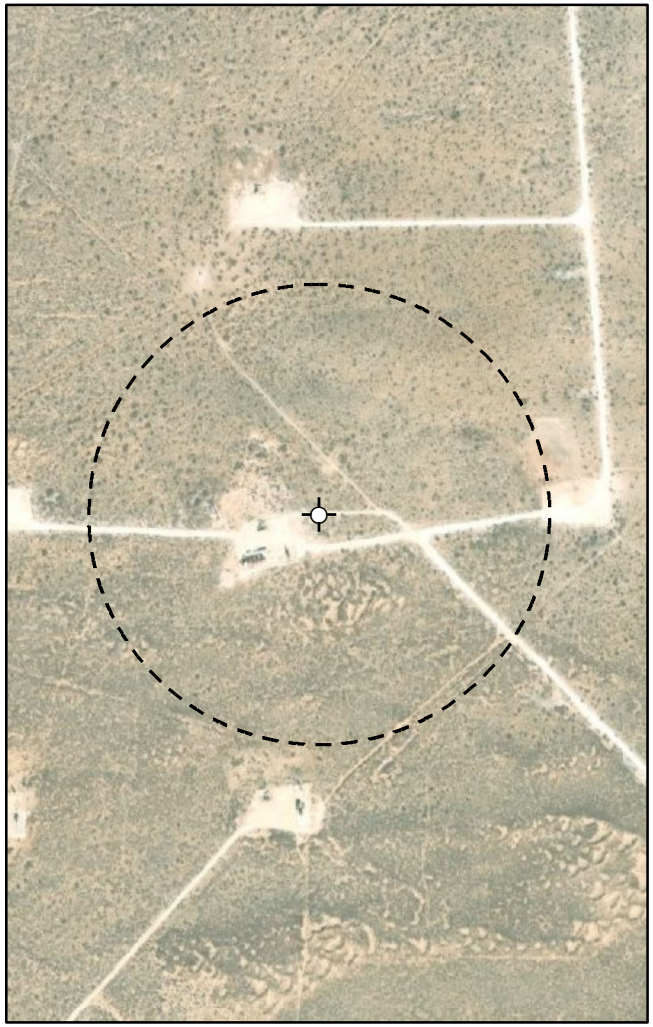
Bureau of Land Management
Bureau of Reclamation
Department of Agriculture
Department of Defense
Department of Energy
National Park Service
Private Land
State Game and Fish
State Land
State Parks
Tribal

U.S. Bureau of Land Management - New Mexico State Office, Sources: Esri, USGS, NOAA, Sources: Esri, Garmin, USGS, NPS

EMNRD MMD GIS Coordinator

New Mexico Energy, Minerals and Natural Resources Department (http://nm-emnrd.maps.arcgis.com/apps/webappviewer/index.html?id=1b5e577974664d689b47790897ca2795)





Karst Potential

- Critical
- High
- Medium
- Low

- Site Location
- Site Location Buffer (1,000 ft.)

Overview Map

0 0.25 0.5 1 mi

Detail Map

0 150 300 600 ft.

VERTEX

Map Center:
Lat/Long: 32.596510, -103.635310

NAD 1983 UTM Zone 13N
Date: Jun 15/22

N

Karst Potential
Gem #4 Water Line

FIGURE:
X

BTA

Geospatial data presented in this figure may be derived from external sources and Vertex does not assume any liability for inaccuracies. This figure is intended for reference use only and is not certified for legal, survey, or engineering purposes.

Note: Inset Map, ESRI 2018; Overview Map: ESRI World Topographic. Karst potential data sourced from Rosswell Field Office, Bureau of Land Management, 2020 or United States Department of the Interior, Bureau of Land Management. (2018). Karst Potential.

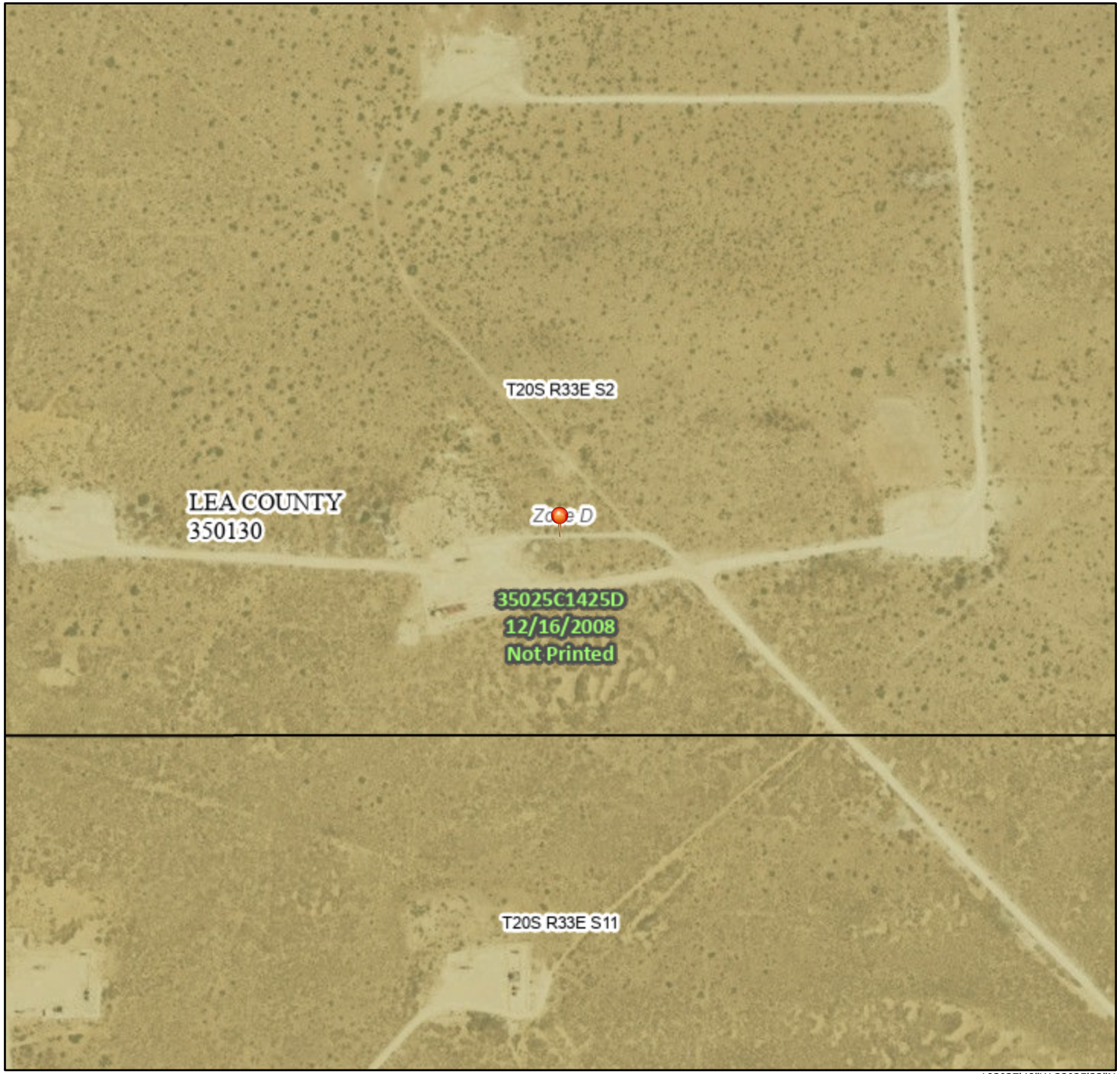
VERSATILITY. EXPERTISE.

Document Path: G:\1-Projects_US PROJECTS\BTA Oil Producers LLC\22E-02120 - Gem #4 Water Line\Figure X Karst Potential Gem #4 Water Line.mxd

National Flood Hazard Layer FIRMette

FEMA

103°38'26"W 32°36'3"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

103°37'48"W 32°35'32"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/14/2023 at 3:29 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Lea County, New Mexico

TF—Tonuco loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tw3c
Elevation: 3,280 to 4,460 feet
Mean annual precipitation: 10 to 16 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Tonuco and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tonuco

Setting

Landform: Ridges, plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits

Typical profile

A - 0 to 12 inches: loamy fine sand
Bw - 12 to 17 inches: loamy sand
Bkkm - 17 to 39 inches: cemented material

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 12 to 20 inches to petrocalcic
Drainage class: Excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R077DY048TX - Shallow 12-17" PZ
Hydric soil rating: No

Minor Components

Simona
Percent of map unit: 15 percent
Landform: Ridges, plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: R070BD002NM - Shallow Sandy
Hydric soil rating: No

Berino
Percent of map unit: 10 percent
Landform: Ridges, plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: R070BD003NM - Loamy Sand
Hydric soil rating: No

Cacique
Percent of map unit: 5 percent
Landform: Ridges, plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: R070BD004NM - Sandy
Hydric soil rating: No

Data Source Information

Soil Survey Area: Lea County, New Mexico
Survey Area Data: Version 19, Sep 8, 2022

USDA Natural Resources Conservation Service

Ecological site R077DY048TX
Shallow 12-17" PZ

Accessed: 08/14/2023

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

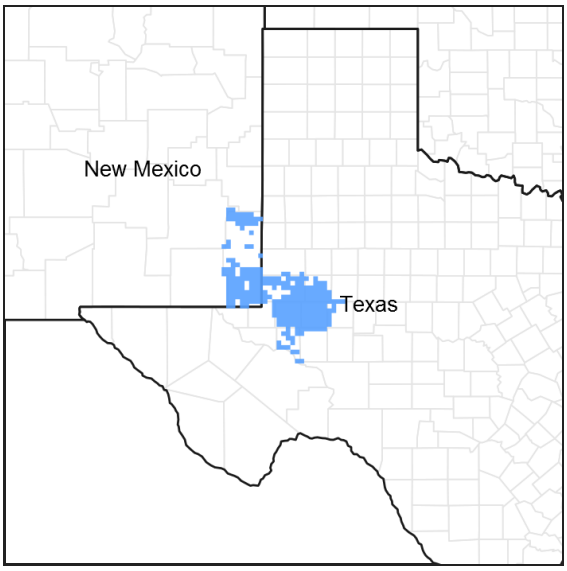


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 077D–Southern High Plains, Southwestern Part

This MLRA 77D is characterized by nearly level to gently undulating plains with scattered playa depressions. Soil temperature regime is thermic and soil moisture regime is aridic bordering on ustic. Sandy and loamy soils are generally well drained and range from shallow to deep and medium- to coarse-textured. Native vegetation is short- to midgrasses and sandy sites support tallgrasses with sand shin oak and mesquite. Current land use is mainly rangeland, although irrigated cropland is expanding.

Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296

Ecological site concept

This site occurs on shallow, calcareous soils on uplands. The reference vegetation consists of primarily shortgrasses with midgrasses, few forbs, and very few shrubs. Abusive grazing practices can lead to a shift in the plant community. Removal of fire from the ecosystem can lead to an increase in woody plant cover.

Associated sites

R077DY042TX	**Limy Upland 12-17" PZ** Shallow sites can be found adjacent to limy upland sites. The limy upland sites will occur as gently undulating soils that occur on broad upland plains.
R077DY047TX	**Sandy Loam 12-17" PZ** Sandy loam sites occur adjacent to shallow sites as deeper soils on nearly level plains.

Similar sites

R077DY047TX	**Sandy Loam 12-17" PZ** Sandy loam sites have similar forage plant communities with higher production potential.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Bouteloua eriopoda*

Physiographic features

Soils correlated in the MLRA 77D Shallow ecological site are shallow to a petrocalcic horizon. They were formed in moderately fine textured eolian sediments of the Blackwater Draw Formation of Pleistocene age. These soils are typically on gently sloping plains, narrow ridges, and side slopes along draws. Slope ranges from 0 to 15 percent.

The landforms for the Shallow site include Plain, Ridge, and Side slopes.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	2,000–5,000 ft
Slope	0–15%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

Continental Steppe climate is prevalent in MLRA 77D. This climate type is typical of interiors of continents and is characterized by large variations in the magnitude of ranges in daily temperature extremes, low relative humidity, and irregularly spaced rainfall of moderate amounts. This climate regime is also known for being semi-arid with mild winters.

Droughts occur with monotonous frequency although there will be years having excessive precipitation resulting in large accumulations of water that little benefit is obtained from the rainfall events. If good rains occur in the spring and summer months, annual production will be favorable even if the remainder of the year is not favorable. Most of the annual precipitation occurs as a result from spring and early summer thunderstorms. Due to the fact that the area is mainly flat, local flooding may occur but only of short duration. There is very little precipitation and infrequent snowfall amounts in the winter.

During the late winter and early spring months, dust storms occur very frequently. The flat plains of the area contribute very little resistance to the strong winds. Dust in many of these storms remains in the air for several days after the storms have passed.

Daytime temperatures are warm in the summer but there is a large diurnal range and most nights are comfortable. In summers, the normal daily maximum temperatures are in the low to mid 90s and the normal minimum temperatures are in the upper 60s and low 70s. Even though the temperatures may be high, the low humidity and high evaporation rates create a cooling effect during the nighttime hours. Fall months exhibit extremely variable weather. Winters are mild and are characterized by frequent cold fronts accompanied by strong, gusty, northerly winds. Most of the cold fronts are dry as they pass through the area.

Table 3. Representative climatic features

Frost-free period (average)	211 days
Freeze-free period (average)	233 days
Precipitation total (average)	20 in

Influencing water features

Soil features

The soils of this site are very shallow to shallow well drained, calcareous, gravelly soils. Permeability is moderate and runoff is low to medium. Parent material is a thin mantle of medium to moderately coarse textured eolian sediments over an indurated layer.

Major Soil Taxonomic Units correlated to this site include: Blakeney soils, Conger soils, Simona soils, and Slaughter soils.

Table 4. Representative soil features

Surface texture	(1) Gravelly clay loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	7–20 in
Surface fragment cover <=3"	0–35%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2–3 in
Calcium carbonate equivalent (0-40in)	10–60%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–65%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

The Reference Plant Community of the Shallow Ecological Site was a Shortgrass/Midgrass Community (1.1). Few if any tallgrass species could be found. Grass species accounted for 90 percent of the total site production. A wide variety of forbs are produced on this site with scattered woody shrubs equally accounting for 10 percent of the total annual production. This site occurs on gently to moderately sloping upland areas. Slopes typically range from 1 to 5 percent. The soils of the site vary from shallow fine sandy loams to loams with a depth of 12 to 20 inches over indurated caliche. The soils have good plant-soil-moisture relationships, but moisture-holding capacity is moderate, often limiting productivity.

The dominant shortgrass species is black grama (*Bouteloua eriopoda*), with lesser amounts of buffalograss (*Bouteloua dactyloides*) and Wright threeawn (Aristida wrightii). Trace amounts of Hall's panicum (*Panicum hallii*), blue grama (*Bouteloua gracilis*) and hairy grama (*Bouteloua hirsuta*) can be found on the site. The dominant midgrass species is sideoats grama (*Bouteloua curtipendula*) and plains bristlegrass (*Setaria macrostachya*), with lesser amounts of cane bluestem (*Bothriochloa barbinodis*), Arizona cottontop (*Digitaria californica*), sand dropseed (*Sporobolus cryptandrus*), slim tridens (*Tridens muticus*), tobosagrass (*Pleuraphis mutica*), vine mesquite (*Panicum obtusum*), and Reverchon bristlegrass (*Setaria reverchonii*). A good variety of forbs exist but the amount varies greatly from year to year depending on moisture. The more commonly found forbs are trailing ratany (*Krameria lanceolata*), orange zexmania (Zexmania hispida), bush sunflower (*Simsia calva*), dotted gayfeather (*Liatris punctata*), white prairie clover (*Dalea albiflora*), gaura spp. (Gaura spp.), plains blackfoot (Melampodium leucanthus), tansy aster (*Machaeranthera tanacetifolia*), Texas croton (*Croton texensis*), Texas sleepy daisy (*Xanthisma texanum*), western ragweed (Ambrosia psilstachya), Oenothera spp. (Oenothera spp.), yellow spiny daisy (Haplpappus spinulosus), and desert holly (*Atriplex hymenelytra*). The major shrubs are catclaw acacia (*Acacia greggii*), vine ephedra (*Ephedra antisyphilitica*), lotebush (*Ziziphus obtusifolia*), pricklypear spp. (Opuntia spp.), javalina bush (*Condalia ericoides*), and winterfat (*Krascheninnikovia lanata*).

Fire plays a role in the ecology of this site as well as most other high plains sites. The general role of fire was to sustain the natural grassland and suppress shrubby species. Fire helps to keep a balance between the grasses, forbs and shrubs. However, in the shortgrass region, fire was probably secondary to climate in shaping the reference vegetative state. A drier climate (<20 inches annual precipitation) creates a situation where the subsoil is dry more often than it is wet. Plant roots grow in response to moisture and this dryer climate favors short grasses with fibrous root systems or short rhizomatous grasses. Annual forbs are stimulated by fire and diversity is generally increased. Heavy grazing after a fire can have a negative effect if conditions are dry and remain so for an extended period.

Periodic overgrazing and trampling by migrating herds of bison and elk as well as resident herds of pronghorn antelope occurred during drought periods. Bison moved about in large herds over the region somewhat regulated by water sources and fire frequency.

However, long rest periods followed once the large herds of bison moved out of the area, allowing the resilient grassland to re-establish and maintain its structure.

Variations in climatic factors, especially the amount and timing of precipitation, greatly influence the productivity of ecological sites and are largely responsible for the fluctuations in the amount of vegetative growth from one season to the next. It is not unusual for fluctuations of greater than 50% to occur from one year to another. These types of climatic variation are part of the overall environment in which the reference state developed. However, it needs to be pointed out that long-term drought (4 to 6 years of rainfall 50 percent below the mean) can act in concert with other forces to affect changes in plant communities. For instance, extended drought weakens plants and makes them more susceptible to the effects of overgrazing. Drought conditions coupled with fire can be damaging and need long periods of time to fully recover. Extremely dry summers followed by wet winters can favor cool-season annual grasses at the expense of perennial warm-season species. A well-adapted, healthy community could better withstand such rigors of drought. However, even they experience damage that would result in some departure from the former stable state. Usually, the departure would be temporary.

When domestic livestock were brought to the plains in the 1870's, it was largely an open range situation. By 1890, however, most of the area had been fenced and livestock were confined to these areas continually. Not understanding the limits of rangeland productivity, European settlers overstocked the area with domesticated livestock almost universally. As overgrazing occurred on this site, there was a reduction of the less grazing resistant

midgrass species, a decline in mulch and organic matter, and consequently a reduction in intensity and frequency of fires. The shift in plant cover to less palatable shortgrass species and the decline in soil cover, favors woody plant encroachment.

With continuous heavy grazing, no fire, no brush management and/or pest management this site will transition to the Shortgrass/Shrub/Annuals Community (1.2). As livestock and wildlife numbers increase and grazing use exceeds a plants ability to sustain defoliation, the more palatable and generally more productive species decline in stature, productivity and density. The tendency of this site is to become a shortgrass dominant site if long term grazing abuse occurs. This will lead to a decline in the vigor of sideoats grama and other palatable midgrass species. Croton species and western ragweed will increase and hairy tridens (*Erioneuron pilosum*), annual broomweed (Guitierrezia dracunculoides), broom snakeweed (*Gutierrezia sarothrae*), mesquite (*Prosopis glandulosa*) and numerous annuals will invade the site. The production of vegetation has shifted from mostly herbaceous vegetation to increasing amounts of woody shrubs. Herbaceous vegetation is still the largest production in this state. Nutrient cycling, the water cycle, watershed protection and biological functions have changed somewhat. This state can transition back to reference with good management practices such as prescribed grazing, brush management and pest management. Prescribed burning could be used if the fuel load and conditions allow.

If long-term, heavy grazing continues with no fire or any form of brush and pest management, a major threshold will be crossed to the Shrub/Shortgrass Community (2.1). In this state, mesquite, broom snakeweed and pricklypear will dominate the site. The typical shortgrass species will be perennial three-awns, hairy tridens and other invading low quality short grasses. Bare areas will increase with annuals filling the voids.

The loss of herbaceous cover and increased bare soil encourages accelerated erosion. Nutrient cycling, the water cycle, watershed protection and biological functions have been severely reduced.

The plant community is so degraded that it cannot reverse retrogression without extensive energy and management inputs. Prescribed grazing with rest periods during the growing season, re-seeding with adapted native grass species, chemical and/or mechanical brush management, and some form of pest management will be required to return this state back to the reference state. With the reduced amounts of grass fuel, prescribed burning is usually not an option in this state.

In the early 1930's Lehman lovegrass (*Eragrostis lehmanniana*), a grass of African origin, was introduced in the southern high plains as a drought tolerant, easy to establish introduced grass species. This grass species was used in many grass mixtures and pasture plantings in an attempt to re-seed poor condition rangeland following mechanical brush management and to return old cropland fields to a perennial vegetative state for livestock grazing purposes. This grass is both invasive and persistent; published evidence indicates that variables such as elevation, summer precipitation, winter temperatures, and soils impact its abundance and distribution. Shallow upland sites in a weakened state near established areas of Lehman lovegrass may become invaded by this grass. Presently, several thousand acres of loam, clay loam and sandy loam sites have been invaded to the point that Lehman lovegrass is the dominant grass species with few if any native species remaining. The resulting plant community is a Lehman Lovegrass/Shrub Dominant Community (3.1). Once this lovegrass has become well established, returning the site to reference would be expensive and generally not very successful or practical. Prescribed burning for seedbed preparation purposes may be necessary to remove excessive amounts of plant biomass. Moderate to heavy mechanical brush management, heavy seedbed preparation and re-seeding to a native grass mixture would be required. The application of herbicides can be effective to reduce competition from this lovegrass species, but there is only a narrow time of treatment opportunity. Since this grass species has become naturalized much like K.R. bluestem has in Central Texas, it is unlikely that it will disappear through any natural processes such as competition from native species.

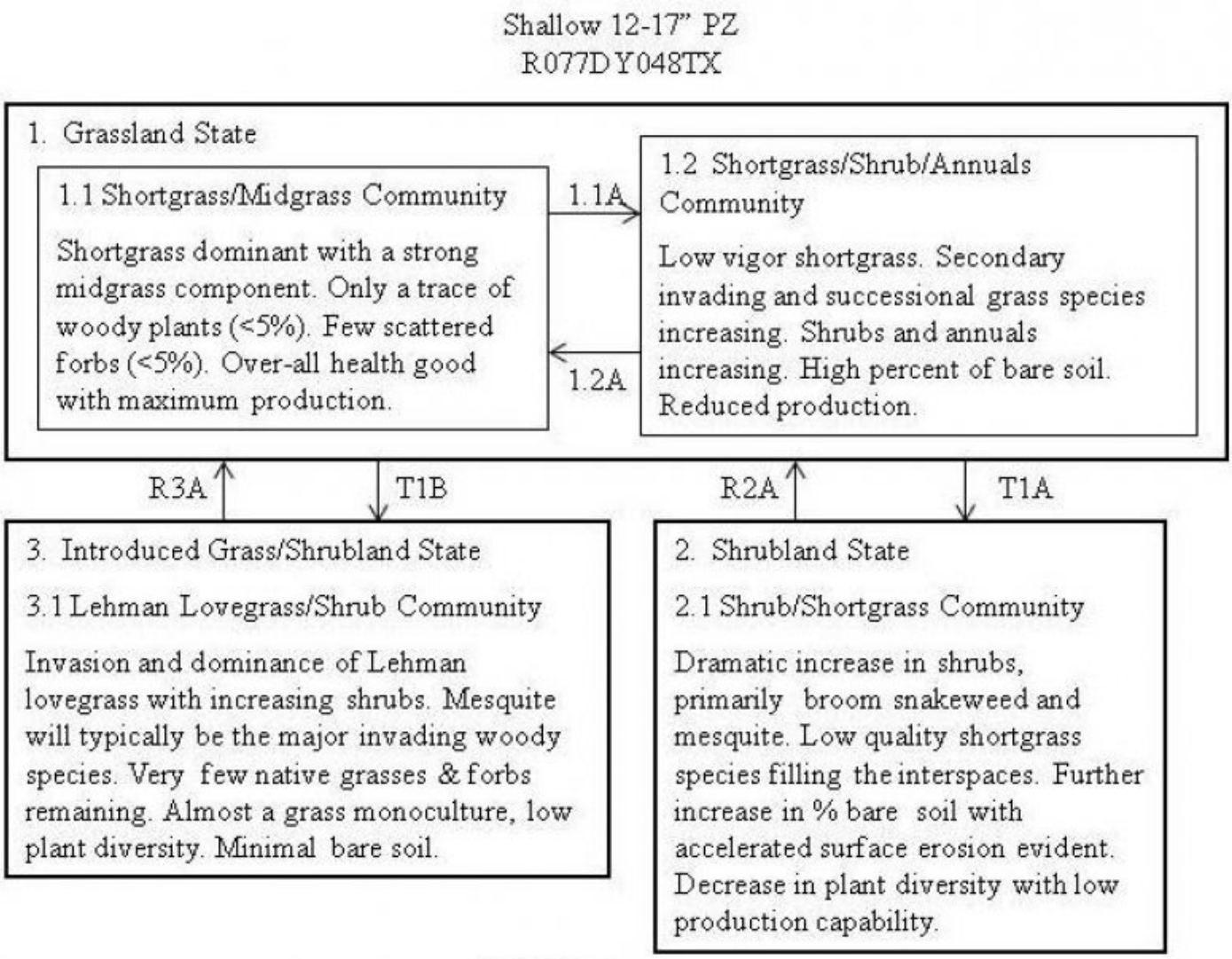
NOTE: Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

STATE AND TRANSITIONAL PATHWAYS: (DIAGRAM)

Narrative:
The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional

guidance should always be sought before pursuing a treatment scenario.

State and transition model



LEGEND

1.1A - Heavy Continuous Grazing, No Fire, No Brush Management, No Pest Management
1.2A - Prescribed Grazing, Prescribed Fire, Brush Management, Pest Management
T1A - Heavy Continuous Grazing, No Fire, Long-term Drought, No Brush Management, No Pest Management
R2A - Prescribed Grazing, Growing Season Rests, Brush Management, Range Planting, Pest Management
T1B - Heavy Continuous Grazing, Invasion Introduced Grass, No Fire, No Brush Management, No Pest Management
R3A - Prescribed Fire, Prescribed Grazing, Growing Season Rests, Brush Management, Range Planting, Pest Management

State 1
Grassland State

The Reference Plant Community of the Shallow Ecological Site is a Shortgrass/Midgrass Community (1.1). Few if any tallgrass species can be found. Grass species account for 90 percent of the total site production. A wide variety of forbs are produced on this site with scattered woody shrubs equally accounting for 10 percent of the total annual production. The dominant shortgrass species was black grama, with lesser amounts of buffalograss and Wright threeawn. With continuous heavy grazing, no fire, no brush management and/or pest management this site will

transition to the Shortgrass/Shrub/Annuals Community (1.2). As livestock and wildlife numbers increase and grazing use exceeds a plants ability to sustain defoliation, the more palatable and generally more productive species decline in stature, productivity and density. The tendency of this site is to become a shortgrass dominant site if long-term grazing abuse occurs. This will lead to a decline in the vigor of sideoats grama and other palatable midgrass species.

Community 1.1
Shortgrass/Midgrass Community

Figure 4. 1.1 Shortgrass/Midgrass Community

The Reference Plant Community of the Shallow Ecological Site is a Shortgrass/Midgrass Community (1.1). Grass species account for 90 percent of the total site production with black grama dominating and a strong midgrass component. A wide variety of forbs are produced on this site with scattered woody shrubs equally accounting for 10 percent of the total annual production. This site occurs on gently to moderately sloping upland areas. Slopes typically range from 1 to 5 percent. The shallow soils of the site vary from fine sandy loams to loams. The soils have good plant-soil-moisture relationships, but moisture-holding capacity is moderate, often limiting productivity. Most energy and nutrient cycling was contained in the narrow grass/soil interface and evapo-transpiration was minimal. Maintenance of this plant community requires continued proper grazing management as well as occasional brush and pest management.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	450	900	1350
Shrub/Vine	25	50	75
Forb	25	50	75
Tree	0	0	0
Microbiotic Crusts	0	0	0
Total	**500**	**1000**	**1500**

Figure 6. Plant community growth curve (percent production by month). TX1251, Warm-season bunchgrasses w/ forbs & shrubs. Warm-season bunchgrasses with forbs and shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	5	12	16	15	20	18	9	1	0

Community 1.2
Shortgrass/Shrub/Annuals Community

Figure 7. 1.2 Shortgrass/Shrub/Annuals Community

With continuous heavy grazing, no fire, no brush management and/or pest management this site will transition to the Shortgrass/Shrub/Annuals Community (1.2). As livestock and wildlife numbers increase and grazing use exceeds a plants ability to sustain defoliation, the more palatable and generally more productive species decline in stature, productivity and density. The tendency of this site is to become a shortgrass dominant site if long term grazing abuse occurs. This will lead to a decline in the vigor of sideoats grama and other palatable midgrass species. Croton species and western ragweed will increase and hairy tridens, annual broomweed, broom snakeweed, mesquite and numerous annuals will invade/increase on the site. The production of vegetation has shifted from mostly herbaceous vegetation to increasing amounts of woody shrubs. Herbaceous vegetation is still the largest production in this state. Nutrient cycling, the water cycle, watershed protection and biological functions have changed somewhat. This state can transition back to the reference community with good management practices such as prescribed grazing, brush management and pest management. Prescribed burning could be used if the fuel load and conditions allow.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	300	600	900
Shrub/Vine	200	300	400
Forb	60	80	100
Tree	0	0	0
Microbiotic Crusts	0	0	0
Total	**560**	**980**	**1400**

Figure 9. Plant community growth curve (percent production by month). TX1252, Shortgrass Dominant/Invading Shrub Community. Warm-season shortgrasses with increasing shrubs and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	5	12	16	15	20	18	9	1	0

Pathway 1.1A
Community 1.1 to 1.2

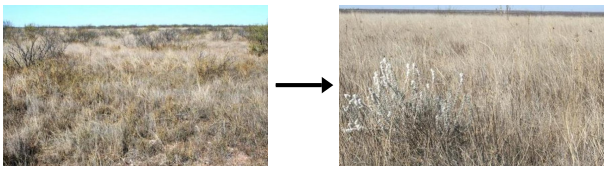
Shortgrass/Midgrass Community

Shortgrass/Shrub/Annuals Community

With continuous heavy grazing, no fire, no brush management and/or pest management this site will shift to the

Shortgrass/Shrub/Annuals Community (1.2). As livestock and wildlife numbers increase and grazing use exceeds a plants ability to sustain defoliation, the more palatable and generally more productive species decline in stature, productivity and density.

Pathway 1.2A
Community 1.2 to 1.1



Shortgrass/Shrub/Annuals Community **Shortgrass/Midgrass Community**

This state can transition back to near reference conditions with good management practices such as prescribed grazing, brush management and pest management. Prescribed burning could be used if the fuel load and conditions allow.

Conservation practices

Brush Management
Prescribed Burning
Integrated Pest Management (IPM)
Prescribed Grazing

State 2
Shrubland State

If long-term, heavy grazing continues with no fire or any form of brush and pest management, a major threshold will be crossed from the Grassland State (1.0) to the Shrubland State (2.0). In this state, mesquite, broom snakeweed and pricklypear will dominate the site. The typical shortgrass species will be perennial three-awns, hairy tridens and other invading low quality short grasses. Bare areas will increase with annuals filling the voids.

Community 2.1
Shrub/Shortgrass Community

Figure 10. 2.1 Shrub/Shortgrass Community

If long-term, heavy grazing continues with no fire or any form of brush and pest management, a major threshold will be crossed to the Shrub/Shortgrass Community (2.1). In this state, mesquite, broom snakeweed and pricklypear will dominate the site. The typical shortgrass species will be perennial threeawns, hairy tridens and other invading low quality short grasses. Bare areas will increase with annuals filling the voids. The loss of herbaceous cover and increased bare soil encourages accelerated erosion. Nutrient cycling, the water cycle, watershed protection and

biological functions have been severely reduced. The plant community is so degraded that it cannot reverse retrogression without extensive energy and management inputs. Prescribed grazing with rest periods during the growing season, re-seeding with adapted native grass species, chemical and/or mechanical brush management, and some form of pest management will be required to return this state back to the reference state. With the reduced amounts of grass fuel, prescribed burning is usually not an option in this state.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	400	500	600
Grass/Grasslike	150	300	450
Forb	60	80	100
Microbiotic Crusts	0	0	0
Tree	0	0	0
Total	**610**	**880**	**1150**

Figure 12. Plant community growth curve (percent production by month). TX1254, Shrub/Shortgrass/Annuals Community. Spring and fall growth of shortgrasses, annuals, and shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	4	6	10	16	15	20	15	12	1	0

State 3
Introduced Grass/Shrubland State

Lehman lovegrass is the dominant grass species with few if any native species remaining. The resulting plant community is a Lehman Lovegrass/Shrub Dominant Community (3.1). Once this lovegrass has become well established, returning the site to the reference state(1)would be expensive and generally not very successful or practical.

Community 3.1
Lehman Lovegrass/Shrub Community

Figure 13. 3.1 Lehman Lovegrass/Shrub Community

Several thousand acres of loam, clay loam and sandy loam sites in the southern high plains that are in a degraded state have been invaded by Lehman lovegrass to the point that it is the dominant grass species with few if any native species remaining. The resulting plant community is a Lehman Lovegrass/Shrub Dominant Community (3.1). Once this lovegrass has become well established, returning the site to the reference state(1) would be expensive and generally not very successful or practical. Prescribed burning for seedbed preparation purposes may be necessary to remove excessive amounts of plant biomass. Moderate to heavy mechanical brush management,

heavy seedbed preparation and re-seeding to a native grass mixture would be required. The application of herbicides can be effective to reduce competition from this lovegrass species, but there is only a narrow time of treatment opportunity. It is unlikely that Lehman loverass will disappear through any natural processes such as competition from native species.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1200	2100	3000
Shrub/Vine	300	550	800
Forb	5	10	15
Tree	0	0	0
Microbiotic Crusts	0	0	0
Total	**1505**	**2660**	**3815**

Figure 15. Plant community growth curve (percent production by month). TX1255, Lehman Lovegrass/Shrub Dominant Community. Lehman lovegrass with shrub dominance..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	8	16	18	12	15	18	6	1	0

Transition T1A
State 1 to 2

If long-term, heavy grazing continues with no fire or any form of brush and pest management, a major threshold will be crossed from the Shortgrass/Shrubs/Annuals Community (1.2) to the Shrub/Shortgrass Community (2.1). In this state, mesquite, broom snakeweed and pricklypear will dominate the site.

Transition T1B
State 1 to 3

If long-term, heavy grazing continues with no fire or any form of brush and pest management, along with encroachment of introduced grasses such as Lehman lovegrass, a major threshold will be crossed from the Shortgrass/Shrubs/Annuals Community (1.2) to the Lehman lovegrass/ Shrubs Community. Dominant species include Lehman lovegrass and mesquite.

Restoration pathway R2A
State 2 to 1

The plant community is so degraded that it cannot reverse retrogression without extensive energy and management inputs. Prescribed grazing with rest periods during the growing season, re-seeding with adapted native grass species, chemical and/or mechanical brush management, and some form of pest management will be required to return this state back to the reference state(1). With the reduced amounts of grass fuel, prescribed burning is usually not an option in this state.

Conservation practices

Brush Management
Range Planting
Integrated Pest Management (IPM)
Prescribed Grazing

Restoration pathway R3A

State 3 to 1

Returning the site to the reference state would be expensive and generally not very successful or practical. Prescribed burning for seedbed preparation purposes may be necessary to remove excessive amounts of plant biomass. Moderate to heavy mechanical brush management, heavy seedbed preparation and re-seeding to a native grass mixture would be required.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Shortgrass**			125–375	
	black grama	BOER4	*Bouteloua eriopoda*	125–375	–
2	**Midgrass**			100–300	
	sideoats grama	BOCU	*Bouteloua curtipendula*	100–300	–
3	**Midgrasses**			175–525	
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	50–150	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	25–75	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	25–75	–
	Arizona cottontop	DICA8	*Digitaria californica*	25–75	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	25–75	–
	vine mesquite	PAOB	*Panicum obtusum*	0–1	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–1	–
4	**Shortgrasses**			50–150	
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	25–75	–
	buffalograss	BODA2	*Bouteloua dactyloides*	25–75	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–5	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–5	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0–5	–
Forb					
5	**Forbs**			25–75	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	2–5	–
	desertholly	ATHY	*Atriplex hymenelytra*	2–5	–
	Texas croton	CRTE4	*Croton texensis*	2–5	–
	whiteflower prairie clover	DAAL	*Dalea albiflora*	2–5	–
	beeblossom	GAURA	*Gaura*	2–5	–
	trailing krameria	KRLA	*Krameria lanceolata*	2–5	–
	dotted blazing star	LIPU	*Liatris punctata*	2–5	–

	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	2–5	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	2–5	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	2–5	–
	evening primrose	OENOT	*Oenothera*	2–5	–
	awnless bushsunflower	SICA7	*Simsia calva*	2–5	–
	Texas sleepydaisy	XATE	*Xanthisma texanum*	2–5	–
Shrub/Vine					
6	**Shrubs**			25–75	
	bigtooth maple	ACGRG	*Acer grandidentatum var. grandidentatum*	4–12	–
	catclaw acacia	ACGRG3	*Acacia greggii var. greggii*	4–12	–
	javelina bush	COER5	*Condalia ericoides*	4–12	–
	clapweed	EPAN	*Ephedra antisyphilitica*	4–12	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	4–12	–
	pricklypear	OPUNT	*Opuntia*	4–12	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	4–12	–

Animal community

This site is inhabited by dove, quail, deer and pronghorn. Limited populations of pronghorn antelope frequent the site. The limited amount of woody plants does not provide good cover and food sources for deer.

This rating system provides general guidance as to animal preference for plant species. It also indicates possible competition between kinds of herbivores for various plants. Grazing preference changes from time to time, especially between seasons, and between animal kinds and classes. Grazing preference does not necessarily reflect the ecological status of the plant within the plant community. For wildlife, plant preferences for food and plant suitability for cover are rated.

Preferred (P) – Percentage of plant in animal diet is greater than it occurs on the land
Desirable (D) – Percentage of plant in animal diet is similar to the percentage composition on the land
Undesirable (U) – Percentage of plant in animal diet is less than it occurs on the land
Not Consumed (N) – Plant would not be eaten under normal conditions; only consumed when other forages not available.
Used, but degree of utilization unknown (X) – Percentage of plant in animal diet is unknown
Toxic (T) – Rare occurrence in diet and, if consumed in any tangible amounts results in death or severe illness in animal

Hydrological functions

These shallow soils have moderate to moderately low runoff potential due to slopes which range from 1 to 5 percent. These soils are fertile and absorb water at a moderate rate. Moisture storage is limited by the 12 to 20 inch depth to indurated caliche.

Recreational uses

This site has very little value from an aesthetic standpoint. The site is occupied almost exclusively by native short and midgrass species with few woody shrubs. Recreational activities could include bird hunting, camping, hiking, bird watching, photography, and horseback riding.

Wood products

None.

Other products

None.

Other information

None.

Inventory data references

NRCS FOTG – Section II of the FOTG Range Site Descriptions and numerous historical accounts of vegetative conditions at the time of early settlement in the area were used in the development of this site description. Vegetative inventories were made at several site locations for support documentation.

Inventory Data References (documents):
NRCS FOTG – Section II - Range Site Descriptions
NRCS Clipping Data summaries over a 20 year period

Other references

Reviewers and Technical Contributors:
Mark Moseley, RMS, NRCS, Boerne, Texas
Justin Clary, RMS, NRCS, Temple, Texas
Kelly Attebury, RSS, NRCS, Lubbock, Texas

Other references: (List other references used in the description or correlation of this site.)
J.R. Bell, USDA-NRCS Rangeland Management Specialist (retired)
Natural Resources Conservation Service - Range Site Descriptions
USDA-Natural Resources Conservation Service - Soil Surveys & Website soil database
Rathjen, Frederick W., The Texas Panhandle Frontier, Rev. 1998, Univ. of Texas Press
Hatch, Brown and Ghandi, Vascular Plants of Texas (An Ecological Checklist)
Texas A&M Exp. Station, College Station, Texas
Texas Tech University – Department of Natural Resources Management
Kingsbury, John M. (1964) Poisonous Plants of the United States and Canada.
Soil Science: November 1964 - Volume 98 - Issue 5 - ppg 349.
Sosebee, Ronald E. Timing – The Key to Herbicidal Control of Broom Snakeweed. Department of Natural Resources Management, Texas Tech University, Lubbock, Texas.

Contributors

Clint Rollins, RMS, NRCS, Amarillo, Texas

Acknowledgments

Site Development and Testing Plan

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem

condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Stan Bradbury, Zone RMS, NRCS, Lubbock, Texas
Contact for lead author	806-791-0581
Date	09/04/2007
Approved by	Mark Moseley, RMS, NRCS, Boerne, Texas
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slight to moderate.

2. **Presence of water flow patterns:** Slight to moderate.

3. **Number and height of erosional pedestals or terracettes:** Slight to moderate.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20-25% bare ground.

5. **Number of gullies and erosion associated with gullies:** Slight to moderate.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None to slight.

7. **Amount of litter movement (describe size and distance expected to travel):** Slight to moderate.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Water erosion hazards are moderate to severe.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Shallow clays and clay loam surfaces; weak fine granular surface; hard; friable; few fine roots; calcareous; moderately alkaline; moderate permeability; well drained; good plant-soil moisture; moderate SOM.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Low vegetative cover and percent slopes makes this site susceptible to erosion.

This site is a very slowly permeable soil, runoff is medium to high depending on slopes and available water holding capacity is moderate to high.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

---

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Warm-season midgrasses > Warm-season shortgrasses>>

    Sub-dominant:

    Other: Forbs = Shrubs/Vines

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Grasses due to their growth habit will exhibit some mortality and decadence though minimal.

---

14. **Average percent litter cover (%) and depth (in):** Litter is dominantly herbaceous.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 500 to 1500 pounds per acre.

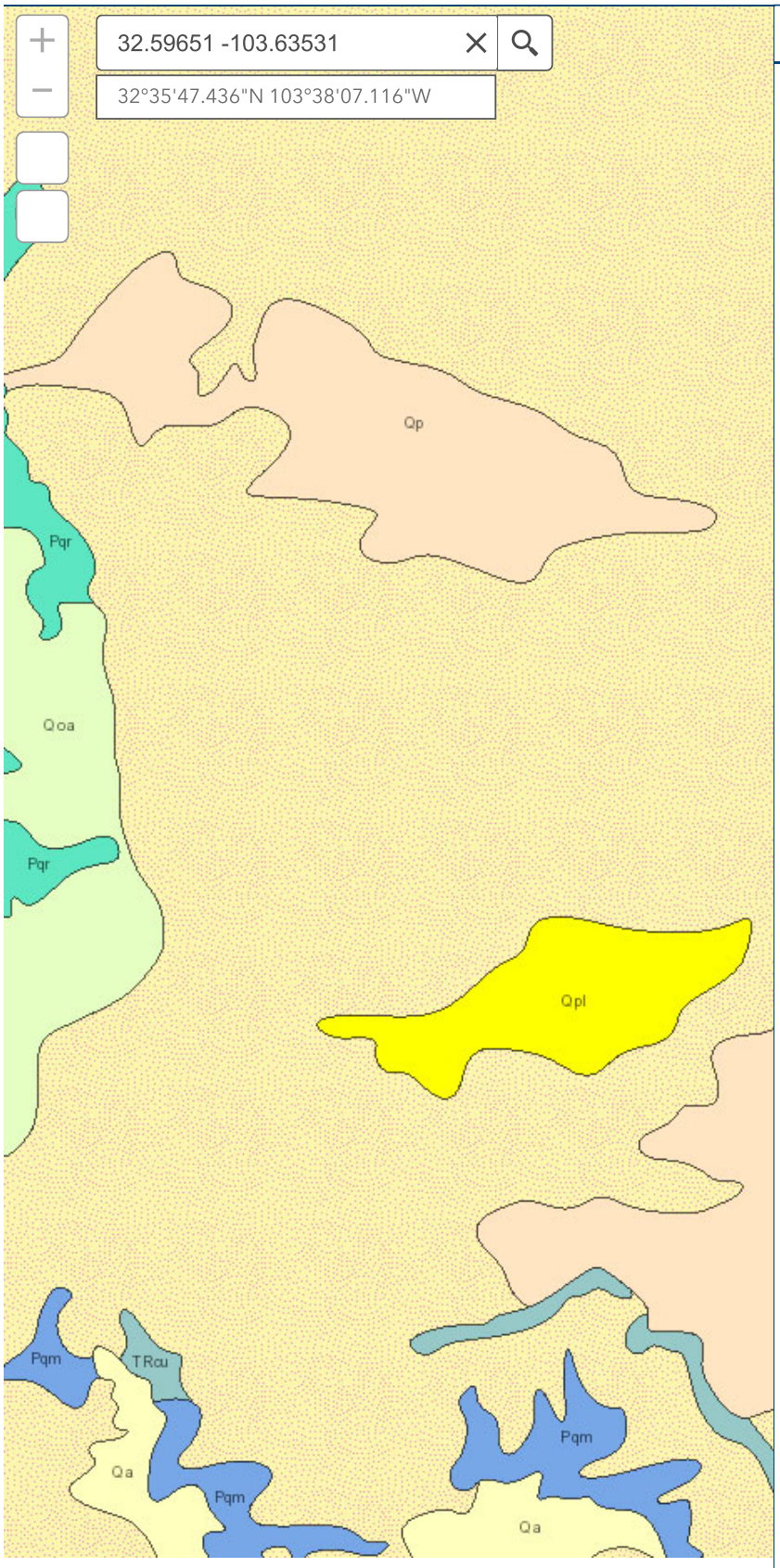
---

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Mesquite, pricklypear, and broom snakeweed can become invasive.

---

17. **Perennial plant reproductive capability:** All plant species should be capable of reproduction except during periods of prolonged drought conditions, heavy natural herbivory or intense wildfires.

NMBGMR Interactive Resources Map



Layer List

Layers

- Geographic_Resources
- Geologic_Resources
  - Precambrian
  - GEOCHRONOLOGY
  - Geologic Maps at 1:24,000 Scale
  - Geologic Maps at Other Scales
  - State Geologic Map 1:500,000
  - Quaternary Faults
  - Valles Caldera at 1:50,000 Scale
- Water_Resources
- Energy_Resources
- Mineral_Resources
- Recreation_Resources

App State

Click to restore the map extent and layers visibility where you left off.

APPENDIX C – Daily Field Reports

Daily Site Visit Report

Client:	BTA Oil Producers LLC	Inspection Date:	
Site Location Name:	Gem #4 Water Line	Report Run Date:	6/21/2023 9:33 PM
Client Contact Name:	Bob Hall	API #:	
Client Contact Phone #:	432-312-2203		
Unique Project ID		Project Owner:	
Project Reference #		Project Manager:	

Summary of Times

Arrived at Site	
Departed Site	

Field Notes

9:13 On site for delineation.

11:12 Gathered samples 01 through 08 at surface depth.

11:13 Updated field report with photos of sample point locations. Updated arc collector with points in the 2023 Characterization map.

13:23 Tested samples for chlorides using silver nitrate method. Samples 03, 04, and 08 were the only samples that were clean for chlorides. All other samples were high in chlorides.

14:28 Tested samples for hydrocarbons which all tested clean except for sample one which was high for hydrocarbons at 120ppm.

14:32 Filled out soil sample report.

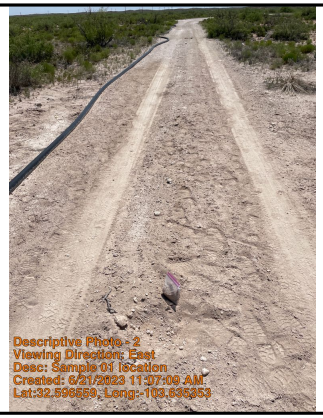
14:41 Jarred samples to send to lab.

Next Steps & Recommendations

1 Continue horizontal delineation and begin vertical delineation.

Daily Site Visit Report

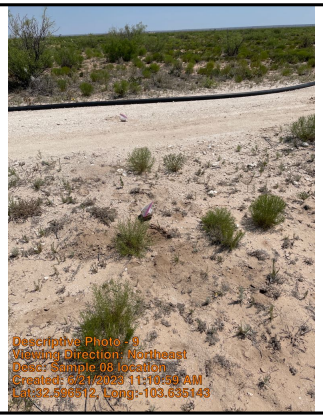
Site Photos

Viewing Direction: East	**Viewing Direction**: East
	
View of sample area	Sample 01 location
Viewing Direction: East	**Viewing Direction**: East
	
Sample 02 location	Sample 03 location

Daily Site Visit Report

Viewing Direction: Southeast	**Viewing Direction**: Southwest
	
Sample 04 location	Sample 05 location
Viewing Direction: East	**Viewing Direction**: North
	
Sample 06 location	Sample 07 location

Daily Site Visit Report

Viewing Direction: Northeast

Sample 08 location

Daily Site Visit Report

Daily Site Visit Signature

Inspector: Zachery Englebert

Signature: 

Daily Site Visit Report

Client:	BTA Oil Producers LLC	Inspection Date:	9/21/2023
Site Location Name:	Gem #4 Water Line	Report Run Date:	9/22/2023 12:59 AM
Client Contact Name:	Kelton Baird	API #:	
Client Contact Phone #:	432-312-2203		
Unique Project ID		Project Owner:	
Project Reference #		Project Manager:	

Summary of Times

Arrived at Site	9/21/2023 8:01 AM
Departed Site	9/21/2023 1:36 PM

Field Notes

15:50 Arrived on site. Filled out paperwork and went over tasks for the day with the TexMex crew.

15:52 Took one western wall sample and a base sample. Crew began removing inner corners and excess soil from inside excavation.

15:53 Field screened samples and jarred them up.

16:00 Crew loaded belly dumpers with excavated soil and it was trucked out.

16:01 Crew began building a berm around the perimeter of the excavation

Next Steps & Recommendations

1

Daily Site Visit Report

Site Photos

Viewing Direction: East

Excavation looking East

Viewing Direction: Southeast

Excavation looking southeast

Viewing Direction: Southwest

Excavation looking southwest

Viewing Direction: West

Excavation looking west

Daily Site Visit Report

Viewing Direction: Northwest	**Viewing Direction**: Northeast
	
Excavation looking northwest	Excavation looking northeast

Daily Site Visit Report

Daily Site Visit Signature

Inspector: Angela Mohle

Signature: 

APPENDIX D – Notification

Gmail **Dhugal Hanton <vertexresourcegroupusa@gmail.com>**

48-Hour Notification - Gem #4 Water Line

2 messages

Dhugal Hanton <vertexresourcegroupusa@gmail.com> Thu, Sep 14, 2023 at 9:38 AM
To: "Enviro, OCD, EMNRD" <OCD.Enviro@emnrd.nm.gov>
Cc: KBeaird@btaoil.com
Bcc: AMohle@vertex.ca

All,

Please accept this email as notification that Vertex Resource Services has scheduled a sampling event to be conducted at the following release.

nAPP2210967015

On Monday, September 18, 2023, at approximately 10:30 a.m., Vertex will be on-site to conduct confirmation sampling. The sampling will continue through Friday, September 22, 2023. This work is being done on behalf of BTA Oil Producers, LLC. If you have any questions regarding this notification, please call me at 575-988-1472.

Thank you,

Chance Dixon B.Sc.
Project Manager

Vertex Resource Services Inc.
3101 Boyd Drive,
Carlsbad, NM 88220

C 575.988.1472

Rodgers, Scott, EMNRD <Scott.Rodgers@emnrd.nm.gov> Thu, Sep 14, 2023 at 10:36 AM
To: Dhugal Hanton <vertexresourcegroupusa@gmail.com>
Cc: "KBeaird@btaoil.com" <KBeaird@btaoil.com>, "Velez, Nelson, EMNRD" <Nelson.Velez@emnrd.nm.gov>, "Bratcher, Michael, EMNRD" <mike.bratcher@emnrd.nm.gov>

The OCD has received your notification. Include a copy of this and all notifications in the remedial and/or closure reports to ensure the notifications are documented in the project file.

Thank you,

Scott

Scott Rodgers ● Environmental Specialist

Environmental Bureau

EMNRD - Oil Conservation Division

8801 Horizon Blvd. NE, Suite 260 | Albuquerque, NM 87113

505.469.1830 | scott.rodgers@emnrd.nm.gov

http://www.emnrd.nm.gov/ocd

From: Dhugal Hanton <vertexresourcegroupusa@gmail.com>
Sent: Thursday, September 14, 2023 9:38 AM
To: Enviro, OCD, EMNRD <OCD.Enviro@emnrd.nm.gov>
Cc: KBeaird@btaoil.com
Subject: [EXTERNAL] 48-Hour Notification - Gem #4 Water Line

CAUTION: This email originated outside of our organization. Exercise caution prior to clicking on links or opening attachments.

[Quoted text hidden]

APPENDIX E – Laboratory Data Reports and Chain of Custody Forms

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

August 01, 2023

CHANCE DIXON

VERTEX RESOURCE GROUP

420 SOUTH MAIN, SUITE 202

TULSA, OK 74103

RE: GEM #4 WATER LINE

Enclosed are the results of analyses for samples received by the laboratory on 07/26/23 14:05.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-22-15. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	07/26/2023	Sampling Date:	07/25/2023
Reported:	08/01/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Tamara Oldaker
Project Location:	BTA		

Sample ID: BH 23 -16 0' (H233901-01)

BTEX 8021B mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/31/2023	ND	2.19	110	2.00	1.62	
Toluene*	<0.050	0.050	07/31/2023	ND	2.11	105	2.00	0.190	
Ethylbenzene*	<0.050	0.050	07/31/2023	ND	2.17	109	2.00	1.73	
Total Xylenes*	<0.150	0.150	07/31/2023	ND	6.54	109	6.00	2.40	
Total BTEX	<0.300	0.300	07/31/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *103 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**768**	16.0	07/31/2023	ND	432	108	400	7.69	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	07/31/2023	ND	183	91.7	200	9.26	
DRO >C10-C28*	<10.0	10.0	07/31/2023	ND	194	97.1	200	5.38	
EXT DRO >C28-C36	<10.0	10.0	07/31/2023	ND					

Surrogate: 1-Chlorooctane *88.9 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *99.5 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	07/26/2023	Sampling Date:	07/25/2023
Reported:	08/01/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Tamara Oldaker
Project Location:	BTA		

Sample ID: BH 23 -16 2' (H233901-02)

BTEX 8021B mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/31/2023	ND	2.19	110	2.00	1.62	
Toluene*	<0.050	0.050	07/31/2023	ND	2.11	105	2.00	0.190	
Ethylbenzene*	<0.050	0.050	07/31/2023	ND	2.17	109	2.00	1.73	
Total Xylenes*	<0.150	0.150	07/31/2023	ND	6.54	109	6.00	2.40	
Total BTEX	<0.300	0.300	07/31/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *102 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**3560**	16.0	07/31/2023	ND	432	108	400	7.69	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	07/31/2023	ND	183	91.7	200	9.26	
DRO >C10-C28*	<10.0	10.0	07/31/2023	ND	194	97.1	200	5.38	
EXT DRO >C28-C36	<10.0	10.0	07/31/2023	ND					

Surrogate: 1-Chlorooctane *93.4 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *104 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	07/26/2023	Sampling Date:	07/25/2023
Reported:	08/01/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Tamara Oldaker
Project Location:	BTA		

Sample ID: BH 23 -16 4' (H233901-03)

BTEX 8021B mg/kg **Analyzed By: MS**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	07/31/2023	ND	2.19	110	2.00	1.62	
Toluene*	<0.050	0.050	07/31/2023	ND	2.11	105	2.00	0.190	
Ethylbenzene*	<0.050	0.050	07/31/2023	ND	2.17	109	2.00	1.73	
Total Xylenes*	<0.150	0.150	07/31/2023	ND	6.54	109	6.00	2.40	
Total BTEX	<0.300	0.300	07/31/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *104 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg **Analyzed By: AC**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**4040**	16.0	07/31/2023	ND	432	108	400	7.69	

TPH 8015M mg/kg **Analyzed By: MS**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	07/31/2023	ND	183	91.7	200	9.26	
DRO >C10-C28*	<10.0	10.0	07/31/2023	ND	194	97.1	200	5.38	
EXT DRO >C28-C36	<10.0	10.0	07/31/2023	ND					

Surrogate: 1-Chlorooctane *89.6 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *99.1 %* *49.1-148*

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Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name: Vertex Resource Group
Project Manager: Chance Dixon
Address: 3101 Boyd Dr
City: Carlsbad State: NM Zip: 88220
Phone #: Fax #:
Project #: 22E-02120 Project Owner:
Project Name: Gem #4 Water Line
Project Location:
Sampler Name: Hunter Klein

BILL TO
P.O. #: BTA Oil Producers
Company:
Attn: Kelton Beard
Address: 104 S. Pecos St.
City: Midland
State: TX Zip: 79701
Phone #: 432 682 3753
Fax #:

FOR LAB USE ONLY

Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	PRESERV.: ACID/BASE:	ICE / COOL	OTHER :	SAMPLING: DATE	TIME	ANALYSIS REQUEST: BTEX	TPH	Cl
H233901																	
1	BH23-16 0'	G	1			X							7/25/23	9:15	X	X	X
2	BH23-16 2'	G	1			X							7/25/23	9:20	X	X	X
3	BH23-16 4'	G	1			X							7/25/23	9:25	X	X	X

CASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequental damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: Hunter Klein Date: 7/25/23 Time: 3:00 PM
Received By:
Relinquished By: Date: 7-26-23 Time: 1405
Received By: Tamara Oldaker

Verbal Result: ☐ Yes ☐ No Add'l Phone #:
All Results are emailed. Please provide Email address:
REMARKS:

Delivered By: (Circle One)
Sampler - UPS - Bus - Other:
Observed Temp. °C 1.7
Corrected Temp. °C
Sample Condition: Cool ☑ Yes ☐ No Intact ☑ Yes ☐ No
CHECKED BY: (Initials) TO

Turnaround Time: Standard ☑ Rush ☐
Thermometer ID #113 #140
Correction Factor -0.5°C TO 7/26/23

Bacteria (only) Sample Condition: Cool ☐ Yes ☐ No Intact ☐ Yes ☐ No Observed Temp. °C Corrected Temp. °C

† Cardinal cannot accept verbal changes. Please email changes to celey.keene@cardinallabsnm.com

FORM-006 R 3.2 10/07/21

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

September 22, 2023

CHANCE DIXON

VERTEX RESOURCE GROUP

420 SOUTH MAIN, SUITE 202

TULSA, OK 74103

RE: GEM #4 WATER LINE

Enclosed are the results of analyses for samples received by the laboratory on 09/21/23 10:36.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-22-15. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Mike Snyder For Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/18/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: WES 23 - 02 0-4' (H235128-01)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *112 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**144**	16.0	09/22/2023	ND	432	108	400	3.77	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *117 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *124 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/19/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: WES 23 - 14 0-4' (H235128-02)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *112 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**48.0**	16.0	09/22/2023	ND	432	108	400	3.77	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *91.1 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *95.8 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/19/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: WES 23 - 24 0-4' (H235128-03)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *110 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**48.0**	16.0	09/22/2023	ND	432	108	400	3.77	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *92.6 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *96.7 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/20/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: WES 23 - 35 0-4' (H235128-04)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *113 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**32.0**	16.0	09/22/2023	ND	432	108	400	3.77	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *87.5 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *88.9 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/20/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: WES 23 - 37 0-4' (H235128-05)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *110 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**80.0**	16.0	09/22/2023	ND	432	108	400	3.77	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *90.0 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *93.2 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/18/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: BES 23 - 01 4' (H235128-06)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *111 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**112**	16.0	09/22/2023	ND	432	108	400	3.77	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *90.4 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *90.7 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/18/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: BES 23 - 02 4' (H235128-07)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *118 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1440**	16.0	09/22/2023	ND	432	108	400	3.77	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *78.8 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *80.9 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/18/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: BES 23 - 03 4' (H235128-08)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *117 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**5840**	16.0	09/22/2023	ND	432	108	400	0.00	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *87.8 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *90.6 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/20/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: BES 23 - 09 4' (H235128-09)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *118 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**4000**	16.0	09/22/2023	ND	432	108	400	0.00	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *85.5 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *87.3 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/20/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: BES 23 - 10 4' (H235128-10)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *110 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**5040**	16.0	09/22/2023	ND	432	108	400	0.00	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *84.2 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *87.4 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/20/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: BES 23 - 12 4' (H235128-11)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/21/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/21/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/21/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/21/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/21/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *112 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**5040**	16.0	09/22/2023	ND	432	108	400	0.00	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *87.8 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *90.1 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/21/2023	Sampling Date:	09/20/2023
Reported:	09/22/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Shalyn Rodriguez
Project Location:	BTA		

Sample ID: BES 23 - 11 4' (H235128-12)

BTEX 8021B mg/kg Analyzed By: JH/

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/22/2023	ND	1.94	96.8	2.00	0.667	
Toluene*	<0.050	0.050	09/22/2023	ND	2.10	105	2.00	6.41	
Ethylbenzene*	<0.050	0.050	09/22/2023	ND	2.12	106	2.00	0.154	
Total Xylenes*	<0.150	0.150	09/22/2023	ND	6.37	106	6.00	0.783	
Total BTEX	<0.300	0.300	09/22/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *111 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2240**	16.0	09/22/2023	ND	432	108	400	0.00	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/21/2023	ND	172	86.0	200	1.31	
DRO >C10-C28*	<10.0	10.0	09/21/2023	ND	192	96.2	200	7.30	
EXT DRO >C28-C36	<10.0	10.0	09/21/2023	ND					

Surrogate: 1-Chlorooctane *83.7 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *83.7 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Cardinal Laboratories *=Accredited Analyte

Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name:	Vertex	**BILL TO**	
Project Manager:	C. Dixon	P.O. #:	
Address:	on file	Company:	BTA
City:	State: Zip:	Attn:	on file
Phone #:	Fax #:	Address:	
Project #:	22E-02120 Project Owner: BTA	City:	
Project Name:	Gem #4 Water Line	State: Zip:	
Project Location:		Phone #:	
Sampler Name:	Angie Mone	Fax #:	

FOR LAB USE ONLY Lab I.D.	Sample I.D.		(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	PRESERV.: ACID/BASE:	ICE / COOL	OTHER :	SAMPLING: DATE	TIME	BTEX (8021)	TPH (8015D)	Cl
H235128																		
1	WES23-02	0-4'	G				X					X		9/18/23	10:00			
2	WES23-14	0-4'												9/19/23	9:40			
3	WES23-24	0-4'												↓	15:00			
4	WES23-35	0-4'												9/20/23	12:40			
5	WES23-37	0-4'												↓	12:45			
6	BES23-01	4'												9/18/23	10:05			
7	BES23-02	4'												↓	10:10			
8	BES23-03	4'												↓	10:15			
9	BES23-09	4'												9/20/23	8:35			
10	BES23-10	4'												↓	8:30			

Relinquished By:	Date: 9/20/23	Received By:	Verbal Result: ☐ Yes ☐ No	Add'l Phone #:
	Time: 18:10		All Results are emailed. Please provide Email address:	
Relinquished By:	Date: 9/21	Received By:	REMARKS:	
	Time: 10:36			
Delivered By: (Circle One)	Observed Temp. °C 0.1	Sample Condition: Cool ☑ Yes ☐ No; Intact ☑ Yes ☐ No	CHECKED BY: (Initials)	Turnaround Time: Standard ☐ Rush ☑ 2 day
Sampler - UPS - Bus - Other:	Corrected Temp. °C	Thermometer ID #140 Correction Factor 0°C		Bacteria (only) Sample Condition: Cool ☐ Yes ☐ No; Intact ☐ Yes ☐ No; Observed Temp. °C; Corrected Temp. °C

FORM-006 R 3.4 07/11/23

† Cardinal cannot accept verbal changes. Please email changes to celey.keene@cardinallabsnm.com

CARDINAL Laboratories

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name:	Vertex
Project Manager:	C. Dixon
Address:	on file
City:	State: Zip:
Phone #:	Fax #:
Project #:	22E-02120 Project Owner: BTA
Project Name:	Gem #4 water line
Project Location:	
Sampler Name:	Angie Mohl

BILL TO

P.O. #:	
Company:	BTA
Attn:	on file
Address:	
City:	
State:	Zip:
Phone #:	
Fax #:	

ANALYSIS REQUEST

FOR LAB USE ONLY Lab I.D.	Sample I.D.		(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV.: ACID/BASE:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME	BTEX (8021)	TPH (8015D)	Cl
H235128																		
11	BES23-12	4'	G				X					X		9/20/23	8:25	↓	↓	↓
12	BES23-11	4'	↓				↓					↓			8:40			

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequental damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By:	Date: 9/20/23 Time: 18:10	Received By:	Verbal Result: ☐ Yes ☐ No Add'l Phone #: All Results are emailed. Please provide Email address:
Relinquished By:	Date: 9/21 Time: 10:36	Received By: S Rodriguez	REMARKS:
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Observed Temp. °C 0.1 Corrected Temp. °C	Sample Condition Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	CHECKED BY: (Initials) SR
Turnaround Time: Standard ☐ Rush ☑ 2 day	Thermometer ID #140 Correction Factor 0°C	Bacteria (only) Sample Condition Cool: ☐ Yes ☐ No Intact: ☐ Yes ☐ No	Observed Temp. °C Corrected Temp. °C

FORM-006 R 3.4 07/11/23

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CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

September 25, 2023

CHANCE DIXON

VERTEX RESOURCE GROUP

420 SOUTH MAIN, SUITE 202

TULSA, OK 74103

RE: GEM #4 WATER LINE

Enclosed are the results of analyses for samples received by the laboratory on 09/22/23 8:42.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-22-15. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/22/2023	Sampling Date:	09/21/2023
Reported:	09/25/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Tamara Oldaker
Project Location:	BTA		

Sample ID: WES 23 - 38 0-4' (H235148-01)

BTEX 8021B mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/22/2023	ND	1.98	99.1	2.00	0.306	
Toluene*	<0.050	0.050	09/22/2023	ND	2.04	102	2.00	1.23	
Ethylbenzene*	<0.050	0.050	09/22/2023	ND	2.03	102	2.00	0.317	
Total Xylenes*	<0.150	0.150	09/22/2023	ND	6.15	102	6.00	0.652	
Total BTEX	<0.300	0.300	09/22/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *107 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**96.0**	16.0	09/22/2023	ND	432	108	400	0.00	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/22/2023	ND	200	99.8	200	1.39	
DRO >C10-C28*	<10.0	10.0	09/22/2023	ND	220	110	200	3.01	
EXT DRO >C28-C36	<10.0	10.0	09/22/2023	ND					

Surrogate: 1-Chlorooctane *94.6 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *99.1 %* *49.1-148*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

VERTEX RESOURCE GROUP
CHANCE DIXON
420 SOUTH MAIN, SUITE 202
TULSA OK, 74103
Fax To: NA

Received:	09/22/2023	Sampling Date:	09/21/2023
Reported:	09/25/2023	Sampling Type:	Soil
Project Name:	GEM #4 WATER LINE	Sampling Condition:	Cool & Intact
Project Number:	22E-02120	Sample Received By:	Tamara Oldaker
Project Location:	BTA		

Sample ID: BES 23 - 13 4' (H235148-02)

BTEX 8021B mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	09/22/2023	ND	1.98	99.1	2.00	0.306	
Toluene*	<0.050	0.050	09/22/2023	ND	2.04	102	2.00	1.23	
Ethylbenzene*	<0.050	0.050	09/22/2023	ND	2.03	102	2.00	0.317	
Total Xylenes*	<0.150	0.150	09/22/2023	ND	6.15	102	6.00	0.652	
Total BTEX	<0.300	0.300	09/22/2023	ND					

Surrogate: 4-Bromofluorobenzene (PID *105 %* *71.5-134*

Chloride, SM4500Cl-B mg/kg Analyzed By: AC

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**5520**	16.0	09/22/2023	ND	432	108	400	0.00	

TPH 8015M mg/kg Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10*	<10.0	10.0	09/22/2023	ND	200	99.8	200	1.39	
DRO >C10-C28*	<10.0	10.0	09/22/2023	ND	220	110	200	3.01	
EXT DRO >C28-C36	<10.0	10.0	09/22/2023	ND					

Surrogate: 1-Chlorooctane *88.7 %* *48.2-134*

Surrogate: 1-Chlorooctadecane *94.3 %* *49.1-148*

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Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

CHAIN OF-CUSTODY AND ANALYSIS REQUEST

Company Name: Vertex		**BILL TO**	
Project Manager: C. Dixon		P.O. #:	
Address: on file		Company: BTA	
City:	State: Zip:	Attn: on file	
Phone #:	Fax #:	Address:	
Project #: 22E-02120	Project Owner: BTA	City:	
Project Name: GCM #4 Water Line		State: Zip:	
Project Location:		Phone #:	
Sampler Name: Angie Mohl		Fax #:	

FOR LAB USE ONLY					MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST												
Lab I.D.	Sample I.D.		(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	BTEX (8021)	TPH (8015D)	Cl											
H235148																												
1	WES23-38	0-4'	G				X					X		9/21/23	8:40	X	X	X										
2	BES23-13	4'	↓				↓					↓		↓	8:35	↓	↓	↓											

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequental damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By:	Date: 9-22-23	Received By:	Verbal Result: ☐ Yes ☐ No Add'l Phone #:
	Time: 0842		All Results are emailed. Please provide Email address:
Relinquished By:	Date:	Received By:	REMARKS:
	Time:		

Delivered By: (Circle One)	Observed Temp. °C 5.6	Sample Condition Cool ☑ Yes Intact ☑ Yes	CHECKED BY: (Initials)	Turnaround Time: Standard ☐ Rush ☑	Bacteria (only) Sample Condition Cool ☐ Yes Intact ☐ Yes Observed Temp. °C
Sampler - UPS - Bus - Other:	Corrected Temp. °C	☐ No ☐ No		Thermometer ID #140 Correction Factor 0°C	☐ No ☐ No Corrected Temp. °C
				2 Day	

FORM-006 R 3.4 07/11/23

† Cardinal cannot accept verbal changes. Please email changes to celey.keene@cardinallabsnm.com

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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 273060

CONDITIONS

Operator: BTA OIL PRODUCERS, LLC 104 S Pecos Midland, TX 79701	OGRID: 260297
	Action Number: 273060
	Action Type: [C-141] Release Corrective Action (C-141)

CONDITIONS

Created By	Condition	Condition Date
nvelez	None	11/20/2023