February 2, 2022 Vertex Project #: 21E-00580-009

Spill Closure Report: Billiken 6 CTB 1
Unit D, Section 06, Township 26 South, Range 35 East
County: Lea
API: N/A
Tracking Number: nAPP2134155628

Prepared For: Devon Energy Production Company
6488 Seven Rivers Highway
Artesia, New Mexico 88210

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

Devon Energy Production Company (Devon) retained Vertex Resource Services Inc. (Vertex) to conduct a spill assessment and liner inspection for a produced water release that occurred at Billiken 6 CTB 1 (hereafter referred to as "Billiken CTB"). Devon provided immediate notification of the spill to New Mexico Oil Conservation Division (NMOCD) District 1 and the Bureau of Land Management (BLM), who own the property, on December 4, 2021, via phone call and email. The initial C-141 Release Notification was received by NMOCD on December 22, 2021 (Attachment 1). The NMOCD tracking number assigned to this incident is nAPP2134155628.

This letter provides a description of the liner inspection and demonstrates that closure criteria established in 19.15.29.12 *New Mexico Administrative Code* (NMAC; New Mexico Oil Conservation Division, 2022) have 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.

Incident Description

On December 3, 2021, a release occurred at Devon's Billiken CTB site when a leak developed in a flowline. The incident resulted in the release of approximately 236.28 barrels (bbl) of produced water into lined containment. A hydrovac arrived on-site to recover free fluids; approximately 236.28 bbls of produced water were recovered and removed for disposal off-site. The spill was fully contained within the bermed, lined containment on the facility pad. No produced water was released into undisturbed areas or waterways.

Site Characterization

The release at Billiken CTB occurred on federally-owned land, N 32.076535, W 103.411171, approximately 12.5 miles west of Jal, New Mexico. The legal description for the site is Unit D, Section 06, Township 26 South, Range 35 East, Lea County, New Mexico. This location is within the Permian Basin in southeast New Mexico and has historically been used for oil and gas exploration and production, and rangeland. An aerial map of the site is included in Attachment 2.

Billiken CTB is typical of oil and gas exploration and production sites in the western portion of the Permian Basin and is currently used for oil and gas production and storage. The following sections specifically describe the area in which the Billiken CTB facility is located.

The surrounding landscape is associated with sandy plains typical of elevations of 3,000 to 3,900 feet above sea level. The climate is semi-arid, with average annual precipitation ranging between 10 and 12 inches. Historically, the plant community was dominated by grasses, which stabilized the potentially erosive sandy soils; however, more recent conditions, resulting from fire suppression and extensive grazing, show increased woody plant abundance. The dominant grass species are black grama, dropseeds and bluestems, with scattered shinnery oak and sand sage. Litter and, to a lesser extent, bare ground are a significant proportion of ground cover while grasses compose the remainder (United States Department of Agriculture, Natural Resources Conservation Service, 2022). Limited to no vegetation is allowed to grow on the compacted facility pad.

The *Geological Map of New Mexico* indicates the surface geology at Billiken CTB is comprised of Qep – eolian and piedmont deposits that include eolian sands interlaid with piedmont-slope deposits (New Mexico Bureau of Geology and Mineral Resources, 2022). The Natural Resources Conservation Service *Web Soil Survey* characterizes the soil at the site as Pyote and Maljamar fine sands, characterized by deep, fine sandy and loamy fine sandy soil. It tends to be well-drained with very low to negligible runoff and low available moisture levels in the soil profile (United States Department of Agriculture, Natural Resources Conservation Service, 2022). There is low potential for karst geology to be present near Billiken CTB, though some erosional karst is possible (United States Department of the Interior, Bureau of Land Management, 2018).

There is no surface water located at Billiken CTB. The nearest significant watercourse, as defined in Subsection P of 19.15.17.7 NMAC, is an intermittent stream located approximately 1.19 miles east of the site. An emergent wetland is located approximately 0.64 miles west of the site. An intermittent lake is located approximately 14 miles south-southeast of the release site (United States Fish and Wildlife Service, 2022). At Billiken CTB, there are no continuously flowing watercourses, lakebeds, sinkholes, playa lakes, or other critical water or community features nearby as outlined in Paragraph (4) of Subsection C of 19.15.29.12 NMAC.

The nearest well to Billiken CTB is a United States Geological Survey-identified well located approximately 2.4 miles south of the site, with no groundwater data. New Mexico Office of the State Engineer-identified wells are located approximately 2.57 miles north and 3.57 miles west of the site with recorded depths to groundwater of 300 and 230 feet below ground surface, respectively (bgs; New Mexico Office of the State Engineer, New Mexico Water Rights Reporting System, 2022). Documentation pertaining to site characterization and depth to groundwater determination is included in Attachment 3.

Closure Criteria Determination

Using site characterization information, a closure criteria determination worksheet (Attachment 3) was completed to determine if the release was subject to any of the special case scenarios outlined in Paragraph (4) of Subsection C of 19.15.29.12 NMAC.

Based on data included in the closure criteria determination worksheet, the release at Billiken CTB is not subject to the requirements of Paragraph (4) of Subsection C of 19.15.29.12 NMAC. The nearest depth to groundwater reference is

more than 0.5 miles from the site; therefore, the closure criteria for the incident assume the most stringent conditions (depth to groundwater <50 feet bgs) and are determined to be associated with the following constituent concentration limits.

Table 1. Closure Criteria for Soils Impacted by a Release

Minimum depth below any point within the horizontal boundary of the release to ground water less than 10,000 mg/L TDS[1]	Constituent	Limit
< 50 feet	Chloride	600 mg/kg
	TPH[2] (GRO + DRO + MRO)	100 mg/kg
	BTEX[3]	50 mg/kg
	Benzene	10 mg/kg

[1]Total Dissolved Solids (TDS)

[2]Total petroleum hydrocarbons (TPH) = gasoline range organics (GRO) + diesel range organics (DRO) + motor oil range organics (MRO)

[3]Benzene, toluene, ethylbenzene and xylenes (BTEX)

Liner Inspection

On January 13, 2022, Vertex provided 48-hour notification of the liner inspection to NMOCD and the BLM, as required by Subparagraph (a) of Paragraph (5) of Subsection A 19.15.29.11 NMAC (Attachment 4). On January 21, 2022, Vertex was on-site to conduct an inspection of the lined containment and verify that the liner was intact and had the ability to contain the release. The Daily Field Report and associated photographs of the liner inspection are included in Attachment 5. The inspection confirmed the liner remained intact and had the ability to contain the release. This was further evidenced by the amount of fluid released (~236.28 bbl) and recovered (~236.28 bbl).

Closure Request

Vertex recommends no additional remediation action to address the release at Billiken CTB. The secondary containment liner was intact and contained the release. There are no anticipated risks to human, ecological or hydrological receptors associated with the release site.

Vertex requests that this incident (nAPP2134155628) be closed as all closure requirements set forth in Subsection E of 19.15.29.12 NMAC have been met. Devon certifies that all information in this report and the attachments is 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 December 3, 2021, release at Billiken CTB. A complete C-141 form is presented in Attachment 6.

Should you have any questions or concerns, please do not hesitate to contact the undersigned at 832.588.0674 or dhanton@vertex.ca

Lakin Pullman, B.Sc.
ENVIRONMENTAL TECHNICIAN, REPORT

February 2, 2022
Date

Dhugal Hanton, B.Sc., P.Ag, P.Biol., SR/WA.
VICE PRESIDENT- USA, REPORT REVIEW

February 2, 2022
Date

Attachments

Attachment 1. NMOCD C-141 Initial Notification
Attachment 2. Aerial Site Map
Attachment 3. Closure Criteria for Soils Impacted by a Release Research Determination Documentation
Attachment 4. 48-hr Notification of Confirmatory Sampling to Regulatory Agencies
Attachment 5. Daily Field Report with Photographs
Attachment 6. Complete C-141 Form

References

New Mexico Bureau of Geology and Mineral Resources. (2022). *Interactive Geologic Map.* Retrieved from http://geoinfo.nmt.edu.

New Mexico Office of the State Engineer, New Mexico Water Rights Reporting System. (2022). *Water Column/Average Depth to Water Report.* Retrieved from http://nmwrrs.ose.state.nm.us/nmwrrs/waterColumn.html.

New Mexico Oil Conservation Division. (2022). *New Mexico Administrative Code – Natural Resources and Wildlife Oil and Gas Releases*. Santa Fe, New Mexico.

United States Department of Agriculture, Natural Resources Conservation Service. (2022). *Web Soil Survey*. Retrieved from https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

United States Department of the Interior, Bureau of Land Management. (2018). *CFO Karst Public*. https://www.nm.blm.gov/shapeFiles/cfo/carlsbad_spatial_data.html

United States Fish and Wildlife Service. (2022). *National Wetlands Inventory*. Retrieved from https://www.fws.gov/wetlands/data/Mapper.html.

Limitations

This report has been prepared for the sole benefit of Devon Energy Production Company (Devon). This document may not be used by any other person or entity, with the exception of the New Mexico Oil Conservation Division and Bureau of Land Management, without the express written consent of Vertex Resource Services Inc. (Vertex) and Devon. 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 judgement 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.

ATTACHMENT 1

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	nAPP2134155628
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party Devon Energy Production Company	OGRID 6137
Contact Name Dale Woodall	Contact Telephone
Contact email Dale.Woodall@dvn.com	Incident # *(assigned by OCD)*
Contact mailing address 6488 Seven Rivers Hwy Artesia, NM 88210	

Location of Release Source

Latitude 32.076535 Longitude -103.411171
(NAD 83 in decimal degrees to 5 decimal places)

Site Name Billiken 6 CTB 1	Site Type Oil
Date Release Discovered 12/03/2021	API# *(if applicable)*

Unit Letter	Section	Township	Range	County
D	6	23S	35E	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) 236.28 BBLS	Volume Recovered (bbls) 236.28 BBLS
	Is the concentration of total dissolved solids (TDS) 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 Leak developed in flowline. Fluid remained in lined containment.

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2134155628
District RP	
Facility ID	
Application ID	

Was this a major release as defined by 19.15.29.7(A) NMAC? ☒ Yes ☐ No	If YES, for what reason(s) does the responsible party consider this a major release? The spill is over 25 BBLS.

If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)?
Notice given by Dale Woodall to OCD.

Initial Response

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

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

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

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

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

Printed Name: Kendra DeHoyos Title: EHS Associate

Signature: Kendra DeHoyos Date: 12/22/2021

email: Kendra.Ruiz@dvn.com Telephone: 575-748-0167

OCD Only

Received by: Ramona Marcus Date: 12/27/2021

NAPP2134155628

Spills In Lined Containment	
Measurements Of Standing Fluid	
Length(Ft)	100
Width(Ft)	53
Depth(in.)	4
Total Capacity without tank displacements (bbls)	314.66
No. of 500 bbl Tanks In Standing Fluid	7
No. of Other Tanks In Standing Fluid	1
OD Of Other Tanks In Standing Fluid(feet)	
Total Volume of standing fluid accounting for tank displacement.	236.28

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

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

CONDITIONS

Operator: DEVON ENERGY PRODUCTION COMPANY, LP 333 West Sheridan Ave. Oklahoma City, OK 73102	OGRID: 6137
	Action Number: 68440
	Action Type: [C-141] Release Corrective Action (C-141)

CONDITIONS

Created By	Condition	Condition Date
rmarcus	None	12/27/2021

ATTACHMENT 2

Containment (~7,161 sq. ft.)

VERTEX

0 25 50 100 ft.

NAD 1983 UTM Zone 13N
Date: Jan 24/22

Map Center:
Lat: 32.076583,
Long:-103.411132

N

Aerial Site Map
Billiken 6 CTB 1

FIGURE: 1

devon

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.

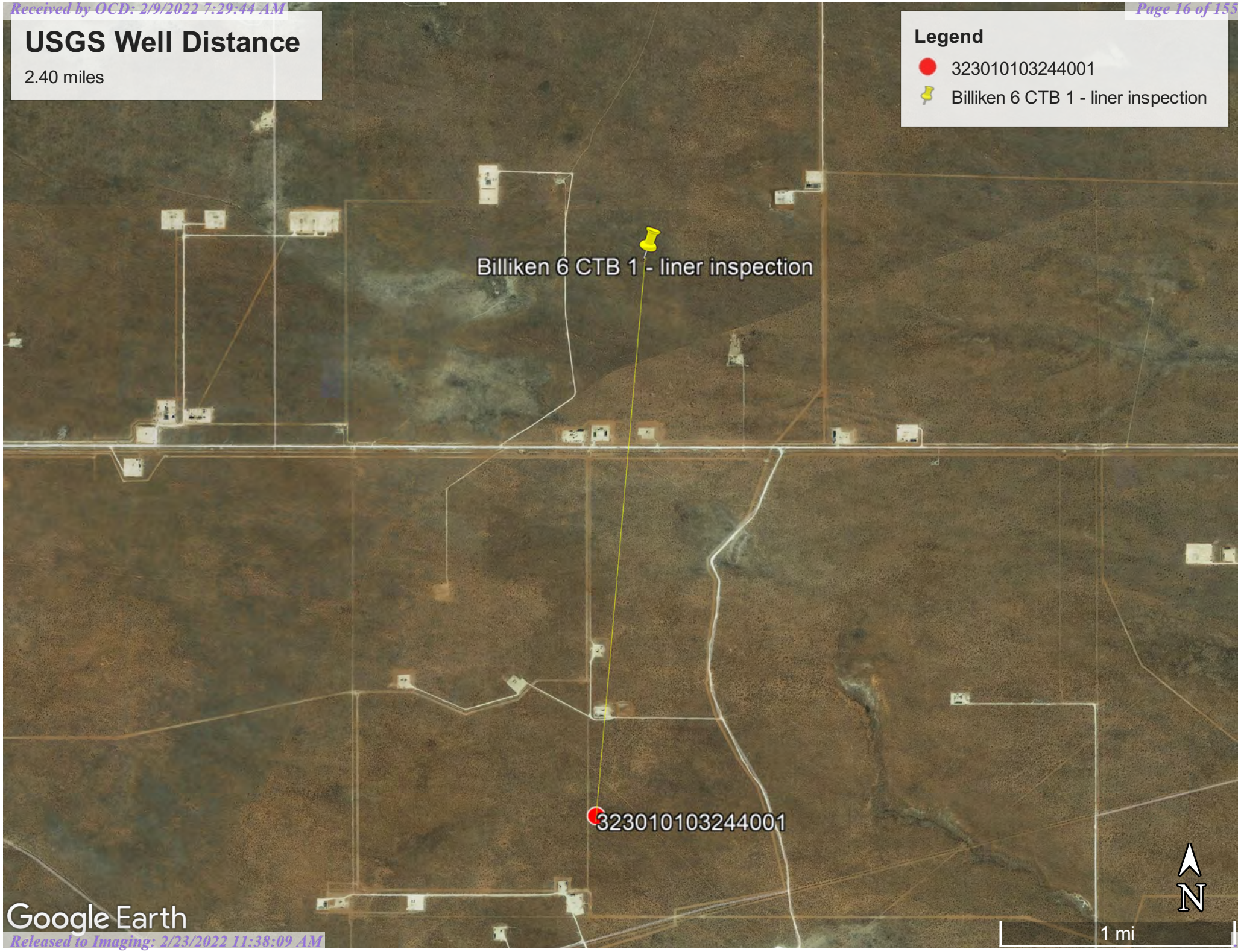
Note: Feature locations from aerial imagery, ESRI, 2021.

VERSATILITY. EXPERTISE.

Document Path: G:\1-Projects_US PROJECTS\Devon Energy Corporation\21E-00580\009 - Billiken 6 CTB 1\Figure 1 Aerial Map Billiken 6 CTB 1 (21E-00580).mxd

ATTACHMENT 3

Closure Criteria Worksheet			
Site Name: Billiken 6 CTB 1			
Spill Coordinates:		**X: 32.076535**	**Y: -103.411171**
Site Specific Conditions		**Value**	**Unit**
1	Depth to Groundwater	**<50**	feet
2	Within 300 feet of any continuously flowing watercourse or any other significant watercourse	12,664	feet
3	Within 200 feet of any lakebed, sinkhole or playa lake (measured from the ordinary high-water mark)	74,079	feet
4	Within 300 feet from an occupied residence, school, hospital, institution or church	46,941	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**	13,556	feet
	ii) Within 1000 feet of any fresh water well or spring	13,556	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	3,374	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	N/A	year
11	Soil Type	Fine Sand, Fine Sandy Loam, Sandy Clay Loam	
12	Ecological Classification	Loamy Sand	
13	Geology	Qep	
NMAC 19.15.29.12 E (Table 1) Closure Criteria		<50'	<50' 51-100' >100'

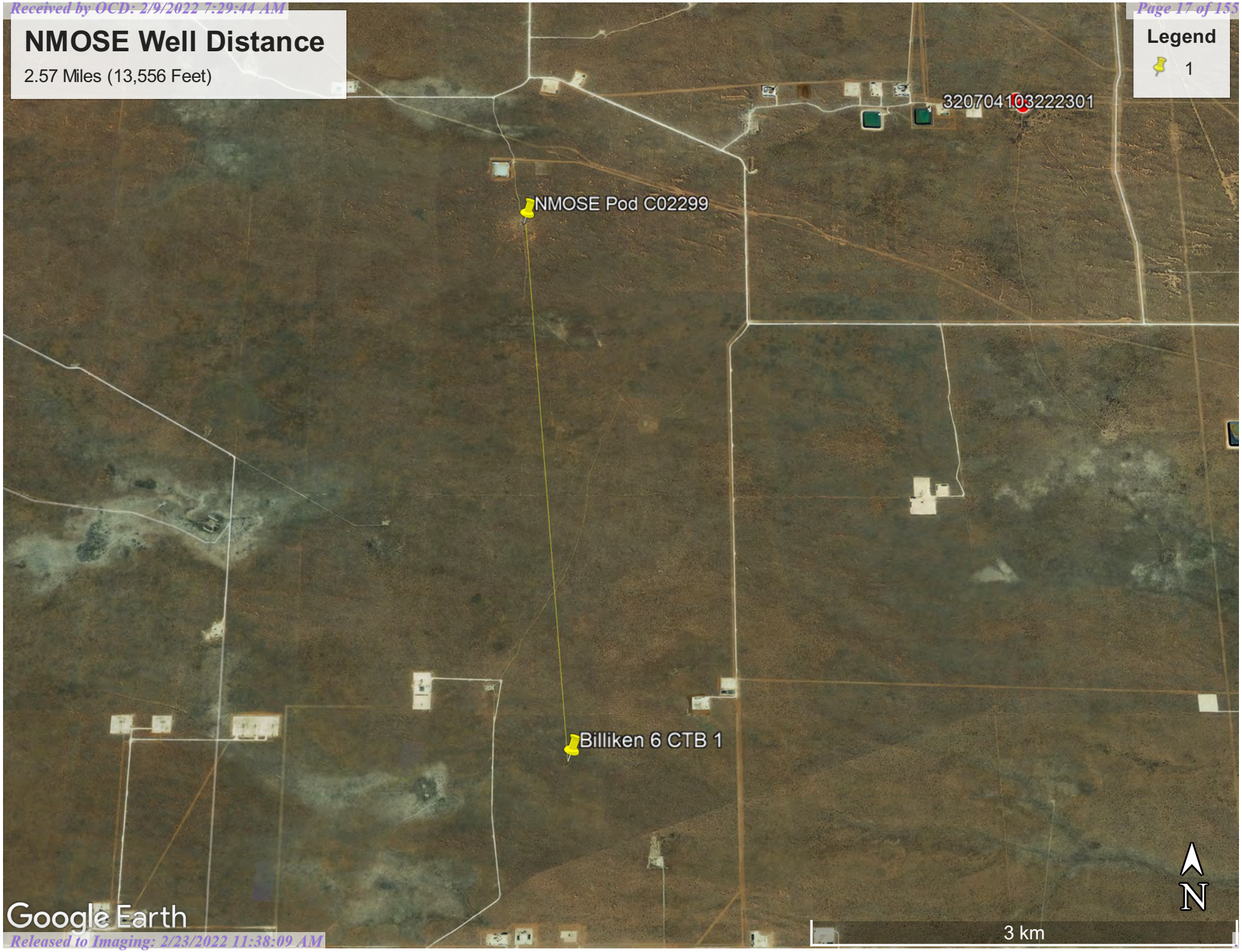

USGS Well Distance
2.40 miles
Legend
323010103244001
Billiken 6 CTB 1 - liner inspection
Billiken 6 CTB 1 - liner inspection
323010103244001
Google Earth
N
1 mi

NMOSE Well Distance

2.57 Miles (13,556 Feet)

Legend

1



New Mexico Office of the State Engineer

Point of Diversion Summary

Well Tag	POD Number	(quarters are 1=NW 2=NE 3=SW 4=SE) (quarters are smallest to largest) Q64	Q16	Q4	Sec	Tws	Rng	(NAD83 UTM in meters) X	Y
	C 02299	4	2	4	24	25S	34E	649517	3554125

Driller License: 122 **Driller Company:** UNKNOWN

Driller Name: UNKNOWN

Drill Start Date: **Drill Finish Date:** 12/31/1949 **Plug Date:**

Log File Date: **PCW Rcv Date:** **Source:**

Pump Type: **Pipe Discharge Size:** **Estimated Yield:** 3 GPM

Casing Size: 8.00 **Depth Well:** 350 feet **Depth Water:** 300 feet

New Mexico Office of the State Engineer
Water Right Summary

get image list

WR File Number: C 02299 **Subbasin:** CUB **Cross Reference:** -

Primary Purpose: PLS NON 72-12-1 LIVESTOCK WATERING

Primary Status: DCL DECLARATION

Total Acres: 0 **Subfile:** - **Header:** -

Total Diversion: 3 **Cause/Case:** -

Owner: INTREPID POTASH NEW MEXICO LLC

Contact: KATIE KELLER

Documents on File

	Trn #	Doc	File/Act	Status 1	Status 2	Transaction Desc.	From/ To	Acres	Diversion	Consumptive
get images	673682	UWL	2020-05-15	UWL	ACC	C 02299	T	0	0	
get images	652933	COWNF	2019-06-11	CHG	PRC	C 02299	T	0	0	
get images	648796	COWNF	2019-03-20	CHG	PRC	C 02299	T	0	0	
get images	198392	DCL	1993-02-02	DCL	PRC	C-02299	T	0	3	

Current Points of Diversion

(NAD83 UTM in meters)

POD Number	Well Tag	Source	Q 64	Q16	Q4	Sec	Tws	Rng	X	Y	Other Location Desc
C 02299			4	2	4	24	25S	34E	649517	3554125	

Priority Summary

Priority	Status	Acres	Diversion	Pod Number
12/31/1949	DCL	0	3	C 02299

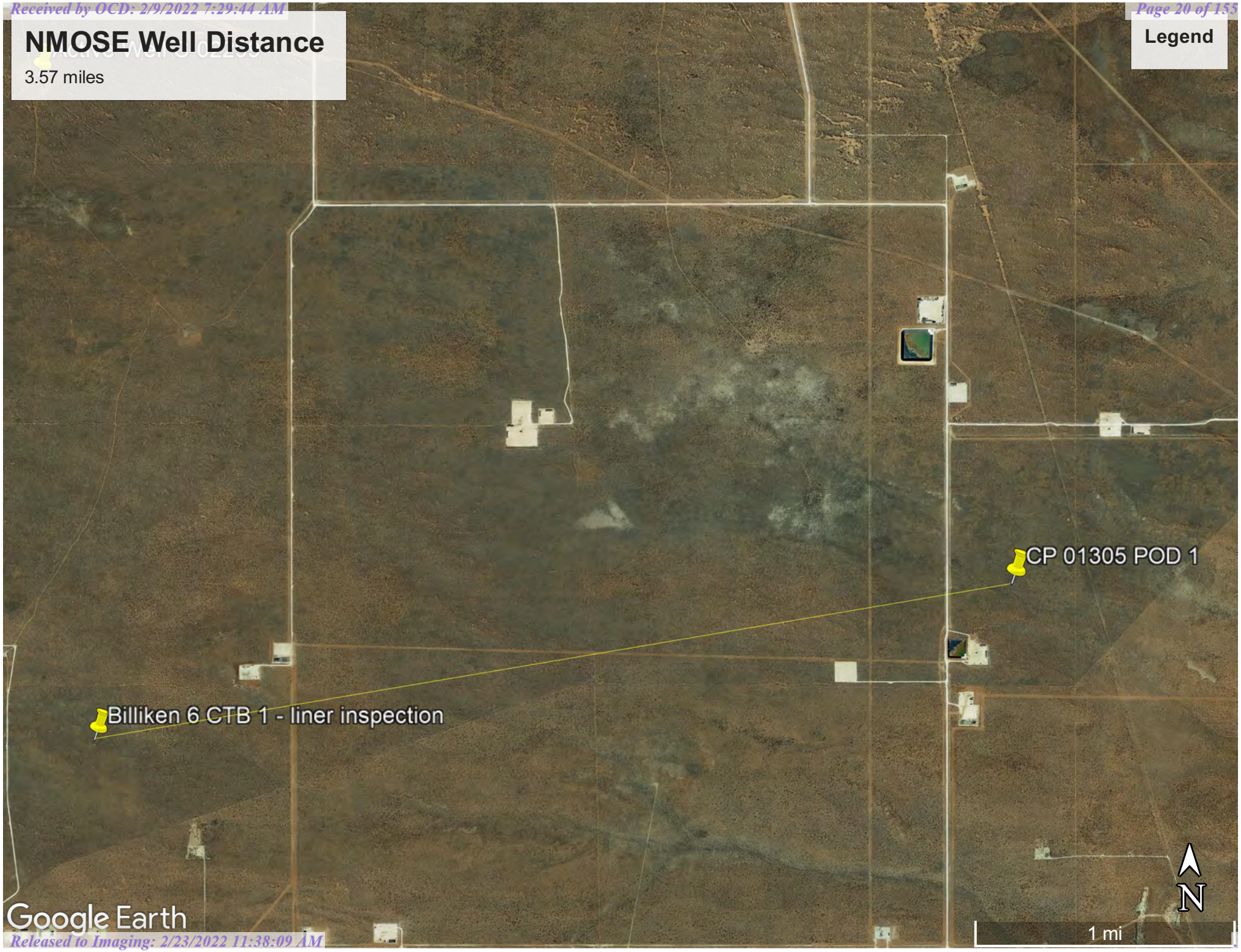
Place of Use

Q 256	Q 64	Q16	Q4	Sec	Tws	Rng	Acres	Diversion	CU	Use	Priority	Status	Other Location Desc
							0	3		PLS	12/31/1949	DCL	NO PLACE OF USE GIVEN

NMOSE Well Distance

3.57 miles

Legend



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	Twn	Rng	X	Y
	CP 01305 POD1		1	4	31	25S	37E	655628	3551065

Driller License: 1706 **Driller Company:** ELITE DRILLERS CORPORATION

Driller Name: WALLACE, BRYCE J.

Drill Start Date:	05/04/2017	**Drill Finish Date:**	05/06/2017	**Plug Date:**	
Log File Date:	07/07/2017	**PCW Rcv Date:**		**Source:**	Artesian
Pump Type:		**Pipe Discharge Size:**		**Estimated Yield:**	60 GPM
Casing Size:	6.00	**Depth Well:**	420 feet	**Depth Water:**	230 feet

Water Bearing Stratifications:

Top	Bottom	Description
280	320	Sandstone/Gravel/Conglomerate
330	400	Sandstone/Gravel/Conglomerate
400	420	Shale/Mudstone/Siltstone

Casing Perforations:

Top	Bottom
320	420

Meter Number:	19203	**Meter Make:**	TURBINES
Meter Serial Number:	7678015	**Meter Multiplier:**	1.0000
Number of Dials:	9	**Meter Type:**	Diversion
Unit of Measure:	Barrels 42 gal.	**Return Flow Percent:**	
Usage Multiplier:		**Reading Frequency:**	Monthly

Meter Readings (in Acre-Feet)

Read Date	Year	Mtr Reading	Flag	Rdr	Comment	Mtr Amount	Online
03/31/2021	2021	141799	A	RPT	Initital reading submitted	0	
05/31/2021	2021	1470544	A	ad		171.266	
10/31/2021	2021	1610094	A	ad		17.987	

**YTD Meter Amounts:	Year	Amount
	2021	189.253

New Mexico Office of the State Engineer
Water Right Summary

get image list

WR File Number: CP 01305 **Subbasin:** CP **Cross Reference:** -

Primary Purpose: COM COMMERCIAL

Primary Status: PMT PERMIT

Total Acres: 0 **Subfile:** - **Header:** -

Total Diversion: 100 **Cause/Case:** -

Owner: FULFER OIL & CATTLE COMPANY

Contact: GREGG FULFER

Owner: ATKINS ENGR ASSOC INC

Contact: RICHARD CIBAK

Documents on File

	Trn #	Doc	File/Act	Status 1	Status 2	Transaction Desc.	From/ To	Acres	Diversion	Consumptive
get images	604490	APPRO	2016-01-21	PMT	MTR	CP 01305	T	0	100	100

Current Points of Diversion

(NAD83 UTM in meters)

POD Number	Well Tag	Source	Q 64	Q16	Q4	Sec	Tws	Rng	X	Y	Other Location Desc
CP 01305 POD1		Artesian	1	4		31	25S	37E	655628	3551065	

Priority Summary

Priority	Status	Acres	Diversion	Pod Number	
03/27/2014	PMT	0	100	CP 01305 POD1	Artesian

Place of Use

Q 256	Q 64	Q16	Q4	Sec	Tws	Rng	Acres	Diversion	CU	Use	Priority	Status	Other Location Desc
							0	100	100	COM	03/27/2014	PMT	NO PLACE OF USE GIVEN

Source

Acres	Diversion	CU	Use	Priority	Source	Description
0	100	100	COM	03/27/2014	GW	

U.S. Fish and Wildlife Service

National Wetlands Inventory

Nearest Continuously Flowing Watercourse

January 20, 2022

Wetlands

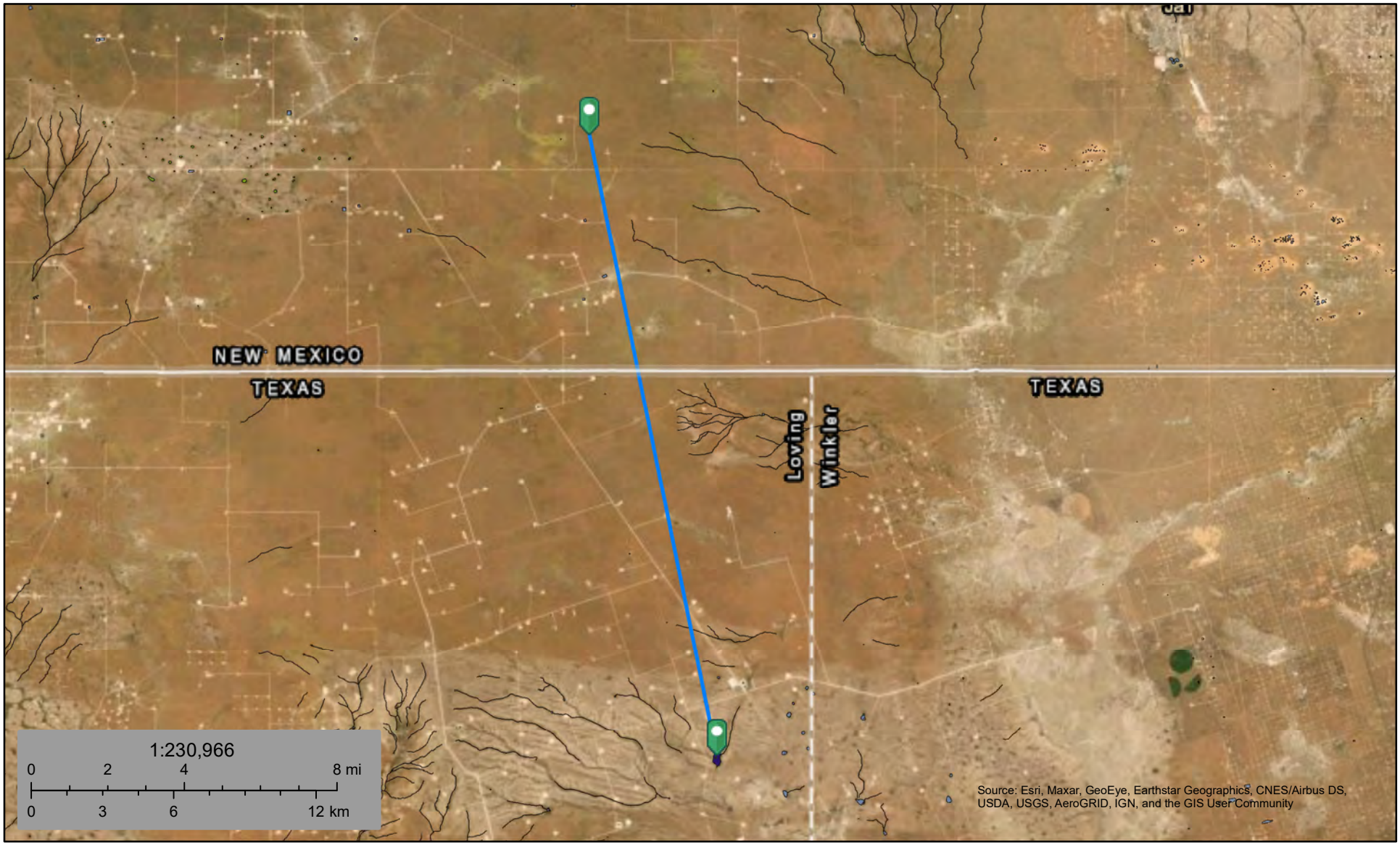
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

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.

U.S. Fish and Wildlife Service

National Wetlands Inventory

Lake 14 Miles (74,079 Feet)



January 20, 2022

Wetlands

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

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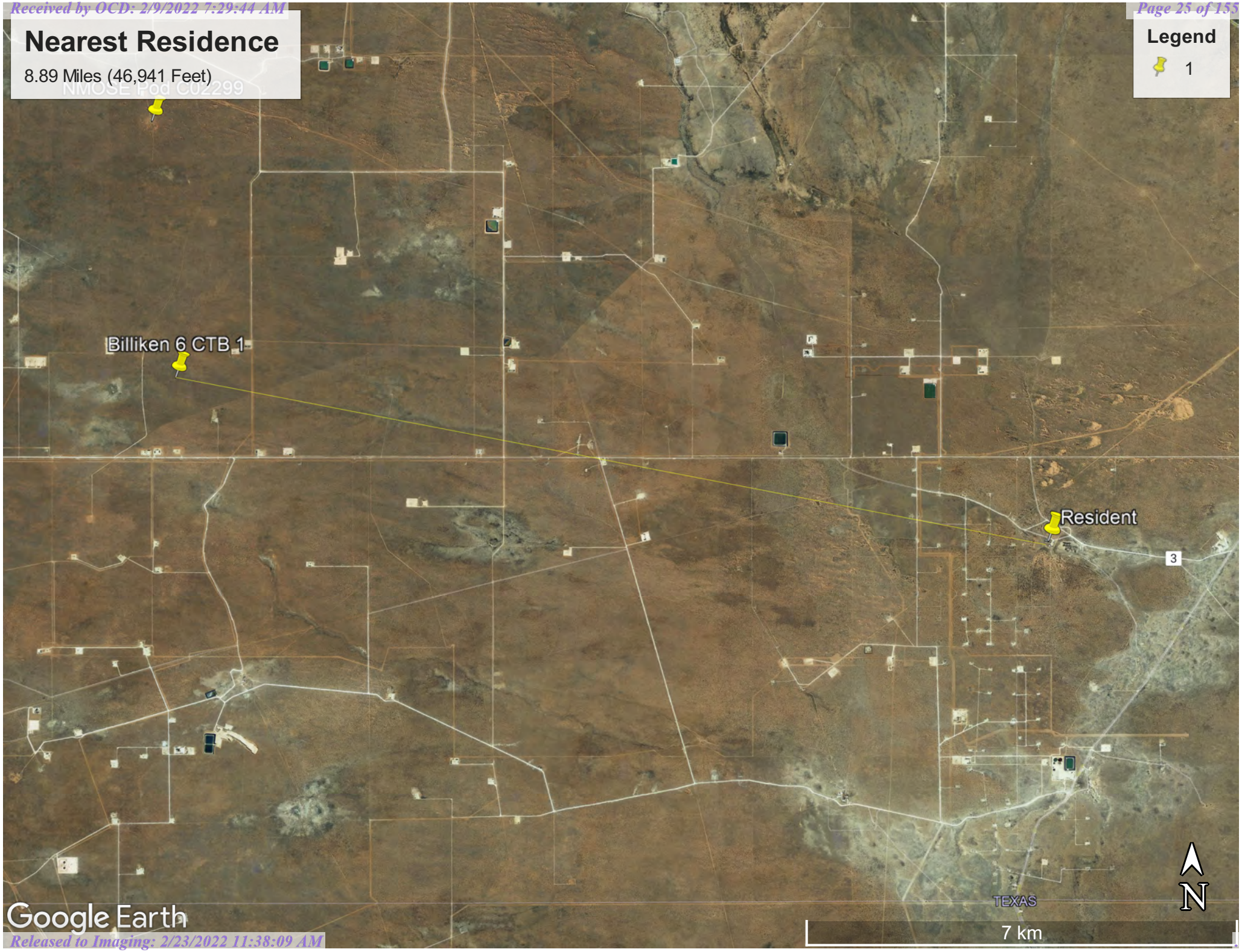
National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Nearest Residence

8.89 Miles (46,941 Feet)



U.S. Fish and Wildlife Service
National Wetlands Inventory

Emergent Wetland 0.64 Miles (3,374 Feet)

January 20, 2022

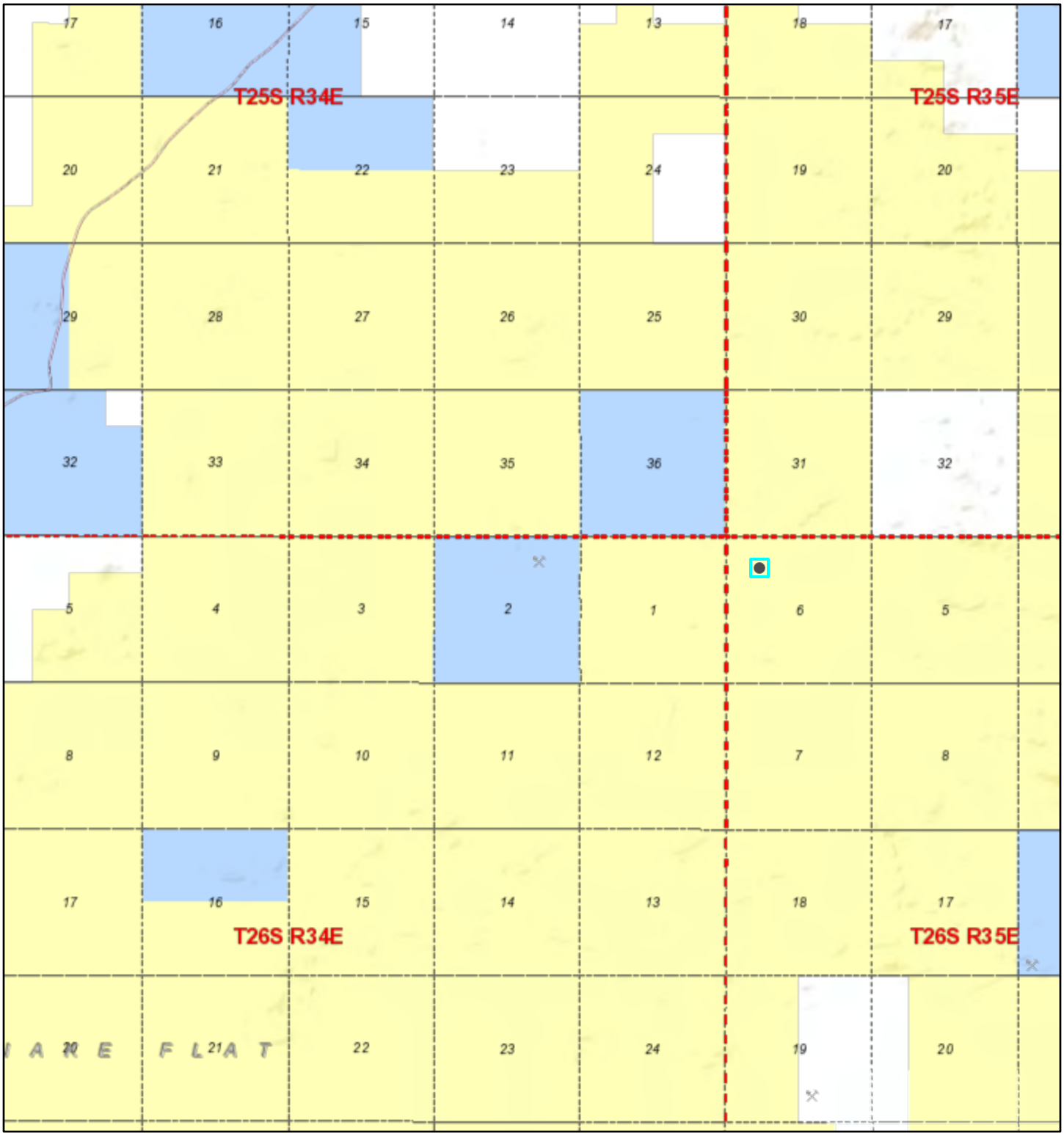
Wetlands

- 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



1/20/2022, 10:48:08 AM

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

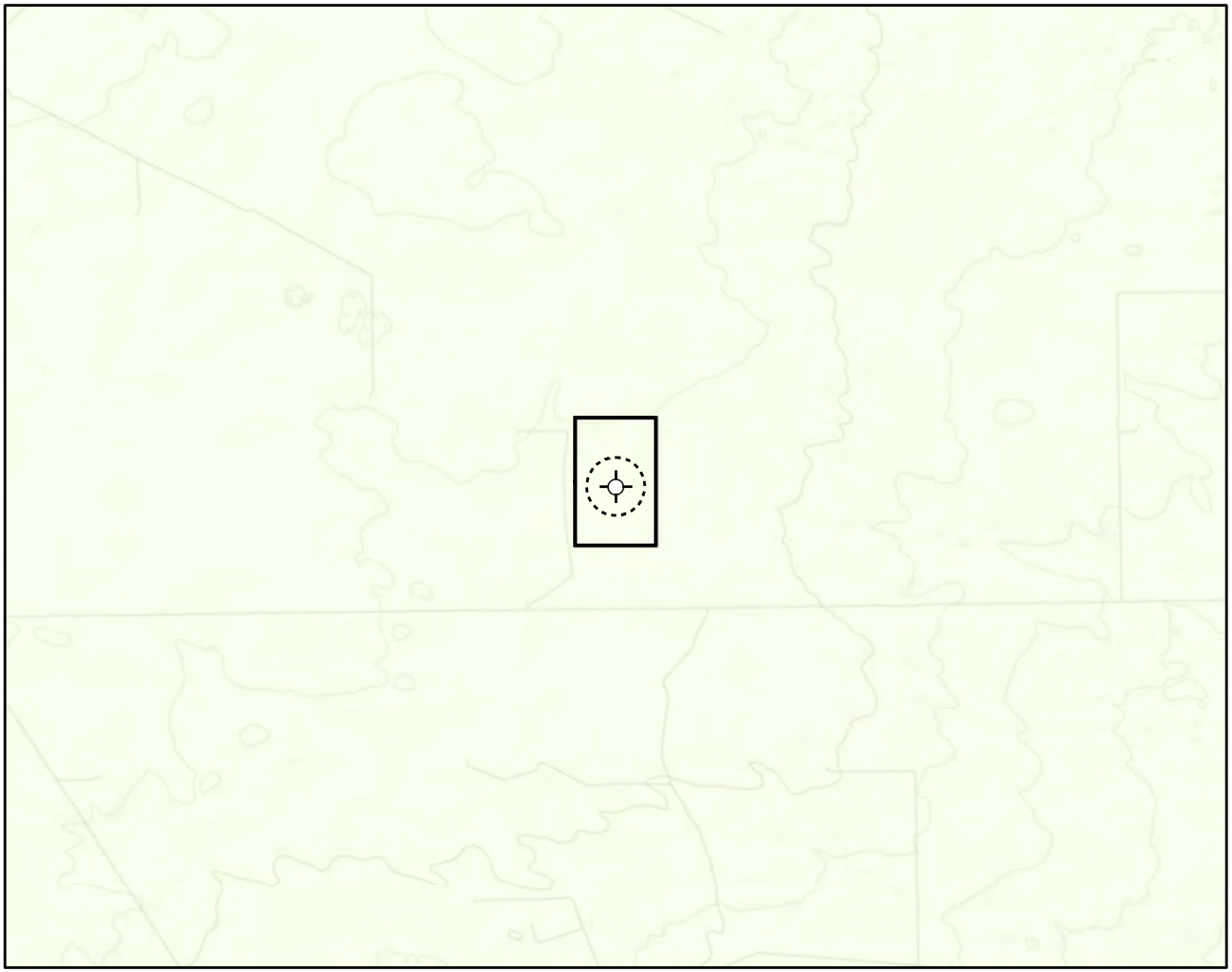
State Parks

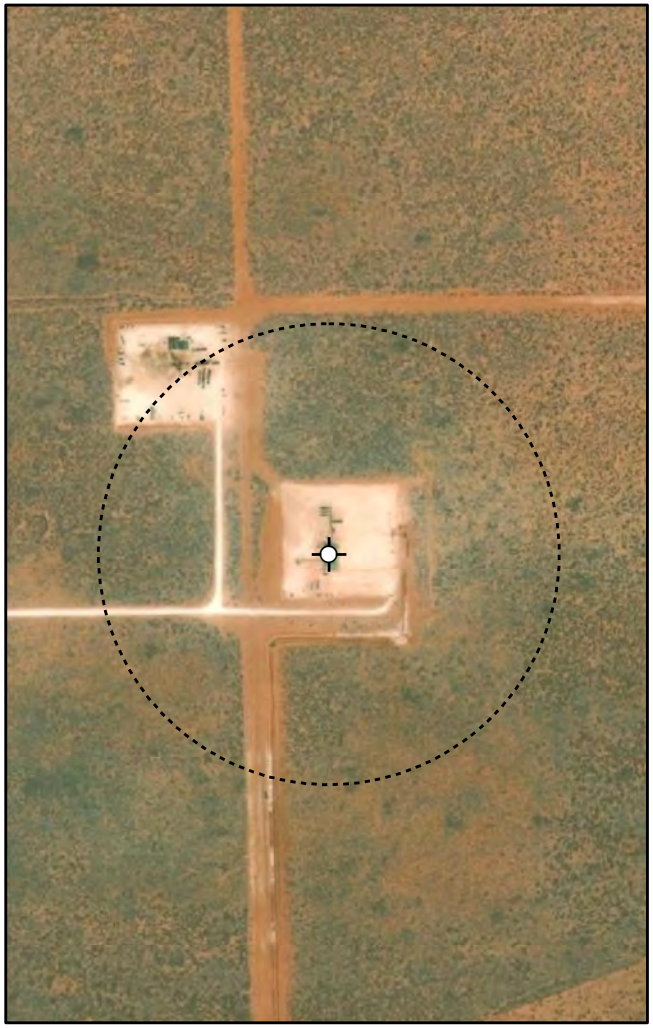
Tribal

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 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: 32.077000, -103.411171

NAD 1983 UTM Zone 13N

Date: Jan 20/22

N

Karst Potential Map
Billiken 6 CTB 1

FIGURE:

X

devon

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 2021; Overview Map: ESRI World Topographic

VERSATILITY. EXPERTISE.

Document Path: G:\1-Projects_US PROJECTS\Devon Energy Corporation\21E-00580\009 - Billiken 6 CTB 1\Figure x Karst Potential Map Billiken 6 CTB 1 (21E-00580).mxd

National Flood Hazard Layer FIRMette

FEMA

103°24'59"W 32°4'51"N

103°24'21"W 32°4'20"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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 1/20/2022 at 12:55 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.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Lea County, New Mexico

January 20, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

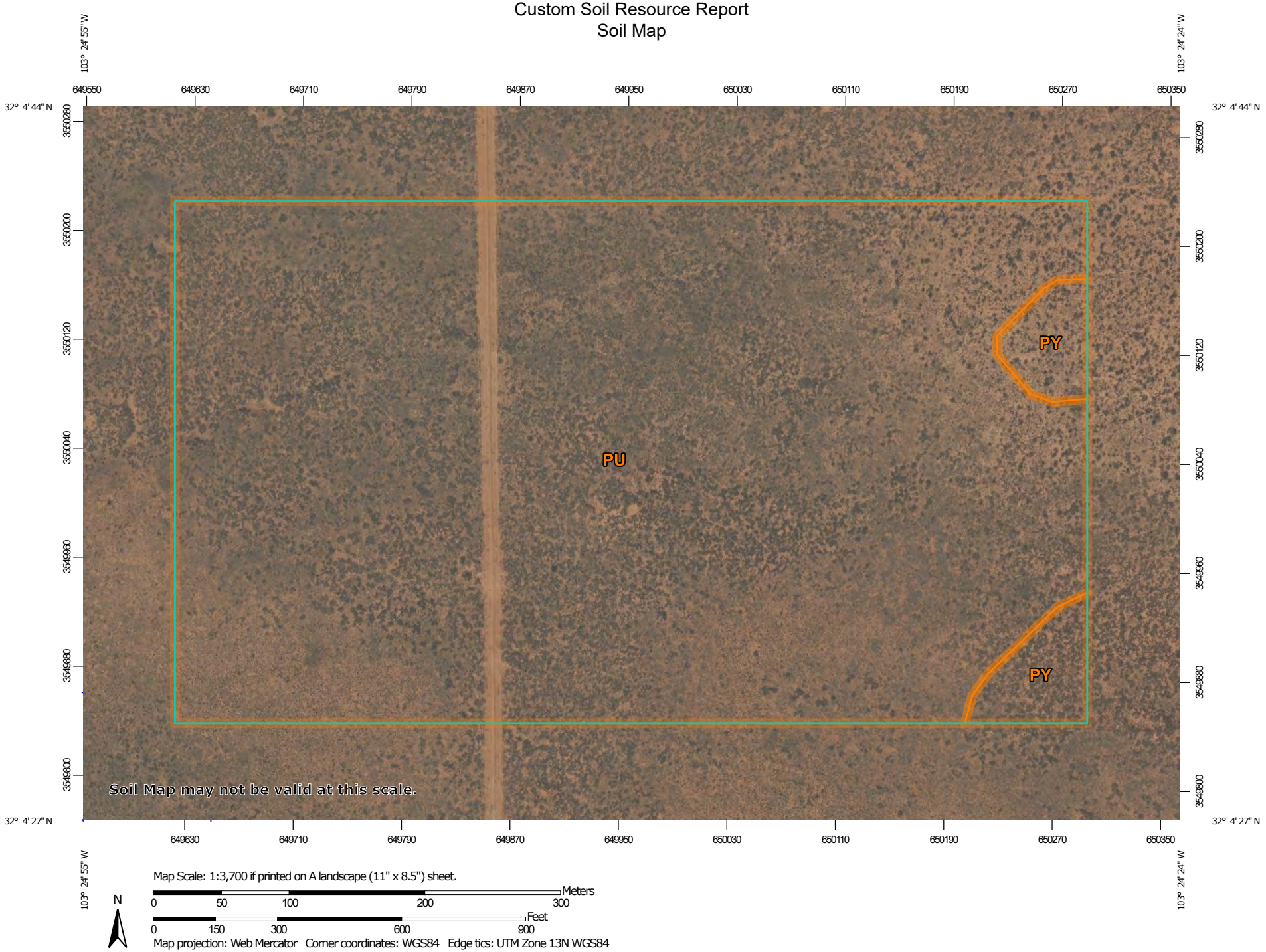
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lea County, New Mexico
Survey Area Data: Version 18, Sep 10, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 7, 2020—May 12, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
PU	Pyote and Maljamar fine sands	61.5	96.1%
PY	Pyote soils and Dune land	2.5	3.9%
Totals for Area of Interest		**64.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lea County, New Mexico

PU—Pyote and Maljamar fine sands

Map Unit Setting

National map unit symbol: dmqq
Elevation: 3,000 to 3,900 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 60 to 62 degrees F
Frost-free period: 190 to 205 days
Farmland classification: Not prime farmland

Map Unit Composition

Pyote and similar soils: 46 percent
Maljamar and similar soils: 44 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pyote

Setting

Landform: Plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 30 inches: fine sand
Bt - 30 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 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: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

Description of Maljamar

Setting

Landform: Plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 24 inches: fine sand
Bt - 24 to 50 inches: sandy clay loam
Bkm - 50 to 60 inches: cemented material

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 40 to 60 inches to petrocalcic
Drainage class: Well drained
Runoff class: Very low
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: 5 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: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

Minor Components

Kermit

Percent of map unit: 10 percent
Ecological site: R042XC022NM - Sandhills
Hydric soil rating: No

PY—Pyote soils and Dune land

Map Unit Setting

National map unit symbol: dmqr
Elevation: 3,000 to 4,400 feet

Mean annual precipitation: 10 to 15 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 190 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Pyote and similar soils: 46 percent
Dune land: 44 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pyote

Setting

Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 30 inches: fine sand
Bt - 30 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 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: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

Description of Dune Land

Setting

Landform: Dunes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Sandy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 6 inches: fine sand
C - 6 to 60 inches: fine sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Kermit

Percent of map unit: 5 percent
Ecological site: R042XC022NM - Sandhills
Hydric soil rating: No

Maljamar, fine sand

Percent of map unit: 3 percent
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

Wink

Percent of map unit: 2 percent
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

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USDA Natural Resources Conservation Service

Ecological site R042XC004NM
Sandy

Accessed: 01/20/2022

General information

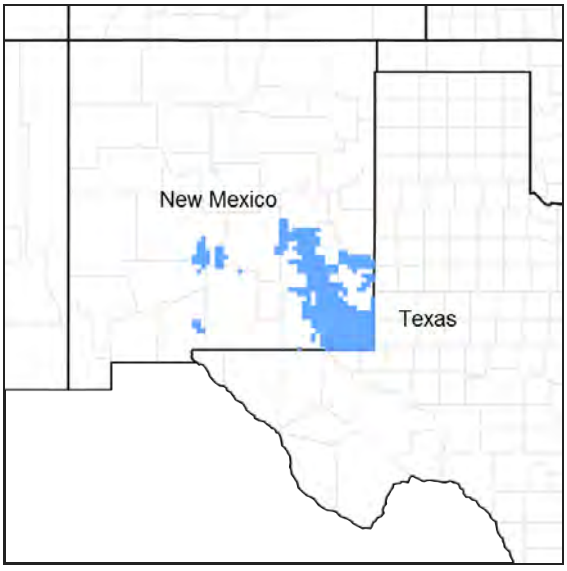

Figure 1. Mapped extent

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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site is on uplands, plains, dunes, fan piedmonts, terraces and in inter dunal areas. The parent material consists of mixed alluvium and or eolian sands or calcareous alluvium derived from sedimentary rock. Slope range on this site range from 0 to 9 percent with the average of 5 percent.

Low stabilized dunes may occur occasionally on this site. Elevations range from 2,800 to 5,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Fan piedmont (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	2,842–4,500 ft

Slope	0–5%
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 8 to 13 inches. Variations of 5 inches, more or less, are common. Over 80 percent of the precipitation falls from April through October. Most of the summer precipitation comes in the form of high intensity short duration thunderstorms.
Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature is 61 degrees with extremes of 25 degrees below zero in the winter to 112 degrees in the summer.
The average frost-free season is 207 to 220 days. The last killing frost is in late March or early April, and the first killing frost is in late October or early November.
Temperature and rainfall both favor warm season perennial plant growth. In years of abundant spring moisture, annual forbs and cool season grasses can make up an important component of this site. Strong winds blow from the southwest in January through June which rapidly dries out the soil during a critical period for cool season plant growth.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

Table 3. Representative climatic features

Frost-free period (average)	200 days
Freeze-free period (average)	219 days
Precipitation total (average)	12 in

Influencing water features

This site is not influenced from water from wetlands or streams.

Soil features

Soils are moderately deep or very deep. Surface textures are loamy fine sand, fine sandy loam, loamy very fine sand or gravelly sandy loam.

Subsurface is a sandy loam, loam, sandy clay loam, clay loam (contains more than 45 percent sand and 18 to 35 percent clay) and less than 15 percent carbonates.

Substratum is a sandy loam, fine sandy loam, sandy clay loam, clay loam, coarse sandy loam, or coarse sand and Calcium carbonate equivalent of 15 to 40 percent. Some layers high in lime or with caliche fragments may occur at depths of 20 to 30 inches.

These soils, if unprotected by plant cover and organic residue, become wind blown and low hummocks are formed. They contains more than 45 percent sand and 18 to 35 percent clay.

Minimum and maximum values listed below represent the characteristic soils for this site.

Characteristic Soils Are:
Anthony
Berino
Cacique
Harkey
Pajaritio

Reakor
Mobeetie
Wink
Sotim
Vinton
Drake
Onite
Alma
Poquita
Dona Ana
Monahans

Note: *Cacique soils is a shallow soil.

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam (2) Sandy loam (3) Loamy fine sand
Family particle size	(1) Loamy
Drainage class	Well drained to moderately well drained
Permeability class	Moderately rapid to moderately slow
Soil depth	30–72 in
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3–11 in
Calcium carbonate equivalent (0-40in)	5–30%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Overview

The Sandy site often intergrades with the Loamy Sand and Deep Sand sites (SD-3). Sandy sites occur on plains, fans, or terraces between drainages. Slopes average less than five percent. Surface textures are usually sandy loams. The historic plant community of the Sandy site is dominated by black grama (*Bouteloua eriopoda*) and dropseeds (*Sporobolus flexuosus*, *S. contractus*, *S. cryptandrus*). Blue grama (*B. gracilis*) also occurs as a subdominant species. Perennial and annual forb abundance is distributed relative to precipitation occurrence. Litter and to a lesser extent, bare ground, compose a significant proportion of the ground cover while grasses compose the remainder. Decreases in black grama and other grass species' cover indicate a transition to states with an

increased shrub component. Shinnery oak (*Quercus havardii*), sand sage(*Artemisia filifolia*), and honey mesquite (*Prosopis glandulosa*) can all increase in composition. Lehmann lovegrass (*Eragrostis lehmanniana*) also may occur as a result of invasion and competition among grass species. Heavy grazing intensity and/or drought are influential in decreasing grass cover and subsequently increasing shrub cover. Fire suppression further supports shrub cover increase and an advantage over grass species. However, brush and grazing management may restore grass species and reverse shrub or grass/shrub dominated states back toward the historic plant community.

State and transition model

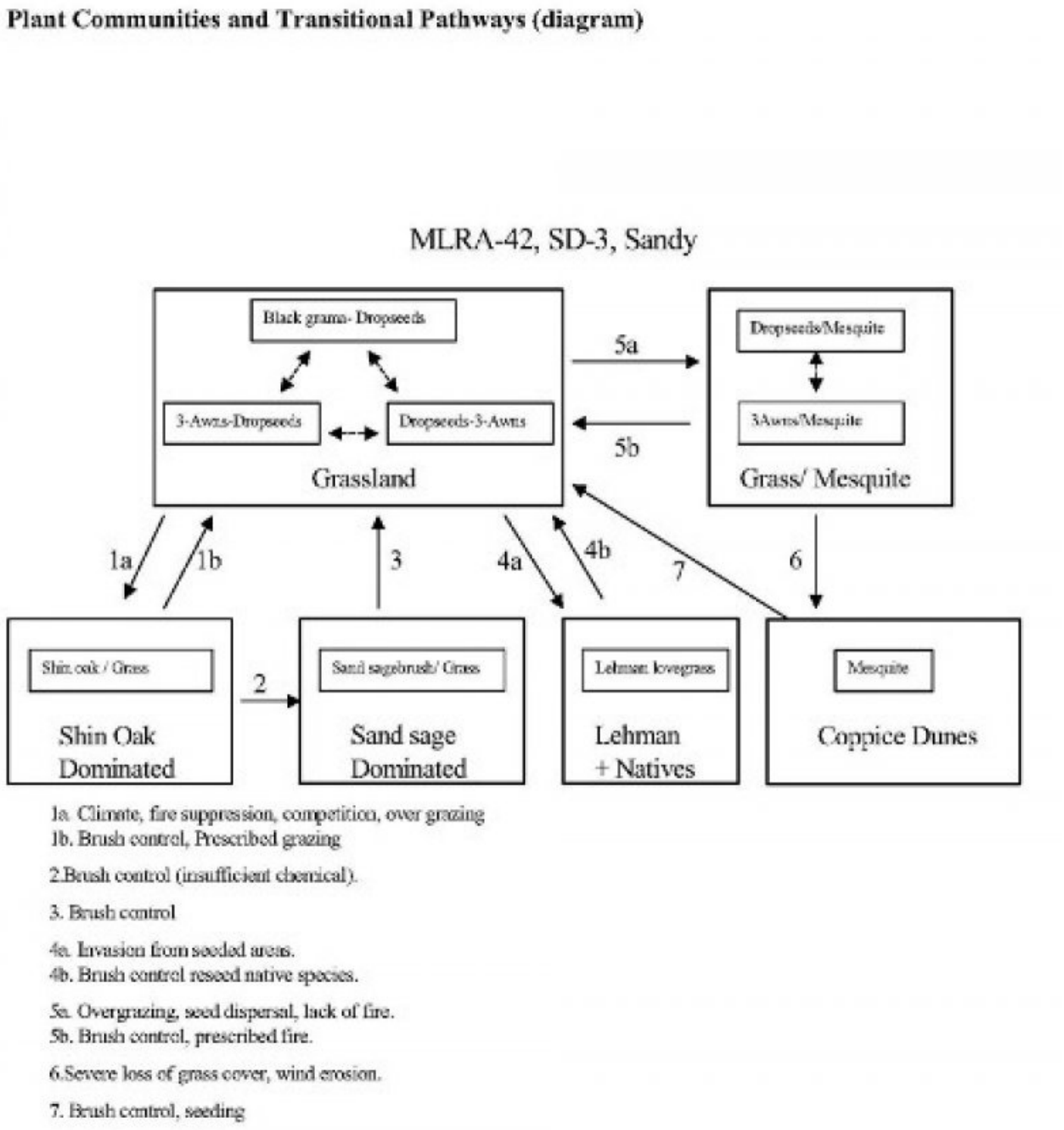

Figure 6.

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

Grassland: The historic plant community is composed primarily of black grama, dropseeds, and a secondary component of blue grama. Black grama tends to dominate due to the predominance of sandy loam soils; however, dropseeds increase on more loamy soils. Perennial and annual forbs are common but their abundance and distribution are dependent on seasonal precipitation. Historical fire frequency is unknown but probably contributed to shrub reduction to the competitive advantage of grass species. Excessive grazing and drought are likely the dominant drivers that decrease black grama and increase dropseed and threeawn abundance within the historic plant community. Black grama has low seed viability, and therefore, reproduces vegetatively during the summer growing season. However, black grama growth is delayed one season after normal precipitation. Black grama is dormant for the remainder of the year; however, black grama retains nutritive value yearlong for grazing. In contrast, dropseeds have relatively abundant, viable seed production and can benefit from early spring as well as summer precipitation. Threeawns also respond to spring and summer moisture and tend to be the year's first palatable species. Threeawns and dropseeds, however, are not palatable during dormant periods, which extends grazing pressure to black grama. Moderate to heavy grazing reduces vegetative cover of black grama which increases its susceptibility to wind erosion and drought (Canfield 1939). Black grama is especially vulnerable to grazing during the summer growing season when stoloniferous growth and rooting occur. Black grama sustains short droughts through reduction of plant tufts which will subsequently emerge with sufficient moisture. Prolonged drought or grazing concurrently under drought conditions can delay or impede recovery of black grama (Nelson 1934) and increase abundance of dropseeds, threeawns, and blue grama. Historical fire events may have benefited black grama, especially, frequent, light intensity/severity fires in conjunction with sufficient moisture to increase stolon production (McPherson 1995). Fires which were hot and severe, however, probably contributed to black grama mortality, more so in drought conditions.

Diagnosis: This state is a grassland dominated by black grama, dropseeds, and threeawns, with subdominant blue grama. Shrubs, such as sand sage and mesquite, are sparsely dispersed throughout the grassland. Forb populations are present and fluctuate with precipitation variability.

Other grasses that could appear on this site include: fall withchgrass, slim tridens, Almejita signalgrass, Indian ricegrass and fluffgrass.

Other shrubs include: pale wolfberry, lotebush, tarbush, Apacheplume, and mesquite.

Other forbs include: plains tickseed, plains blackfoot, scorpionweed, nama, wooly guara, wooly dalea, spectaclepod mustard, bladderpod mustard, menodora, prickly lettuce, lambsquarter, wooly Indianwheat and wild buckwheat.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	480	720	960
Forb	90	135	180
Shrub/Vine	30	45	60
Total	**600**	**900**	**1200**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	35-40%
Forb foliar cover	0%
Non-vascular plants	0%

Biological crusts	0%
Litter	35-45%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	15-20%

Figure 8. Plant community growth curve (percent production by month). NM2804, R042XC004NM-Sandy-HCPC. SD-3 Sandy - Warm season plant community .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	4	10	10	25	30	12	5	0	0

State 2
Shinnery Oak Dominated

Community 2.1
Shinnery Oak Dominated

Shinnery Oak Dominated: This state is dominated by Shinnery oak with subdominant grass species from the historic plant community. Bare ground is a significant component in this state. Shinnery oak tends to be clumped in distribution in finer soil textures. Shinnery oak density increases (as well as dropseeds, threeawns, and blue grama) in coarse textured (e.g., Loamy Sand sites) and deeper, coarse textured (e.g., Deep Sand and Sandhills sites) soils. Shinnery oak predominates during periods of above average (i.e., 16 in.) precipitation during the months of July and August. Abundance and distribution also increases with disturbance, such as excessive grazing and fire, due to an aggressive rhizome system. Shinnery oak's extensive root system allows competitive exclusion of grasses and forbs. Brush control with herbicide treatments applied in the spring can reduce Shinnery oak (Herbel et al. 1979, Pettit 1986). In addition, repetitive seasons of goat browsing can also decrease Shinnery oak abundance. However, brush management should maintain shrub patches to prevent erosion and to provide wildlife cover and forage.

Diagnosis: This state represents a clumped distribution of Shinnery oak with patches of bare ground and subdominant grass species, such as black grama, dropseeds, threeawns, and blue grama. Shinnery oak density increases, as do dropseeds, threeawns, and blue grama, as Sandy site intergrades with Deep Sand and Sandhills sites.

Transition to Shinnery Oak-Dominated State (1a): Decrease in black grama with subsequent decrease in dropseeds and threeawns. Increase in Shinnery oak as a result of drought, above average precipitation (>16 inches), grazing, fire suppression, interspecific competition, and coarse textured soils.

Key indicators of approach to transition:
• Loss of black grama and other grass species cover
• Increase of dropseed/threeawn and shinnery oak
• Surface soil erosion and bare patch expansion

Transition to Historic Plant Community (1b): The Shinnery oak-dominated state begins to transition toward the historic plant community as drivers such as drought, but also above average precipitation (e.g., 16 inches) discontinue. Brush control can also drive the Shinnery oak state toward a grassland state.

State 3
Sand Sage Dominated

Community 3.1

Sand Sage Dominated

Sand Sage Dominated: This state is dominated by sand sage with subdominant grass species from the historic plant community. Sand sage occurs as a result of insufficient herbicide application in Shinnery oak dominated sites with subdominant sand sage. Sand sage either reestablishes dominance or colonizes from an off-site location and stabilizes soils. Sand sage stabilizes light sandy soils from wind erosion and provides a harbor for grass and forb species in heavily grazed conditions (Davis and Bonham 1979). Sand sage abundance increases with drought and/or heavy grazing, but decreases with light grazing due to herbaceous plant competition. Grass and forb species can reestablish as competition from sand sage is relatively light. Herbicide applied in the spring, especially when growth and photosynthesis rates are greatest, can reduce sand sage if there is subsequent rest from grazing (Herbel et al. 1979, Pettit 1986). Brush management should maintain patches of sand sage to prevent wind erosion and subsequent dune formation.

Diagnosis: This state is dominated by sand sage with subdominant grass species, such as black grama, dropseeds, threeawns, and blue grama. Sand sage tends to occur in sites with coarser textured soils.

Transition to Sand Sage Dominated (2): Sand sage appears from off-site locations and/or increases after insufficient herbicide applications aimed at removing Shinnery oak and sand sage.

Key indicators of approach to transition:
• Increase of sand sage seedlings and grasses
• Reduced soil erosion

Transition to Historic Plant Community (3): The sand sage dominated state transitions toward the historic plant community as sand sage decreases primarily through brush management but also with light intensity grazing management. Drought reduction will also support a transition to the historic plant community.

State 4
Lehmann Lovegrass + Natives

Community 4.1
Lehmann Lovegrass + Natives

Lehmann Lovegrass + Natives: This state is dominated by Lehmann lovegrass with subdominant grass species from the historic plant community. Lehmann lovegrass is a warm-season, perennial bunchgrass that was introduced from South Africa in the 1930’s for rangeland restoration purposes (Humphrey 1970). Lehmann lovegrass invades from off-site locations with projects utilizing lovegrass for reseeding, soil stabilization, or highway projects. Lehmann lovegrass provides a winter and early spring forage for grazing. Lehmann lovegrass is vigorous in sandy to sandy loam soils which receive approximately 6-8 inches of summer precipitation (Cox et al. 1988). Lehmann lovegrass’s aggressive competitive exclusion of native grass species has been attributed to lovegrass’s low summer palatability, which reduces vigor of native species and allows lovegrass to increase vigor before grazing. Also, Lehmann lovegrass abundant seed production and establishment, especially after disturbances, allows for increased competition (Cable 1971, Cox et al. 1981). Lehmann lovegrass generally is tolerant to fire because of an aggressive seed-bank; however, severe fires can cause mature lovegrass mortality (Sumrall et al. 1991). Herbicide and reseeding is recommended for control of Lehmann lovegrass (Winn 1991).

Diagnosis: Lehmann lovegrass and grass species from the historic plant community, such as black grama, dropseeds, threeawns, and blue grama, dominate this state.

Transition to Lehmann lovegrass and native grass species (4a): Decrease in black grama with subsequent decrease in dropseeds and threeawns. Increase in Lehmann lovegrass as a result of drought, grazing, fire and interspecific competition from nearby sources of Lehmann lovegrass.

Key indicators of approach to transition:
• Loss of black grama and other grass species cover
• Disturbance and nearby source of Lehmann lovegrass
• Increase of Lehmann lovegrass seedlings

Transition to Historic Plant Community (4b): The Lehmann lovegrass/native grass state transitions toward the historic plant community after actions such as herbicide application and native reseeding have occurred. In addition, prevention of disturbances such as fire and livestock grazing also will encourage the transition to a native grass community

State 5
Grass/Mesquite

Community 5.1
Grass/Mesquite

Grass/Mesquite: This state is dominated by honey mesquite with dropseeds and/or threeawns. Black grama generally is rare as a result of heavy grazing intensity. Honey mesquite invades through seed dispersal from grazing livestock and/or wildlife. Dropseeds and threeawns cohabitate with mesquite due to sufficient precipitation. Mesquite tends to be arborescent due to less soil erosion relative to the Coppice Dunes state which reflects large soil loss. Mesquite obtains approximately half of its nitrogen from symbiotic bacteria housed in root nodules (Lajtha and Schlesinger 1986). Mesquite also provides nitrogen and soil organic matter to co-dominant grasses (Ansley and Jacoby 1998, Ansley et al. 1998). Historical fire occurrences reduced mesquite abundance by disrupting seed production cycles and suppressing seedlings; thus, grass species remained dominant. However, fire suppression has allowed mesquite to increase in density and abundance, increasing mesquite resistance to fires through aggressive resprouting. Herbicide application combined with subsequent prescribed fire may be effective in mesquite reduction (Britton and Wright 1971).

Diagnosis: This state is co-dominated by honey mesquite and dropseeds or threeawns.

Transition to Grass/Mesquite State (5a): This state occurs due to a decrease in black grama primarily from heavy grazing intensity and from an introduction of mesquite seeds from grazers. Dropseeds and threeawns increase and co-exist in the absence of black grama. Fire suppression also is responsible for an increase in mesquite.

Key indicators of approach to transition:
• Loss of black grama
• Increase of dropseeds and/or threeawns
• Increase of mesquite seedlings

Transition to Historic Plant Community (5b): Transition to the historic plant community requires brush management though herbicide application and possibly prescribed fire to reduce mesquite abundance. Once shrub species are removed, prescribed fire may be useful in maintaining a dominant grassland. Precipitation is also necessary in conjunction with management activities to support a dominant grassland.

State 6
Coppice Dunes

Community 6.1
Coppice Dunes

Coppice Dunes: This state is dominated by coppice mesquite dunes with minimal or no grass cover. Honey mesquite occurs in a multi-stemmed growth form which cultivates it’s dune formation by entrapping drifting sands. Mesquite utilizes its extensive tap and lateral roots to benefit from moisture deep in coarse textured soils. Grass species cannot compete for moisture, especially with compounding perturbations such as heavy grazing and drought. Soils succumb to wind erosion with the depletion of grass cover and eventually dunes form around mesquite plants (Gould 1982). Brush management is limited to herbicide application, biological control, or manual removal, as a lack of grass cover prevents prescribed burning. Seeding subsequent to brush control may transition this State toward the historic plant community.

Diagnosis: This state is characterized by low growing, multi-stemmed mesquite plants which form Coppice dunes by drifting soils from wind erosion. As grass cover decreases, windblown soils are removed from unprotected, inter-dune areas. Soils are then re-deposited on dunes which increases dune size.

Transition to Mesquite Coppice Dunes State (6): Decrease in black grama with subsequent decrease in dropseeds and threeawns due to competition with mesquite especially during drought, heavy grazing, and fire suppression. Competitive exclusion of grasses leads to wind erosion of sandy soils and dune formation of low growing mesquite plants.

Key indicators of approach to transition:
• Loss of black grama and other grass species cover
• Wind erosion as evidenced by pedestalled plants
• Bare patch expansion
• Increase of Coppice dune mesquites

Transition to Historic Plant Community (7): Transition toward the historic plant community requires mesquite removal though either herbicide application, biological control, or manual removal. In addition, seeding of native grass species with subsequent years of sufficient moisture is critical.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm Season**			315–360	
	black grama	BOER4	*Bouteloua eriopoda*	315–360	–
2	**Warm Season**			45–90	
	blue grama	BOGR2	*Bouteloua gracilis*	45–90	–
3	**Warm Season**			27–45	
	bush muhly	MUPO2	*Muhlenbergia porteri*	27–45	–
4	**Warm Season**			90–135	
	spike dropseed	SPCO4	*Sporobolus contractus*	90–135	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	90–135	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	90–135	–
5	**Warm Season**			27–45	
	threeawn	ARIST	*Aristida*	27–45	–
6	**Warm Season**			27–45	
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	27–45	–
7	**Warm Season**			27–45	
	Arizona cottontop	DICA8	*Digitaria californica*	27–45	–
8	**Warm Season**			45–72	
	silver bluestem	BOSA	*Bothriochloa saccharoides*	45–72	–
	little bluestem	SCSC	*Schizachyrium scoparium*	45–72	–
9	**Warm Season**			9–27	
	vine mesquite	PAOB	*Panicum obtusum*	9–27	–
10	**Warm Season**			9–27	
	tobosagrass	PLMU3	*Pleuraphis mutica*	9–27	–
11	**Other Perennial Grasses**			9–27	
	Grass, perennial	2GP	*Grass, perennial*	9–27	–
Shrub/Vine					
12	**Shrub**			9–45	

	yucca	YUCCA	*Yucca*	9–45	–
13	**Shrub**			9–27	
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	9–27	–
14	**Shrub**			9–27	
	fourwing saltbush	ATCA2	*Atriplex canescens*	9–27	–
15	**Shrub**			9–27	
	jointfir	EPHED	*Ephedra*	9–27	–
16	**Shrub**			9–27	
	javelina bush	COER5	*Condalia ericoides*	9–27	–
17	**Shrub**			9–27	
	sand sagebrush	ARFI2	*Artemisia filifolia*	9–27	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	9–27	–
18	**Other Shrubs**			9–27	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	9–27	–
Forb					
19	**Forb**			27–63	
	croton	CROTO	*Croton*	27–63	–
	globemallow	SPHAE	*Sphaeralcea*	27–63	–
20	**Forb**			27–45	
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	27–45	–
	woolly groundsel	PACA15	*Packera cana*	27–45	–
21	**Forb**			9–27	
	Adonis blazingstar	MEMU3	*Mentzelia multiflora*	9–27	–
22	**Forb**			27–45	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	27–45	–
	Texas stork's bill	ERTE13	*Erodium texanum*	27–45	–
23	**Other Forbs**			9–27	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	9–27	–

Animal community

This site provides habitat which support a resident animal community that is characterized by pronghorn antelope, black-tailed jackrabbit, spotted ground squirrel, black-tailed prairie dog, yellow-faced pocket gopher, Ord's kangaroo rat, Northern grasshopper mouse, southern plains woodrat, badger, meadowlark, roadrunner, burrowing owl, white-necked raven, cactus wren, pyrrhuloxia, lesser prairie chicken, mourning dove, scaled quail, Harris' hawk, side-blotched lizard, marbled whiptail, Texas horned lizard, prairie rattlesnake, plains spadefoot toad, and ornate box turtle.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydraulic cover conditions and hydrologic soil groups.
Hydrologic Interpretations

Soil Series Hydrologic Group
Anthony B
Berino B

Cacique C *shallow soil
Harkey B
Pajaritio B
Reakor B
Mobeetie B
Wink B
Sotim B
Vinton B
Drake B
Onite B
Alma B
Poquita B
Dona Ana B
Monahans B

Recreational uses

This site offers recreation potential for hiking, horseback riding, nature observation, and photography, bird, antelope and predator hunting. During years of abundant spring moisture, this site displays a colorful array of wildflowers.

Wood products

This site has no potential for wood products.

Other products

This site is suitable for grazing by all classes and kinds of livestock during all seasons of the year. Under retrogression, plants such as black grama, blue grama, bush muhly, plains bristlegrass, Arizona cottontop, vine mesquite, little bluestem and fourwing saltbush will decrease while the dropseeds, threeawns, tobosa, yucca, catclaw mimosa, javelinabush, mesquite and broom snakeweed will increase. This site responds well to brush management and deferment. It is best suited to a system of management that rotates the season of use.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index Ac/AUM
100 - 76 2.7 – 3.8
75 – 51 3.5 – 5.0
50 – 26 5.0 – 8.0
25 – 0 8.1 +

Inventory data references

Other References:
Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Areas of New Mexico. This site has been mapped and correlated with soils in the following soil surveys. Eddy County, Lea County, and Chaves County.

Other references

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Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Areas of New Mexico. This site has been mapped and correlated with soils in the following soil surveys. Eddy County, Lea County, and Chaves County.

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Contributors

Don Sylvester
Quinn Hodgson

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)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

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

ATTACHMENT 4

Gmail

Dhugal Hanton <vertexresourcegroupusa@gmail.com>

48-HR Notification Billiken 6 CTB 1, Gaucho Unit 30 CTB 1, Green Wave 20 CTB 9 Liner Inspections

Dhugal Hanton <vertexresourcegroupusa@gmail.com> Thu, Jan 13, 2022 at 1:52 PM
To: EMNRD-OCD-District1spills <emnrd-ocd-district1spills@state.nm.us>, "CFO_Spill, BLM_NM" <blm_nm_cfo_spill@blm.gov>, "Enviro, OCD, EMNRD" <OCD.Enviro@state.nm.us>
Cc: wesley.mathews@dvn.com, dale.woodall@dvn.com
Bcc: Jramirez@vertex.ca, bschafer@vertex.ca

All,

Please accept this email as 48-hr notification that Vertex Resource Services has scheduled 3 liner inspections to be conducted for the following releases:

nAPP2129845429 DOR: 10/24/2021 Site Name: Green Wave 20 CTB 9

nAPP2134155628 DOR: 12/3/2021 Site Name: Billiken 6 CTB 1

nAPP2131553617 DOR: 11/5/2021 Site Name: Gaucho Unit 30 CTB 1

This work will be completed on behalf of Devon Energy Production Company.

On Friday, January 21, 2022 at approximately 8:00 a.m., John Ramirez will be on the first site to conduct a liner inspection and continue them throughout the day. He can be reached at 575-725-1809. If you need directions to the sites, please do not hesitate to contact him. If you have any questions or concerns regarding this notification, please give me a call at 701-301-1564.

Thank you,

Brandon Schafer
Project Manager

Vertex Resource Services Inc.

P 701.645.3111 Ext. 706
C 701.301.1564
F 780.464.3731

www.vertex.ca

ATTACHMENT 5

Daily Site Visit Report

Client:	Devon Energy Corporation	Inspection Date:	1/21/2022
Site Location Name:	Billiken 6 CTB 1	Report Run Date:	1/21/2022 10:59 PM
Client Contact Name:	Wes Matthews	API #:	
Client Contact Phone #:	(575) 748-0176		
Unique Project ID		Project Owner:	
Project Reference #		Project Manager:	

Summary of Times

Arrived at Site	1/21/2022 9:55 AM
Departed Site	1/21/2022 10:20 AM

Field Notes

10:56 Arrived on site to perform liner inspection.

11:05 Inside and outside of the wall dike does not appear to have any significant damage.

11:09 The bottom of the containment does not appear to have any significant damage around and between the tanks.

11:09 There's is nothing that I see that brings up any environmental concern.

Next Steps & Recommendations

1 No recommendations at this time.

Daily Site Visit Report

Site Photos

Viewing Direction: South	**Viewing Direction**: Northwest
	
Outside the wall dike east side.	Inside the wall dike west side.
Viewing Direction: Northeast	**Viewing Direction**: South
	
Inside the wall dike north side.	West side of the containment.

Daily Site Visit Report

Viewing Direction: East

Bottom of containment between tanks 451 and 413

Viewing Direction: East

Bottom of containment between tanks 413 and 452

Viewing Direction: East

Bottom of containment between tanks 452 and 453

Viewing Direction: North

Bottom of containment between all tanks N-S

Daily Site Visit Report

Viewing Direction: East	**Viewing Direction**: North
	
Outside the wall dike north side.	Outside the wall dike west side.
Viewing Direction: East	**Viewing Direction**: North
	
Outside the wall dike south side.	Inside the wall dike east side.

Daily Site Visit Report

Viewing Direction: North

East side of the containment.

Viewing Direction: Southwest

South side of the containment.

Viewing Direction: Southeast

South side of the containment.

Viewing Direction: Southwest

Inside the wall dike south side.

Daily Site Visit Report

Daily Site Visit Signature

Inspector: Chance Dixon

Signature: 

Signature

ATTACHMENT 6

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	nAPP2134155628
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party Devon Energy Production Company	OGRID 6137
Contact Name Dale Woodall	Contact Telephone
Contact email Dale.Woodall@dvn.com	Incident # *(assigned by OCD)*
Contact mailing address 6488 Seven Rivers Hwy Artesia, NM 88210	

Location of Release Source

Latitude 32.076535 Longitude -103.411171

(NAD 83 in decimal degrees to 5 decimal places)

Site Name Billiken 6 CTB 1	Site Type Oil
Date Release Discovered 12/03/2021	API# *(if applicable)*

Unit Letter	Section	Township	Range	County
D	6	23S	35E	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) 236.28 BBLS	Volume Recovered (bbls) 236.28 BBLS
	Is the concentration of total dissolved solids (TDS) 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 Leak developed in flowline. Fluid remained in lined containment.		

Form C-141
Page 2

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2134155628
District RP	
Facility ID	
Application ID	

Was this a major release as defined by 19.15.29.7(A) NMAC? ☒ Yes ☐ No	If YES, for what reason(s) does the responsible party consider this a major release? The spill is over 25 BBLS.

If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)?
Notice given by Dale Woodall to OCD.

Initial Response

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

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

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

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

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

Printed Name: Kendra DeHoyos
Title: EHS Associate
Signature: Kendra DeHoyos
Date: 12/22/2021
email: Kendra.Ruiz@dvn.com
Telephone: 575-748-0167

OCD Only

Received by: Ramona Marcus
Date: 12/27/2021

NAPP2134155628

Spills In Lined Containment	
Measurements Of Standing Fluid	
Length(Ft)	100
Width(Ft)	53
Depth(in.)	4
Total Capacity without tank displacements (bbls)	314.66
No. of 500 bbl Tanks In Standing Fluid	7
No. of Other Tanks In Standing Fluid	1
OD Of Other Tanks In Standing Fluid(feet)	
Total Volume of standing fluid accounting for tank displacement.	236.28

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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 68440

CONDITIONS

Operator: DEVON ENERGY PRODUCTION COMPANY, LP 333 West Sheridan Ave. Oklahoma City, OK 73102	OGRID: 6137
	Action Number: 68440
	Action Type: [C-141] Release Corrective Action (C-141)

CONDITIONS

Created By	Condition	Condition Date
rmarcus	None	12/27/2021

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Submit to appropriate OCD District office

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Site Assessment/Characterization

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

What is the shallowest depth to groundwater beneath the area affected by the release?	<50 (ft bgs)
Did this release impact groundwater or surface water?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse?	☐ Yes ☒ No
Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church?	☐ Yes ☒ No
Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes?	☐ Yes ☒ No
Are the lateral extents of the release within 1000 feet of any other fresh water well or spring?	☐ Yes ☒ No
Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a wetland?	☐ Yes ☒ No
Are the lateral extents of the release overlying a subsurface mine?	☐ Yes ☒ No
Are the lateral extents of the release overlying an unstable area such as karst geology?	☐ Yes ☒ No
Are the lateral extents of the release within a 100-year floodplain?	☐ Yes ☒ No
Did the release impact areas **not** on an exploration, development, production, or storage site?	☐ Yes ☒ No

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

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

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

Form C-141
Page 4

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2134155628
District RP	
Facility ID	
Application ID	

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

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

Printed Name: Dale Woodall Title: EHS Professional

Signature: Dale Woodall (Feb 3, 2022 15:52 MST) Date: Feb 3, 2022

email: Dale.Woodall@dvn.com Telephone: 575-748-1838

OCD Only

Received by: _____ Date: _____

Form C-141
Page 6

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2134155628
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: Dale Woodall Title: EHS Professional

Signature: Dale Woodall (Feb 3, 2022 15:52 MST) Date: Feb 3, 2022

email: Dale.Woodall@dvn.com Telephone: 575-748-1838

OCD Only

Received by: Chad Hensley Date: 02/23/2022

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: Chad Hensley Date: 02/23/2022

Printed Name: Chad Hensley Title: Environmental Specialist Advanced

February 2, 2022 Vertex Project #: 21E-00580-009

Spill Closure Report: Billiken 6 CTB 1
Unit D, Section 06, Township 26 South, Range 35 East
County: Lea
API: N/A
Tracking Number: nAPP2134155628

Prepared For: Devon Energy Production Company
6488 Seven Rivers Highway
Artesia, New Mexico 88210

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

Devon Energy Production Company (Devon) retained Vertex Resource Services Inc. (Vertex) to conduct a spill assessment and liner inspection for a produced water release that occurred at Billiken 6 CTB 1 (hereafter referred to as "Billiken CTB"). Devon provided immediate notification of the spill to New Mexico Oil Conservation Division (NMOCD) District 1 and the Bureau of Land Management (BLM), who own the property, on December 4, 2021, via phone call and email. The initial C-141 Release Notification was received by NMOCD on December 22, 2021 (Attachment 1). The NMOCD tracking number assigned to this incident is nAPP2134155628.

This letter provides a description of the liner inspection and demonstrates that closure criteria established in 19.15.29.12 *New Mexico Administrative Code* (NMAC; New Mexico Oil Conservation Division, 2022) have 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.

Incident Description

On December 3, 2021, a release occurred at Devon's Billiken CTB site when a leak developed in a flowline. The incident resulted in the release of approximately 236.28 barrels (bbl) of produced water into lined containment. A hydrovac arrived on-site to recover free fluids; approximately 236.28 bbls of produced water were recovered and removed for disposal off-site. The spill was fully contained within the bermed, lined containment on the facility pad. No produced water was released into undisturbed areas or waterways.

Site Characterization

The release at Billiken CTB occurred on federally-owned land, N 32.076535, W 103.411171, approximately 12.5 miles west of Jal, New Mexico. The legal description for the site is Unit D, Section 06, Township 26 South, Range 35 East, Lea County, New Mexico. This location is within the Permian Basin in southeast New Mexico and has historically been used for oil and gas exploration and production, and rangeland. An aerial map of the site is included in Attachment 2.

Billiken CTB is typical of oil and gas exploration and production sites in the western portion of the Permian Basin and is currently used for oil and gas production and storage. The following sections specifically describe the area in which the Billiken CTB facility is located.

The surrounding landscape is associated with sandy plains typical of elevations of 3,000 to 3,900 feet above sea level. The climate is semi-arid, with average annual precipitation ranging between 10 and 12 inches. Historically, the plant community was dominated by grasses, which stabilized the potentially erosive sandy soils; however, more recent conditions, resulting from fire suppression and extensive grazing, show increased woody plant abundance. The dominant grass species are black grama, dropseeds and bluestems, with scattered shinnery oak and sand sage. Litter and, to a lesser extent, bare ground are a significant proportion of ground cover while grasses compose the remainder (United States Department of Agriculture, Natural Resources Conservation Service, 2022). Limited to no vegetation is allowed to grow on the compacted facility pad.

The *Geological Map of New Mexico* indicates the surface geology at Billiken CTB is comprised of Qep – eolian and piedmont deposits that include eolian sands interlaid with piedmont-slope deposits (New Mexico Bureau of Geology and Mineral Resources, 2022). The Natural Resources Conservation Service *Web Soil Survey* characterizes the soil at the site as Pyote and Maljamar fine sands, characterized by deep, fine sandy and loamy fine sandy soil. It tends to be well-drained with very low to negligible runoff and low available moisture levels in the soil profile (United States Department of Agriculture, Natural Resources Conservation Service, 2022). There is low potential for karst geology to be present near Billiken CTB, though some erosional karst is possible (United States Department of the Interior, Bureau of Land Management, 2018).

There is no surface water located at Billiken CTB. The nearest significant watercourse, as defined in Subsection P of 19.15.17.7 NMAC, is an intermittent stream located approximately 1.19 miles east of the site. An emergent wetland is located approximately 0.64 miles west of the site. An intermittent lake is located approximately 14 miles south-southeast of the release site (United States Fish and Wildlife Service, 2022). At Billiken CTB, there are no continuously flowing watercourses, lakebeds, sinkholes, playa lakes, or other critical water or community features nearby as outlined in Paragraph (4) of Subsection C of 19.15.29.12 NMAC.

The nearest well to Billiken CTB is a United States Geological Survey-identified well located approximately 2.4 miles south of the site, with no groundwater data. New Mexico Office of the State Engineer-identified wells are located approximately 2.57 miles north and 3.57 miles west of the site with recorded depths to groundwater of 300 and 230 feet below ground surface, respectively (bgs; New Mexico Office of the State Engineer, New Mexico Water Rights Reporting System, 2022). Documentation pertaining to site characterization and depth to groundwater determination is included in Attachment 3.

Closure Criteria Determination

Using site characterization information, a closure criteria determination worksheet (Attachment 3) was completed to determine if the release was subject to any of the special case scenarios outlined in Paragraph (4) of Subsection C of 19.15.29.12 NMAC.

Based on data included in the closure criteria determination worksheet, the release at Billiken CTB is not subject to the requirements of Paragraph (4) of Subsection C of 19.15.29.12 NMAC. The nearest depth to groundwater reference is

more than 0.5 miles from the site; therefore, the closure criteria for the incident assume the most stringent conditions (depth to groundwater <50 feet bgs) and are determined to be associated with the following constituent concentration limits.

Table 1. Closure Criteria for Soils Impacted by a Release

Minimum depth below any point within the horizontal boundary of the release to ground water less than 10,000 mg/L TDS[1]	Constituent	Limit
< 50 feet	Chloride	600 mg/kg
	TPH[2] (GRO + DRO + MRO)	100 mg/kg
	BTEX[3]	50 mg/kg
	Benzene	10 mg/kg

[1]Total Dissolved Solids (TDS)

[2]Total petroleum hydrocarbons (TPH) = gasoline range organics (GRO) + diesel range organics (DRO) + motor oil range organics (MRO)

[3]Benzene, toluene, ethylbenzene and xylenes (BTEX)

Liner Inspection

On January 13, 2022, Vertex provided 48-hour notification of the liner inspection to NMOCD and the BLM, as required by Subparagraph (a) of Paragraph (5) of Subsection A 19.15.29.11 NMAC (Attachment 4). On January 21, 2022, Vertex was on-site to conduct an inspection of the lined containment and verify that the liner was intact and had the ability to contain the release. The Daily Field Report and associated photographs of the liner inspection are included in Attachment 5. The inspection confirmed the liner remained intact and had the ability to contain the release. This was further evidenced by the amount of fluid released (~236.28 bbl) and recovered (~236.28 bbl).

Closure Request

Vertex recommends no additional remediation action to address the release at Billiken CTB. The secondary containment liner was intact and contained the release. There are no anticipated risks to human, ecological or hydrological receptors associated with the release site.

Vertex requests that this incident (nAPP2134155628) be closed as all closure requirements set forth in Subsection E of 19.15.29.12 NMAC have been met. Devon certifies that all information in this report and the attachments is 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 December 3, 2021, release at Billiken CTB. A complete C-141 form is presented in Attachment 6.

Should you have any questions or concerns, please do not hesitate to contact the undersigned at 832.588.0674 or dhanton@vertex.ca

Lakin Pullman, B.Sc. February 2, 2022
ENVIRONMENTAL TECHNICIAN, REPORT Date

Dhugal Hanton, B.Sc., P.Ag, P.Biol., SR/WA. February 2, 2022
VICE PRESIDENT- USA, REPORT REVIEW Date

Attachments

Attachment 1. NMOCD C-141 Initial Notification
Attachment 2. Aerial Site Map
Attachment 3. Closure Criteria for Soils Impacted by a Release Research Determination Documentation
Attachment 4. 48-hr Notification of Confirmatory Sampling to Regulatory Agencies
Attachment 5. Daily Field Report with Photographs
Attachment 6. Complete C-141 Form

References

New Mexico Bureau of Geology and Mineral Resources. (2022). *Interactive Geologic Map.* Retrieved from http://geoinfo.nmt.edu.

New Mexico Office of the State Engineer, New Mexico Water Rights Reporting System. (2022). *Water Column/Average Depth to Water Report.* Retrieved from http://nmwrrs.ose.state.nm.us/nmwrrs/waterColumn.html.

New Mexico Oil Conservation Division. (2022). *New Mexico Administrative Code – Natural Resources and Wildlife Oil and Gas Releases*. Santa Fe, New Mexico.

United States Department of Agriculture, Natural Resources Conservation Service. (2022). *Web Soil Survey*. Retrieved from https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

United States Department of the Interior, Bureau of Land Management. (2018). *CFO Karst Public*. https://www.nm.blm.gov/shapeFiles/cfo/carlsbad_spatial_data.html

United States Fish and Wildlife Service. (2022). *National Wetlands Inventory*. Retrieved from https://www.fws.gov/wetlands/data/Mapper.html.

Limitations

This report has been prepared for the sole benefit of Devon Energy Production Company (Devon). This document may not be used by any other person or entity, with the exception of the New Mexico Oil Conservation Division and Bureau of Land Management, without the express written consent of Vertex Resource Services Inc. (Vertex) and Devon. 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 judgement 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.

ATTACHMENT 1

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Energy Minerals and Natural Resources Department

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

Incident ID	nAPP2134155628
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party Devon Energy Production Company	OGRID 6137
Contact Name Dale Woodall	Contact Telephone
Contact email Dale.Woodall@dvn.com	Incident # *(assigned by OCD)*
Contact mailing address 6488 Seven Rivers Hwy Artesia, NM 88210	

Location of Release Source

Latitude 32.076535 Longitude -103.411171
(NAD 83 in decimal degrees to 5 decimal places)

Site Name Billiken 6 CTB 1	Site Type Oil
Date Release Discovered 12/03/2021	API# *(if applicable)*

Unit Letter	Section	Township	Range	County
D	6	23S	35E	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) 236.28 BBLS	Volume Recovered (bbls) 236.28 BBLS
	Is the concentration of total dissolved solids (TDS) 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 Leak developed in flowline. Fluid remained in lined containment.

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2134155628
District RP	
Facility ID	
Application ID	

Was this a major release as defined by 19.15.29.7(A) NMAC? ☒ Yes ☐ No	If YES, for what reason(s) does the responsible party consider this a major release? The spill is over 25 BBLS.

If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)?
Notice given by Dale Woodall to OCD.

Initial Response

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

- ☒ The source of the release has been stopped.
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- ☒ All free liquids and recoverable materials have been removed and managed appropriately.

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Printed Name: Kendra DeHoyos Title: EHS Associate

Signature: Kendra DeHoyos Date: 12/22/2021

email: Kendra.Ruiz@dvn.com Telephone: 575-748-0167

OCD Only

Received by: Ramona Marcus Date: 12/27/2021

NAPP2134155628

Spills In Lined Containment	
Measurements Of Standing Fluid	
Length(Ft)	100
Width(Ft)	53
Depth(in.)	4
Total Capacity without tank displacements (bbls)	314.66
No. of 500 bbl Tanks In Standing Fluid	7
No. of Other Tanks In Standing Fluid	1
OD Of Other Tanks In Standing Fluid(feet)	
Total Volume of standing fluid accounting for tank displacement.	236.28

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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 68440

CONDITIONS

Operator: DEVON ENERGY PRODUCTION COMPANY, LP 333 West Sheridan Ave. Oklahoma City, OK 73102	OGRID: 6137
	Action Number: 68440
	Action Type: [C-141] Release Corrective Action (C-141)

CONDITIONS

Created By	Condition	Condition Date
rmarcus	None	12/27/2021

ATTACHMENT 2

Containment (~7,161 sq. ft.)

VERTEX

0 25 50 100 ft.

NAD 1983 UTM Zone 13N
Date: Jan 24/22

Map Center:
Lat: 32.076583,
Long:-103.411132

N

Aerial Site Map
Billiken 6 CTB 1

FIGURE: 1

devon

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.

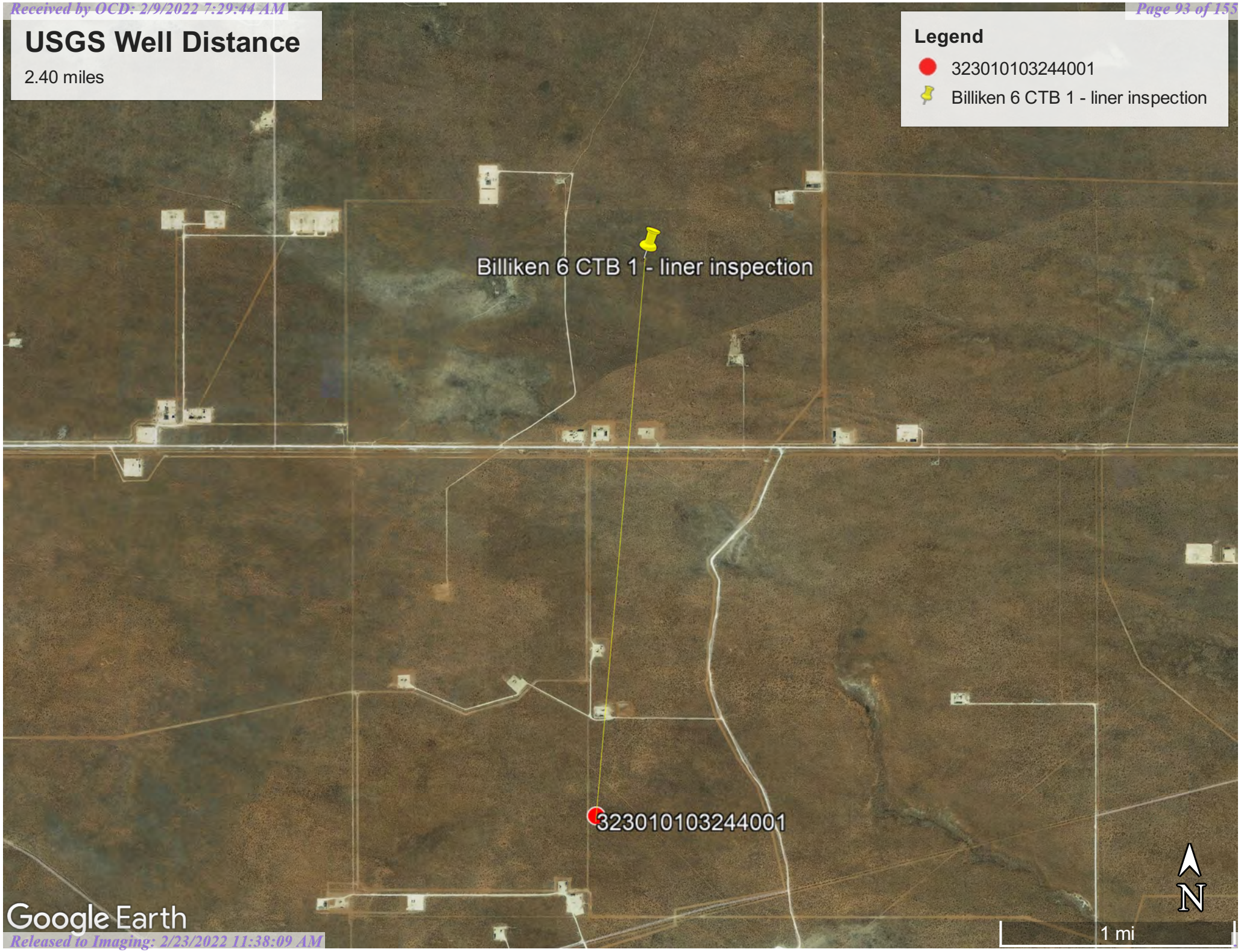
Note: Feature locations from aerial imagery, ESRI, 2021.

VERSATILITY. EXPERTISE.

Document Path: G:\1-Projects_US PROJECTS\Devon Energy Corporation\21E-00580\009 - Billiken 6 CTB 1\Figure 1 Aerial Map Billiken 6 CTB 1 (21E-00580).mxd

ATTACHMENT 3

Closure Criteria Worksheet			
Site Name: Billiken 6 CTB 1			
Spill Coordinates:		**X: 32.076535**	**Y: -103.411171**
Site Specific Conditions		**Value**	**Unit**
1	Depth to Groundwater	**<50**	feet
2	Within 300 feet of any continuously flowing watercourse or any other significant watercourse	12,664	feet
3	Within 200 feet of any lakebed, sinkhole or playa lake (measured from the ordinary high-water mark)	74,079	feet
4	Within 300 feet from an occupied residence, school, hospital, institution or church	46,941	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**	13,556	feet
	ii) Within 1000 feet of any fresh water well or spring	13,556	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	3,374	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	N/A	year
11	Soil Type	Fine Sand, Fine Sandy Loam, Sandy Clay Loam	
12	Ecological Classification	Loamy Sand	
13	Geology	Qep	
NMAC 19.15.29.12 E (Table 1) Closure Criteria		<50'	<50' 51-100' >100'

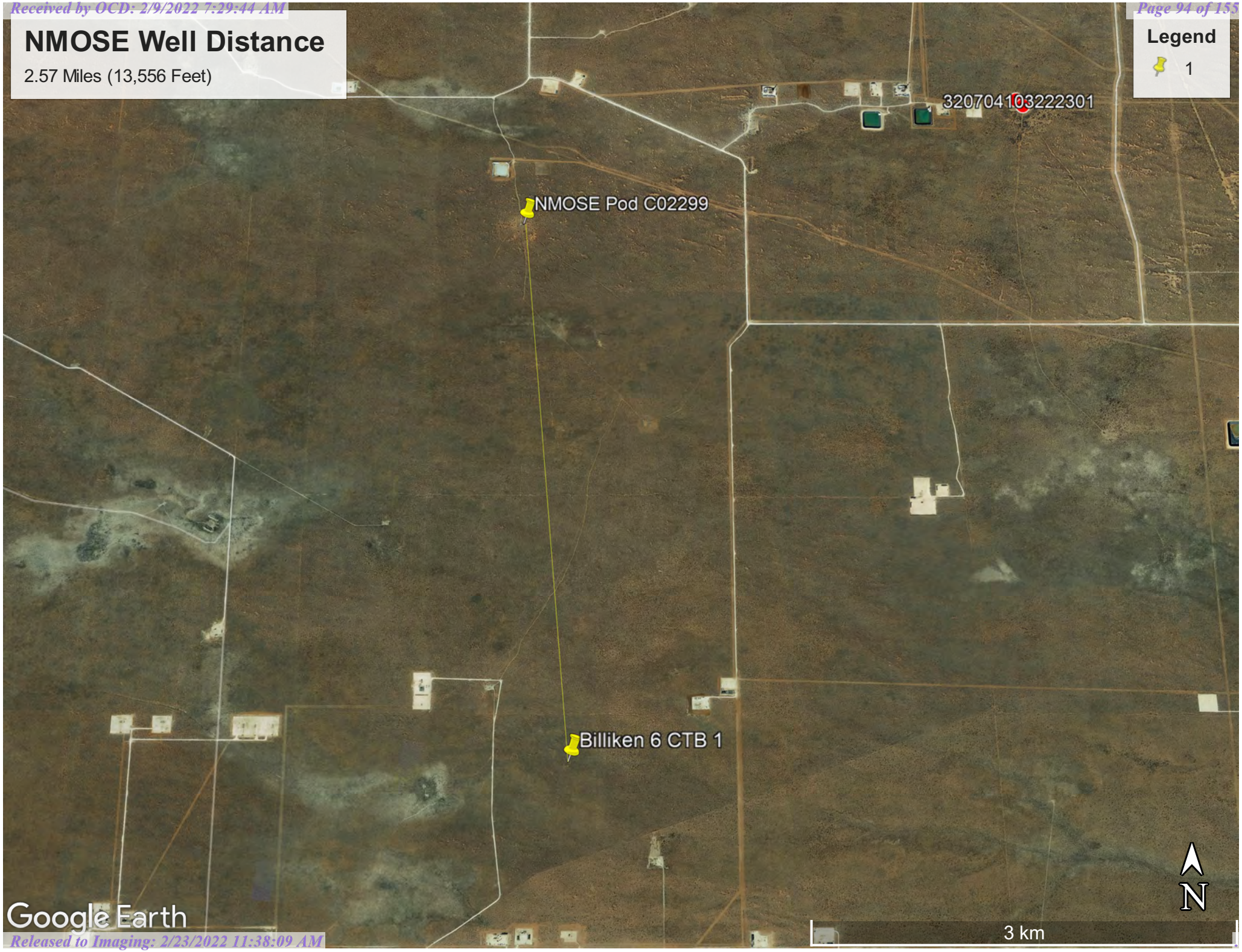

USGS Well Distance
2.40 miles
Legend
323010103244001
Billiken 6 CTB 1 - liner inspection
Billiken 6 CTB 1 - liner inspection
323010103244001
Google Earth
N
1 mi

NMOSE Well Distance

2.57 Miles (13,556 Feet)

Legend

1



New Mexico Office of the State Engineer

Point of Diversion Summary

Well Tag	POD Number	(quarters are 1=NW 2=NE 3=SW 4=SE) (quarters are smallest to largest) Q64	Q16	Q4	Sec	Tws	Rng	(NAD83 UTM in meters) X	Y
	C 02299	4	2	4	24	25S	34E	649517	3554125

Driller License:	122	**Driller Company:**	UNKNOWN		
Driller Name:	UNKNOWN				
Drill Start Date:		**Drill Finish Date:**	12/31/1949	**Plug Date:**	
Log File Date:		**PCW Rcv Date:**		**Source:**	
Pump Type:		**Pipe Discharge Size:**		**Estimated Yield:**	3 GPM
Casing Size:	8.00	**Depth Well:**	350 feet	**Depth Water:**	300 feet

New Mexico Office of the State Engineer
Water Right Summary

get image list

WR File Number: C 02299 **Subbasin:** CUB **Cross Reference:** -

Primary Purpose: PLS NON 72-12-1 LIVESTOCK WATERING

Primary Status: DCL DECLARATION

Total Acres: 0 **Subfile:** - **Header:** -

Total Diversion: 3 **Cause/Case:** -

Owner: INTREPID POTASH NEW MEXICO LLC

Contact: KATIE KELLER

Documents on File

Trn #	Doc	File/Act	Status 1	Status 2	Transaction Desc.	From/ To	Acres	Diversion	Consumptive
get images	673682	UWL 2020-05-15	UWL	ACC	C 02299	T	0	0	
get images	652933	COWNF 2019-06-11	CHG	PRC	C 02299	T	0	0	
get images	648796	COWNF 2019-03-20	CHG	PRC	C 02299	T	0	0	
get images	198392	DCL 1993-02-02	DCL	PRC	C-02299	T	0	3	

Current Points of Diversion

(NAD83 UTM in meters)

POD Number	Well Tag	Source	Q 64	Q16	Q4	Sec	Tws	Rng	X	Y	Other Location Desc
C 02299			4	2	4	24	25S	34E	649517	3554125	

Priority Summary

Priority	Status	Acres	Diversion	Pod Number
12/31/1949	DCL	0	3	C 02299

Place of Use

Q 256	Q 64	Q16	Q4	Sec	Tws	Rng	Acres	Diversion	CU	Use	Priority	Status	Other Location Desc
							0	3		PLS	12/31/1949	DCL	NO PLACE OF USE GIVEN

NMOSE Well Distance

3.57 miles

Legend

CP 01305 POD 1

Billiken 6 CTB 1 - liner inspection

N

1 mi

Google Earth

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	Twn	Rng	X	Y
	CP 01305 POD1		1	4	31	25S	37E	655628	3551065

Driller License: 1706 **Driller Company:** ELITE DRILLERS CORPORATION

Driller Name: WALLACE, BRYCE J.

Drill Start Date:	05/04/2017	**Drill Finish Date:**	05/06/2017	**Plug Date:**	
Log File Date:	07/07/2017	**PCW Rcv Date:**		**Source:**	Artesian
Pump Type:		**Pipe Discharge Size:**		**Estimated Yield:**	60 GPM
Casing Size:	6.00	**Depth Well:**	420 feet	**Depth Water:**	230 feet

Water Bearing Stratifications:	Top	Bottom	Description
	280	320	Sandstone/Gravel/Conglomerate
	330	400	Sandstone/Gravel/Conglomerate
	400	420	Shale/Mudstone/Siltstone

Casing Perforations:	Top	Bottom
	320	420

Meter Number:	19203	**Meter Make:**	TURBINES
Meter Serial Number:	7678015	**Meter Multiplier:**	1.0000
Number of Dials:	9	**Meter Type:**	Diversion
Unit of Measure:	Barrels 42 gal.	**Return Flow Percent:**	
Usage Multiplier:		**Reading Frequency:**	Monthly

Meter Readings (in Acre-Feet)

Read Date	Year	Mtr Reading	Flag	Rdr	Comment	Mtr Amount	Online
03/31/2021	2021	141799	A	RPT	Initital reading submitted	0	
05/31/2021	2021	1470544	A	ad		171.266	
10/31/2021	2021	1610094	A	ad		17.987	

**YTD Meter Amounts:	Year	Amount
	2021	189.253

New Mexico Office of the State Engineer
Water Right Summary

get image list

WR File Number: CP 01305 **Subbasin:** CP **Cross Reference:** -

Primary Purpose: COM COMMERCIAL

Primary Status: PMT PERMIT

Total Acres: 0 **Subfile:** - **Header:** -

Total Diversion: 100 **Cause/Case:** -

Owner: FULFER OIL & CATTLE COMPANY

Contact: GREGG FULFER

Owner: ATKINS ENGR ASSOC INC

Contact: RICHARD CIBAK

Documents on File

	Trn #	Doc	File/Act	Status 1	Status 2	Transaction Desc.	From/ To	Acres	Diversion	Consumptive
get images	604490	APPRO	2016-01-21	PMT	MTR	CP 01305	T	0	100	100

Current Points of Diversion

(NAD83 UTM in meters)

POD Number	Well Tag	Source	Q 64	Q16	Q4	Sec	Tws	Rng	X	Y	Other Location Desc
CP 01305 POD1		Artesian	1	4		31	25S	37E	655628	3551065	

Priority Summary

Priority	Status	Acres	Diversion	Pod Number	
03/27/2014	PMT	0	100	CP 01305 POD1	Artesian

Place of Use

Q 256	Q 64	Q16	Q4	Sec	Tws	Rng	Acres	Diversion	CU	Use	Priority	Status	Other Location Desc
							0	100	100	COM	03/27/2014	PMT	NO PLACE OF USE GIVEN

Source

Acres	Diversion	CU	Use	Priority	Source	Description
0	100	100	COM	03/27/2014	GW	

U.S. Fish and Wildlife Service

National Wetlands Inventory

Nearest Continuously Flowing Watercourse

January 20, 2022

Wetlands

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

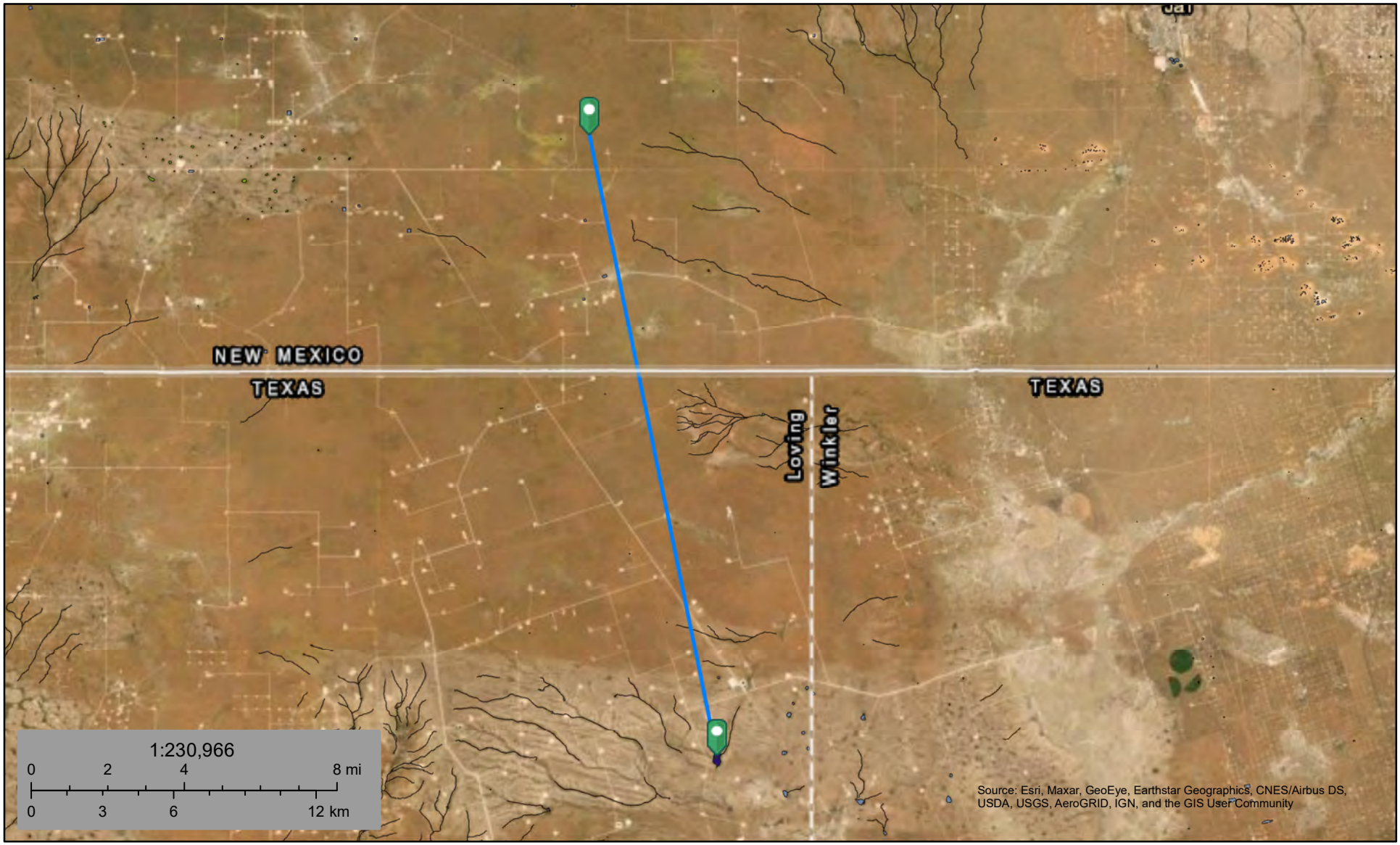
This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

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

U.S. Fish and Wildlife Service

National Wetlands Inventory

Lake 14 Miles (74,079 Feet)



January 20, 2022

Wetlands

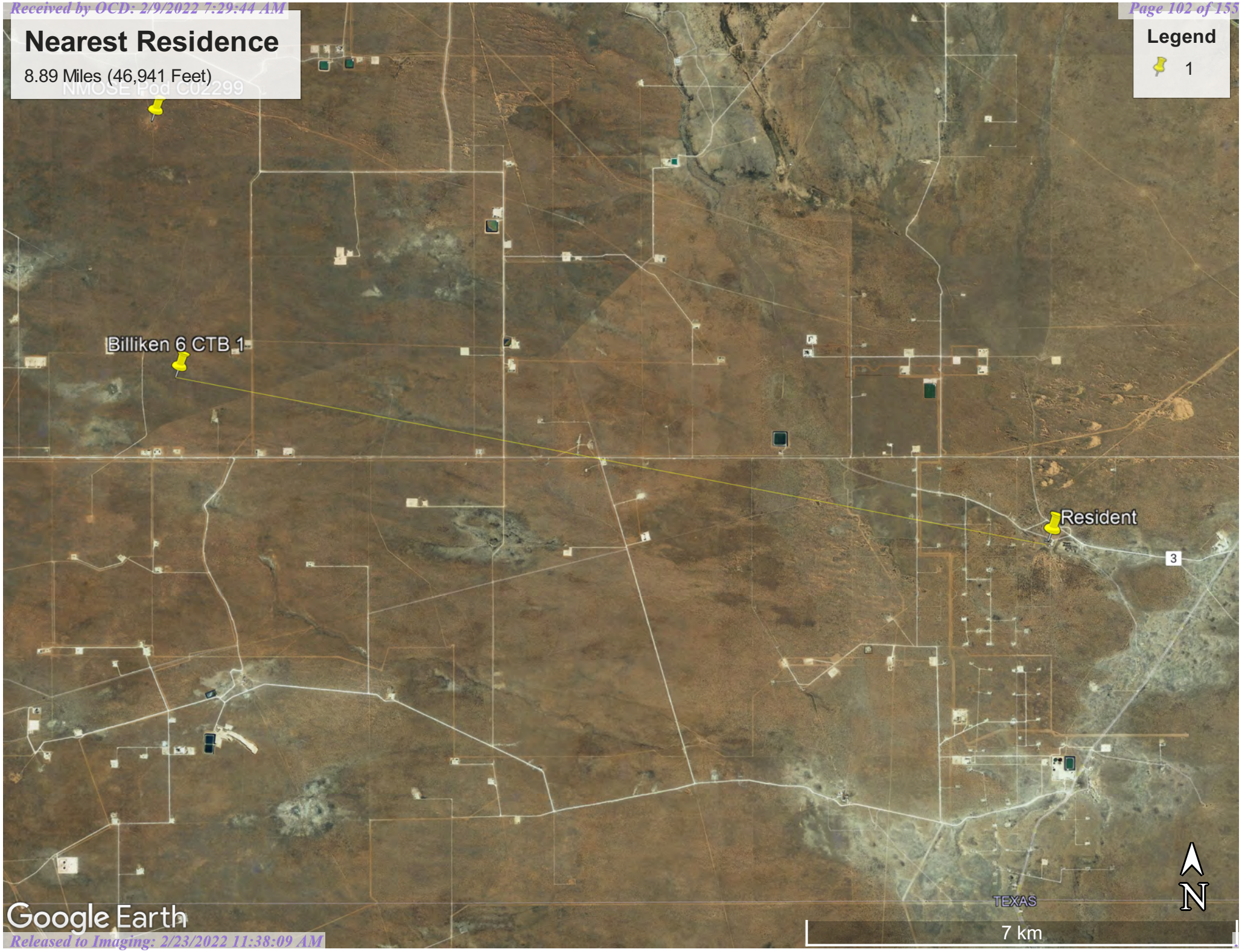
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

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

Nearest Residence

8.89 Miles (46,941 Feet)



U.S. Fish and Wildlife Service

National Wetlands Inventory

Emergent Wetland 0.64 Miles (3,374 Feet)

January 20, 2022

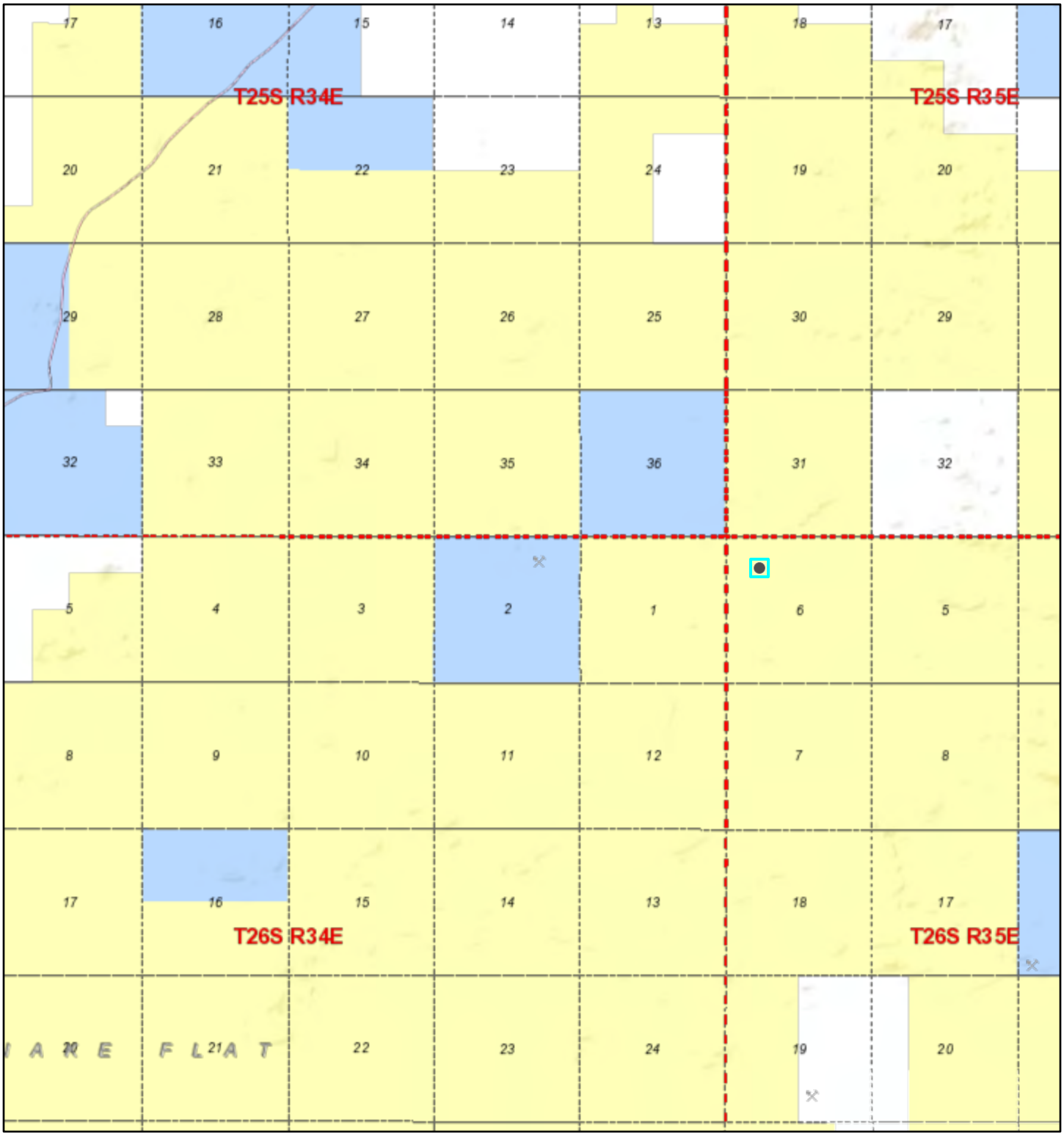
Wetlands

- 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



1/20/2022, 10:48:08 AM

1:72,224

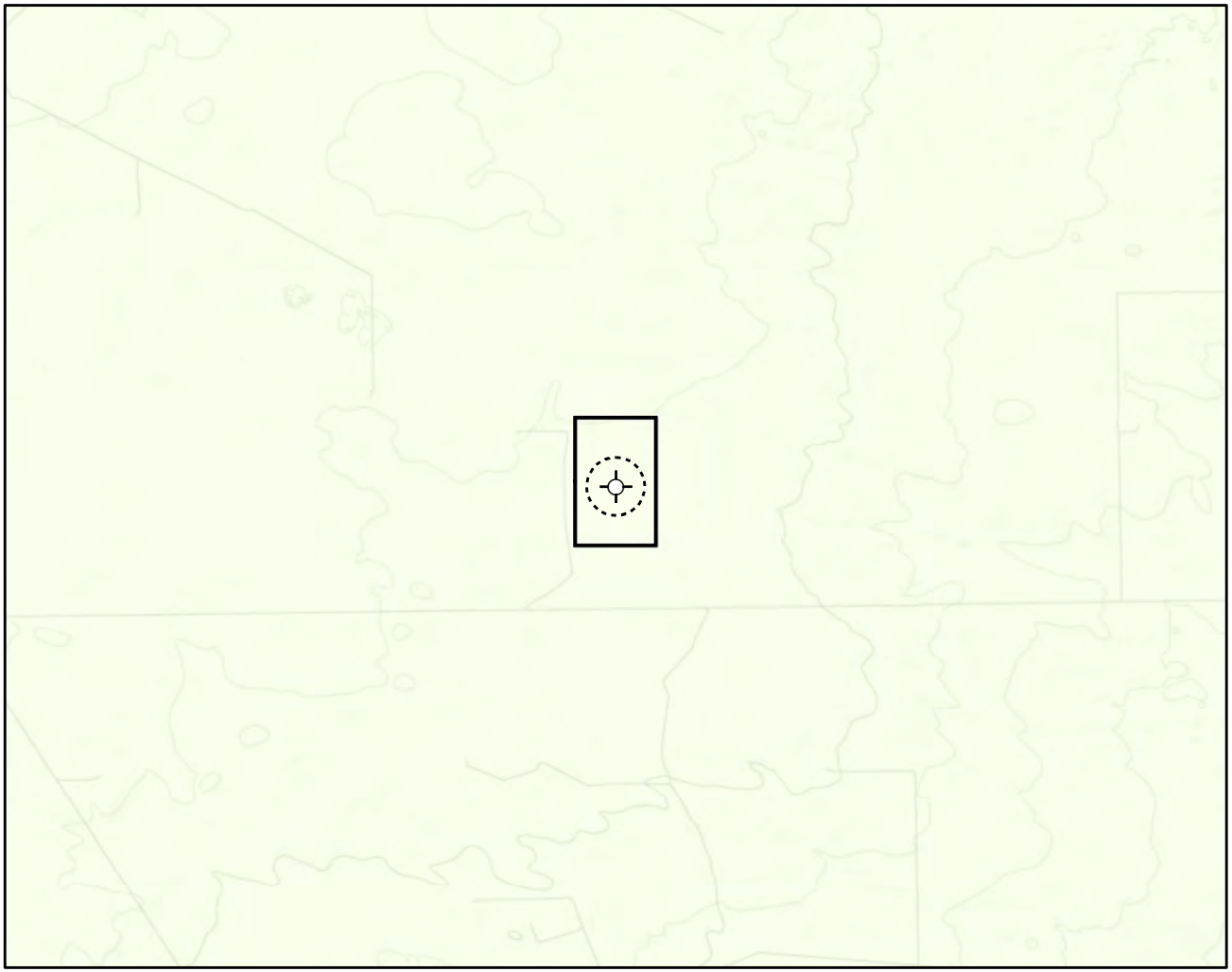
0 0.5 1 2 mi
0 0.75 1.5 3 km

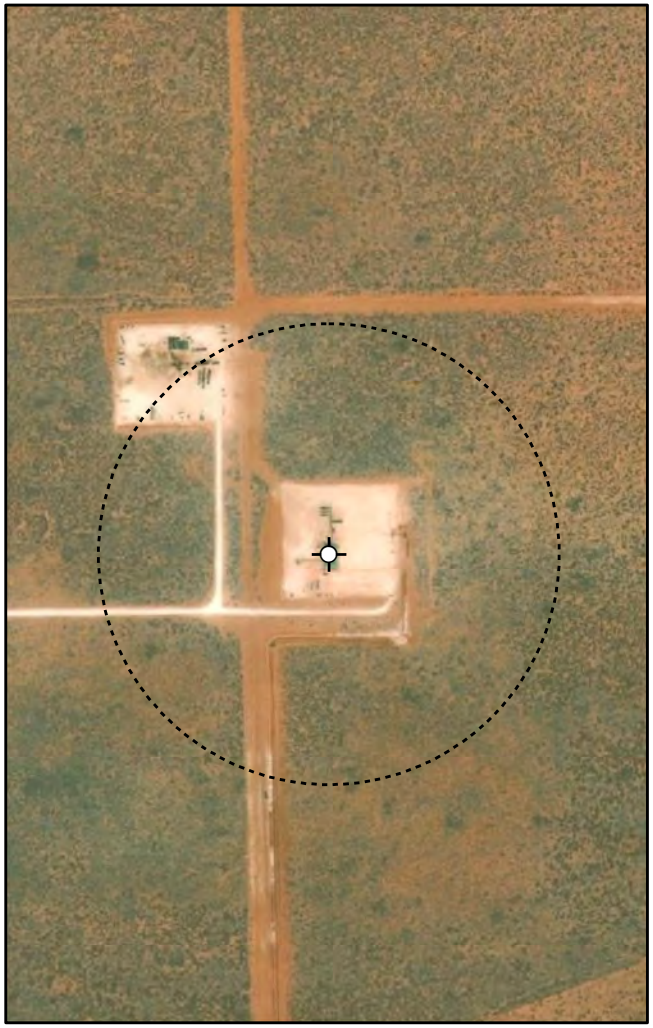
Township / Range
Sections

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 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: 32.077000, -103.411171

NAD 1983 UTM Zone 13N

Date: Jan 20/22

N

Karst Potential Map
Billiken 6 CTB 1

FIGURE:

X

devon

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 2021; Overview Map: ESRI World Topographic

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Document Path: G:\1-Projects_US PROJECTS\Devon Energy Corporation\21E-00580\009 - Billiken 6 CTB 1\Figure x Karst Potential Map Billiken 6 CTB 1 (21E-00580).mxd

National Flood Hazard Layer FIRMette

FEMA

103°24'59"W 32°4'51"N

103°24'21"W 32°4'20"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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 1/20/2022 at 12:55 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.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Lea County, New Mexico

January 20, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

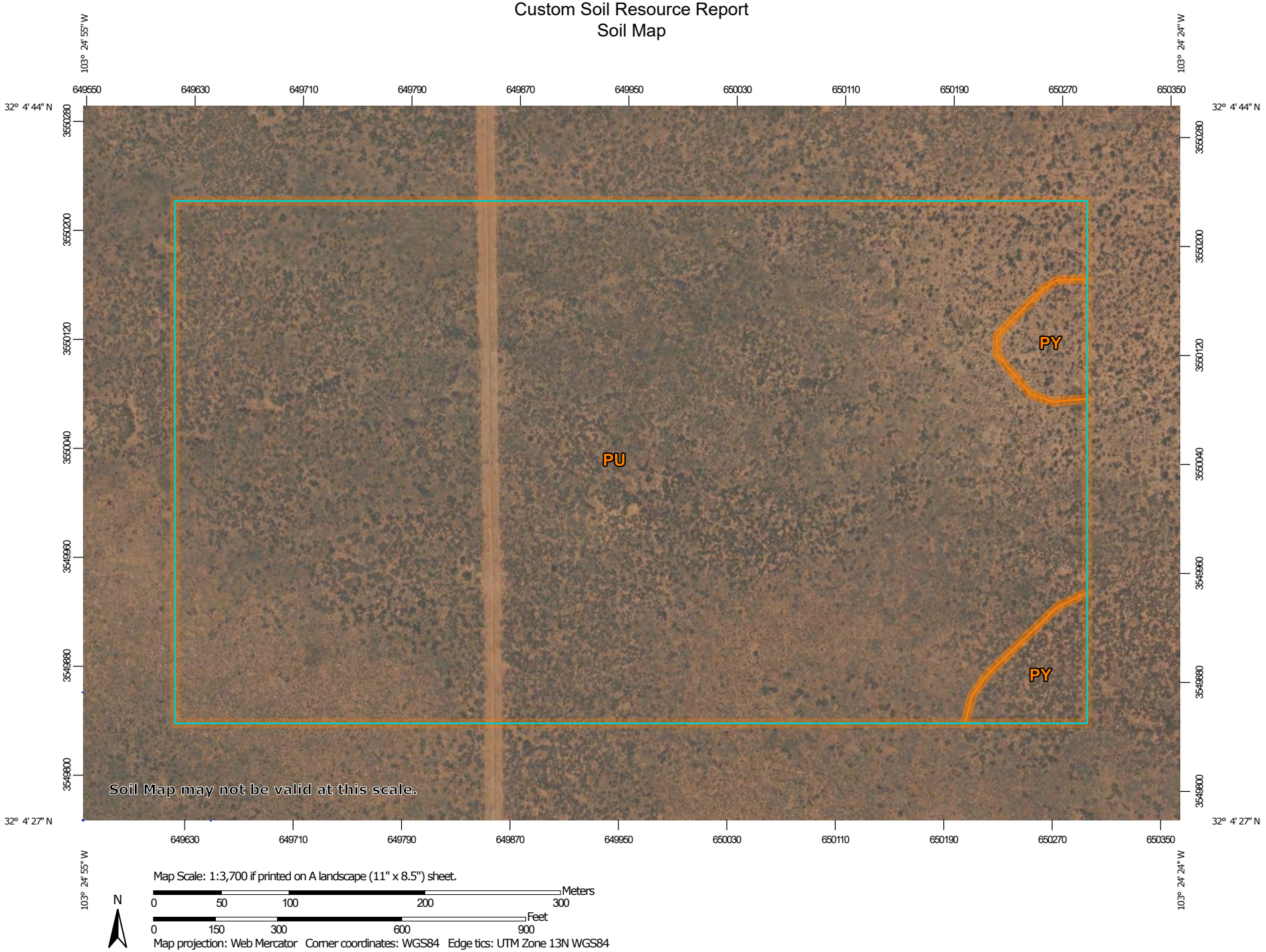
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lea County, New Mexico
Survey Area Data: Version 18, Sep 10, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 7, 2020—May 12, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
PU	Pyote and Maljamar fine sands	61.5	96.1%
PY	Pyote soils and Dune land	2.5	3.9%
Totals for Area of Interest		**64.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lea County, New Mexico

PU—Pyote and Maljamar fine sands

Map Unit Setting

National map unit symbol: dmqq
Elevation: 3,000 to 3,900 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 60 to 62 degrees F
Frost-free period: 190 to 205 days
Farmland classification: Not prime farmland

Map Unit Composition

Pyote and similar soils: 46 percent
Maljamar and similar soils: 44 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pyote

Setting

Landform: Plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 30 inches: fine sand
Bt - 30 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 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: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

Description of Maljamar

Setting

Landform: Plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 24 inches: fine sand
Bt - 24 to 50 inches: sandy clay loam
Bkm - 50 to 60 inches: cemented material

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 40 to 60 inches to petrocalcic
Drainage class: Well drained
Runoff class: Very low
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: 5 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: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

Minor Components

Kermit

Percent of map unit: 10 percent
Ecological site: R042XC022NM - Sandhills
Hydric soil rating: No

PY—Pyote soils and Dune land

Map Unit Setting

National map unit symbol: dmqr
Elevation: 3,000 to 4,400 feet

Mean annual precipitation: 10 to 15 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 190 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Pyote and similar soils: 46 percent
Dune land: 44 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pyote

Setting

Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 30 inches: fine sand
Bt - 30 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 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: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

Description of Dune Land

Setting

Landform: Dunes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Sandy eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 6 inches: fine sand
C - 6 to 60 inches: fine sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Kermit

Percent of map unit: 5 percent
Ecological site: R042XC022NM - Sandhills
Hydric soil rating: No

Maljamar, fine sand

Percent of map unit: 3 percent
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

Wink

Percent of map unit: 2 percent
Ecological site: R042XC003NM - Loamy Sand
Hydric soil rating: No

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USDA Natural Resources Conservation Service

Ecological site R042XC004NM
Sandy

Accessed: 01/20/2022

General information

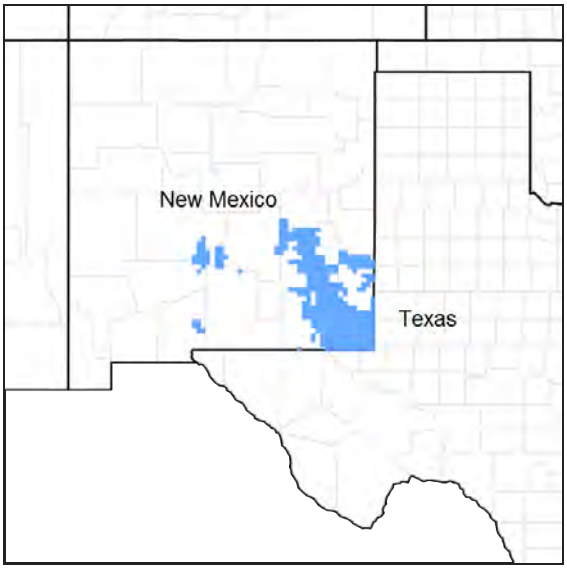

Figure 1. Mapped extent

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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site is on uplands, plains, dunes, fan piedmonts, terraces and in inter dunal areas. The parent material consists of mixed alluvium and or eolian sands or calcareous alluvium derived from sedimentary rock. Slope range on this site range from 0 to 9 percent with the average of 5 percent.

Low stabilized dunes may occur occasionally on this site. Elevations range from 2,800 to 5,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Fan piedmont (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	2,842–4,500 ft

Slope	0–5%
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 8 to 13 inches. Variations of 5 inches, more or less, are common. Over 80 percent of the precipitation falls from April through October. Most of the summer precipitation comes in the form of high intensity short duration thunderstorms.
Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature is 61 degrees with extremes of 25 degrees below zero in the winter to 112 degrees in the summer.
The average frost-free season is 207 to 220 days. The last killing frost is in late March or early April, and the first killing frost is in late October or early November.
Temperature and rainfall both favor warm season perennial plant growth. In years of abundant spring moisture, annual forbs and cool season grasses can make up an important component of this site. Strong winds blow from the southwest in January through June which rapidly dries out the soil during a critical period for cool season plant growth.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

Table 3. Representative climatic features

Frost-free period (average)	200 days
Freeze-free period (average)	219 days
Precipitation total (average)	12 in

Influencing water features

This site is not influenced from water from wetlands or streams.

Soil features

Soils are moderately deep or very deep. Surface textures are loamy fine sand, fine sandy loam, loamy very fine sand or gravelly sandy loam.

Subsurface is a sandy loam, loam, sandy clay loam, clay loam (contains more than 45 percent sand and 18 to 35 percent clay) and less than 15 percent carbonates.

Substratum is a sandy loam, fine sandy loam, sandy clay loam, clay loam, coarse sandy loam, or coarse sand and Calcium carbonate equivalent of 15 to 40 percent. Some layers high in lime or with caliche fragments may occur at depths of 20 to 30 inches.

These soils, if unprotected by plant cover and organic residue, become wind blown and low hummocks are formed. They contains more than 45 percent sand and 18 to 35 percent clay.

Minimum and maximum values listed below represent the characteristic soils for this site.

Characteristic Soils Are:
Anthony
Berino
Cacique
Harkey
Pajaritio

Reakor
Mobeetie
Wink
Sotim
Vinton
Drake
Onite
Alma
Poquita
Dona Ana
Monahans

Note: *Cacique soils is a shallow soil.

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam (2) Sandy loam (3) Loamy fine sand
Family particle size	(1) Loamy
Drainage class	Well drained to moderately well drained
Permeability class	Moderately rapid to moderately slow
Soil depth	30–72 in
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3–11 in
Calcium carbonate equivalent (0-40in)	5–30%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Overview

The Sandy site often intergrades with the Loamy Sand and Deep Sand sites (SD-3). Sandy sites occur on plains, fans, or terraces between drainages. Slopes average less than five percent. Surface textures are usually sandy loams. The historic plant community of the Sandy site is dominated by black grama (*Bouteloua eriopoda*) and dropseeds (*Sporobolus flexuosus*, *S. contractus*, *S. cryptandrus*). Blue grama (*B. gracilis*) also occurs as a subdominant species. Perennial and annual forb abundance is distributed relative to precipitation occurrence. Litter and to a lesser extent, bare ground, compose a significant proportion of the ground cover while grasses compose the remainder. Decreases in black grama and other grass species' cover indicate a transition to states with an

increased shrub component. Shinnery oak (*Quercus havardii*), sand sage(*Artemisia filifolia*), and honey mesquite (*Prosopis glandulosa*) can all increase in composition. Lehmann lovegrass (*Eragrostis lehmanniana*) also may occur as a result of invasion and competition among grass species. Heavy grazing intensity and/or drought are influential in decreasing grass cover and subsequently increasing shrub cover. Fire suppression further supports shrub cover increase and an advantage over grass species. However, brush and grazing management may restore grass species and reverse shrub or grass/shrub dominated states back toward the historic plant community.

State and transition model

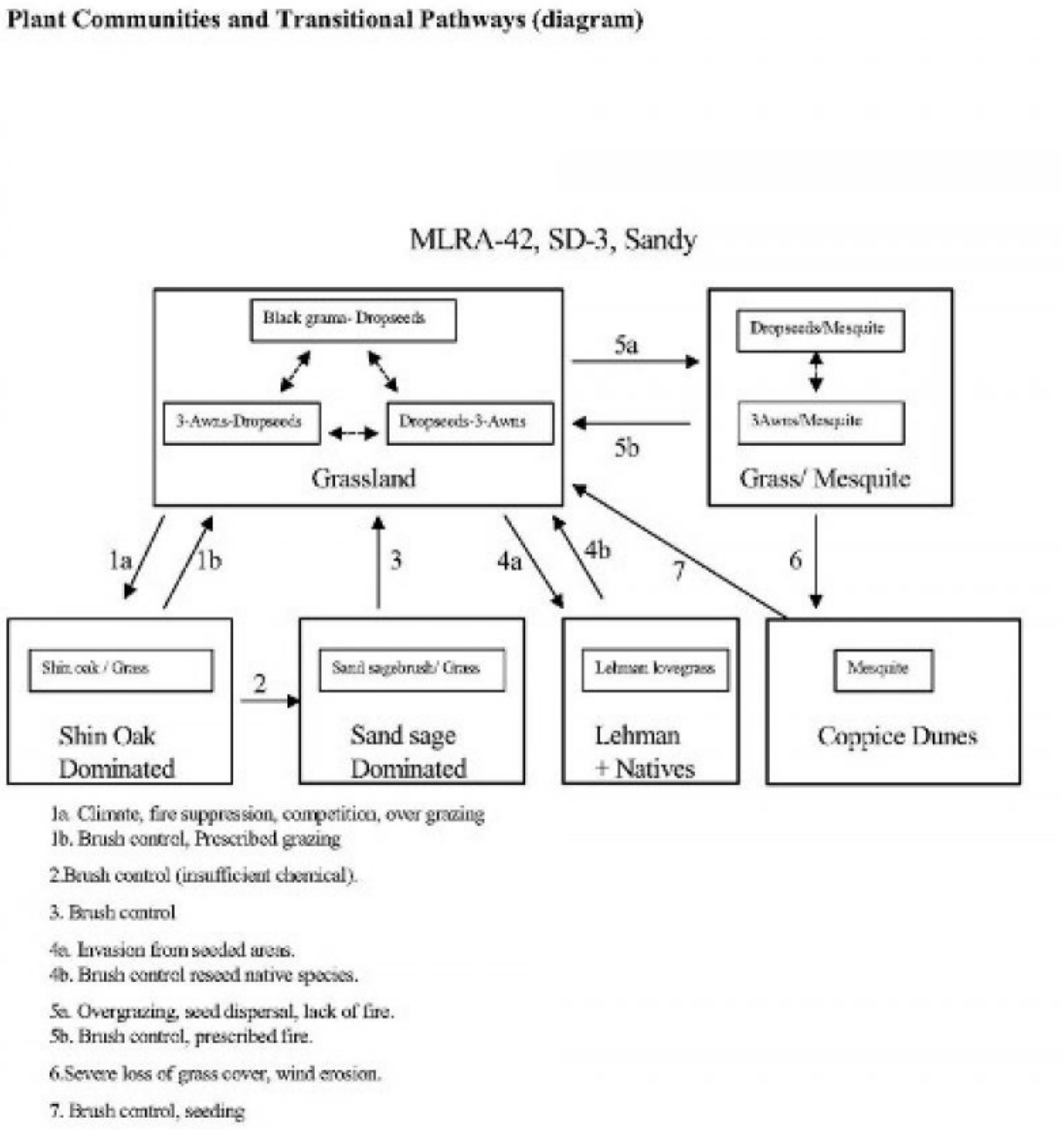

Figure 6.

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

Grassland: The historic plant community is composed primarily of black grama, dropseeds, and a secondary component of blue grama. Black grama tends to dominate due to the predominance of sandy loam soils; however, dropseeds increase on more loamy soils. Perennial and annual forbs are common but their abundance and distribution are dependent on seasonal precipitation. Historical fire frequency is unknown but probably contributed to shrub reduction to the competitive advantage of grass species. Excessive grazing and drought are likely the dominant drivers that decrease black grama and increase dropseed and threeawn abundance within the historic plant community. Black grama has low seed viability, and therefore, reproduces vegetatively during the summer growing season. However, black grama growth is delayed one season after normal precipitation. Black grama is dormant for the remainder of the year; however, black grama retains nutritive value yearlong for grazing. In contrast, dropseeds have relatively abundant, viable seed production and can benefit from early spring as well as summer precipitation. Threeawns also respond to spring and summer moisture and tend to be the year's first palatable species. Threeawns and dropseeds, however, are not palatable during dormant periods, which extends grazing pressure to black grama. Moderate to heavy grazing reduces vegetative cover of black grama which increases its susceptibility to wind erosion and drought (Canfield 1939). Black grama is especially vulnerable to grazing during the summer growing season when stoloniferous growth and rooting occur. Black grama sustains short droughts through reduction of plant tufts which will subsequently emerge with sufficient moisture. Prolonged drought or grazing concurrently under drought conditions can delay or impede recovery of black grama (Nelson 1934) and increase abundance of dropseeds, threeawns, and blue grama. Historical fire events may have benefited black grama, especially, frequent, light intensity/severity fires in conjunction with sufficient moisture to increase stolon production (McPherson 1995). Fires which were hot and severe, however, probably contributed to black grama mortality, more so in drought conditions.

Diagnosis: This state is a grassland dominated by black grama, dropseeds, and threeawns, with subdominant blue grama. Shrubs, such as sand sage and mesquite, are sparsely dispersed throughout the grassland. Forb populations are present and fluctuate with precipitation variability.

Other grasses that could appear on this site include: fall withchgrass, slim tridens, Almejita signalgrass, Indian ricegrass and fluffgrass.

Other shrubs include: pale wolfberry, lotebush, tarbush, Apacheplume, and mesquite.

Other forbs include: plains tickseed, plains blackfoot, scorpionweed, nama, wooly guara, wooly dalea, spectaclepod mustard, bladderpod mustard, menodora, prickly lettuce, lambsquarter, wooly Indianwheat and wild buckwheat.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	480	720	960
Forb	90	135	180
Shrub/Vine	30	45	60
Total	**600**	**900**	**1200**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	35-40%
Forb foliar cover	0%
Non-vascular plants	0%

Biological crusts	0%
Litter	35-45%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	15-20%

Figure 8. Plant community growth curve (percent production by month). NM2804, R042XC004NM-Sandy-HCPC. SD-3 Sandy - Warm season plant community .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	4	10	10	25	30	12	5	0	0

State 2
Shinnery Oak Dominated

Community 2.1
Shinnery Oak Dominated

Shinnery Oak Dominated: This state is dominated by Shinnery oak with subdominant grass species from the historic plant community. Bare ground is a significant component in this state. Shinnery oak tends to be clumped in distribution in finer soil textures. Shinnery oak density increases (as well as dropseeds, threeawns, and blue grama) in coarse textured (e.g., Loamy Sand sites) and deeper, coarse textured (e.g., Deep Sand and Sandhills sites) soils. Shinnery oak predominates during periods of above average (i.e., 16 in.) precipitation during the months of July and August. Abundance and distribution also increases with disturbance, such as excessive grazing and fire, due to an aggressive rhizome system. Shinnery oak's extensive root system allows competitive exclusion of grasses and forbs. Brush control with herbicide treatments applied in the spring can reduce Shinnery oak (Herbel et al. 1979, Pettit 1986). In addition, repetitive seasons of goat browsing can also decrease Shinnery oak abundance. However, brush management should maintain shrub patches to prevent erosion and to provide wildlife cover and forage.

Diagnosis: This state represents a clumped distribution of Shinnery oak with patches of bare ground and subdominant grass species, such as black grama, dropseeds, threeawns, and blue grama. Shinnery oak density increases, as do dropseeds, threeawns, and blue grama, as Sandy site intergrades with Deep Sand and Sandhills sites.

Transition to Shinnery Oak-Dominated State (1a): Decrease in black grama with subsequent decrease in dropseeds and threeawns. Increase in Shinnery oak as a result of drought, above average precipitation (>16 inches), grazing, fire suppression, interspecific competition, and coarse textured soils.

Key indicators of approach to transition:
• Loss of black grama and other grass species cover
• Increase of dropseed/threeawn and shinnery oak
• Surface soil erosion and bare patch expansion

Transition to Historic Plant Community (1b): The Shinnery oak-dominated state begins to transition toward the historic plant community as drivers such as drought, but also above average precipitation (e.g., 16 inches) discontinue. Brush control can also drive the Shinnery oak state toward a grassland state.

State 3
Sand Sage Dominated

Community 3.1

Sand Sage Dominated

Sand Sage Dominated: This state is dominated by sand sage with subdominant grass species from the historic plant community. Sand sage occurs as a result of insufficient herbicide application in Shinnery oak dominated sites with subdominant sand sage. Sand sage either reestablishes dominance or colonizes from an off-site location and stabilizes soils. Sand sage stabilizes light sandy soils from wind erosion and provides a harbor for grass and forb species in heavily grazed conditions (Davis and Bonham 1979). Sand sage abundance increases with drought and/or heavy grazing, but decreases with light grazing due to herbaceous plant competition. Grass and forb species can reestablish as competition from sand sage is relatively light. Herbicide applied in the spring, especially when growth and photosynthesis rates are greatest, can reduce sand sage if there is subsequent rest from grazing (Herbel et al. 1979, Pettit 1986). Brush management should maintain patches of sand sage to prevent wind erosion and subsequent dune formation.

Diagnosis: This state is dominated by sand sage with subdominant grass species, such as black grama, dropseeds, threeawns, and blue grama. Sand sage tends to occur in sites with coarser textured soils.

Transition to Sand Sage Dominated (2): Sand sage appears from off-site locations and/or increases after insufficient herbicide applications aimed at removing Shinnery oak and sand sage.

Key indicators of approach to transition:
• Increase of sand sage seedlings and grasses
• Reduced soil erosion

Transition to Historic Plant Community (3): The sand sage dominated state transitions toward the historic plant community as sand sage decreases primarily through brush management but also with light intensity grazing management. Drought reduction will also support a transition to the historic plant community.

State 4
Lehmann Lovegrass + Natives

Community 4.1
Lehmann Lovegrass + Natives

Lehmann Lovegrass + Natives: This state is dominated by Lehmann lovegrass with subdominant grass species from the historic plant community. Lehmann lovegrass is a warm-season, perennial bunchgrass that was introduced from South Africa in the 1930’s for rangeland restoration purposes (Humphrey 1970). Lehmann lovegrass invades from off-site locations with projects utilizing lovegrass for reseeding, soil stabilization, or highway projects. Lehmann lovegrass provides a winter and early spring forage for grazing. Lehmann lovegrass is vigorous in sandy to sandy loam soils which receive approximately 6-8 inches of summer precipitation (Cox et al. 1988). Lehmann lovegrass’s aggressive competitive exclusion of native grass species has been attributed to lovegrass’s low summer palatability, which reduces vigor of native species and allows lovegrass to increase vigor before grazing. Also, Lehmann lovegrass abundant seed production and establishment, especially after disturbances, allows for increased competition (Cable 1971, Cox et al. 1981). Lehmann lovegrass generally is tolerant to fire because of an aggressive seed-bank; however, severe fires can cause mature lovegrass mortality (Sumrall et al. 1991). Herbicide and reseeding is recommended for control of Lehmann lovegrass (Winn 1991).

Diagnosis: Lehmann lovegrass and grass species from the historic plant community, such as black grama, dropseeds, threeawns, and blue grama, dominate this state.

Transition to Lehmann lovegrass and native grass species (4a): Decrease in black grama with subsequent decrease in dropseeds and threeawns. Increase in Lehmann lovegrass as a result of drought, grazing, fire and interspecific competition from nearby sources of Lehmann lovegrass.

Key indicators of approach to transition:
• Loss of black grama and other grass species cover
• Disturbance and nearby source of Lehmann lovegrass
• Increase of Lehmann lovegrass seedlings

Transition to Historic Plant Community (4b): The Lehmann lovegrass/native grass state transitions toward the historic plant community after actions such as herbicide application and native reseeding have occurred. In addition, prevention of disturbances such as fire and livestock grazing also will encourage the transition to a native grass community

State 5
Grass/Mesquite

Community 5.1
Grass/Mesquite

Grass/Mesquite: This state is dominated by honey mesquite with dropseeds and/or threeawns. Black grama generally is rare as a result of heavy grazing intensity. Honey mesquite invades through seed dispersal from grazing livestock and/or wildlife. Dropseeds and threeawns cohabitate with mesquite due to sufficient precipitation. Mesquite tends to be arborescent due to less soil erosion relative to the Coppice Dunes state which reflects large soil loss. Mesquite obtains approximately half of its nitrogen from symbiotic bacteria housed in root nodules (Lajtha and Schlesinger 1986). Mesquite also provides nitrogen and soil organic matter to co-dominant grasses (Ansley and Jacoby 1998, Ansley et al. 1998). Historical fire occurrences reduced mesquite abundance by disrupting seed production cycles and suppressing seedlings; thus, grass species remained dominant. However, fire suppression has allowed mesquite to increase in density and abundance, increasing mesquite resistance to fires through aggressive resprouting. Herbicide application combined with subsequent prescribed fire may be effective in mesquite reduction (Britton and Wright 1971).

Diagnosis: This state is co-dominated by honey mesquite and dropseeds or threeawns.

Transition to Grass/Mesquite State (5a): This state occurs due to a decrease in black grama primarily from heavy grazing intensity and from an introduction of mesquite seeds from grazers. Dropseeds and threeawns increase and co-exist in the absence of black grama. Fire suppression also is responsible for an increase in mesquite.

Key indicators of approach to transition:
• Loss of black grama
• Increase of dropseeds and/or threeawns
• Increase of mesquite seedlings

Transition to Historic Plant Community (5b): Transition to the historic plant community requires brush management though herbicide application and possibly prescribed fire to reduce mesquite abundance. Once shrub species are removed, prescribed fire may be useful in maintaining a dominant grassland. Precipitation is also necessary in conjunction with management activities to support a dominant grassland.

State 6
Coppice Dunes

Community 6.1
Coppice Dunes

Coppice Dunes: This state is dominated by coppice mesquite dunes with minimal or no grass cover. Honey mesquite occurs in a multi-stemmed growth form which cultivates it’s dune formation by entrapping drifting sands. Mesquite utilizes its extensive tap and lateral roots to benefit from moisture deep in coarse textured soils. Grass species cannot compete for moisture, especially with compounding perturbations such as heavy grazing and drought. Soils succumb to wind erosion with the depletion of grass cover and eventually dunes form around mesquite plants (Gould 1982). Brush management is limited to herbicide application, biological control, or manual removal, as a lack of grass cover prevents prescribed burning. Seeding subsequent to brush control may transition this State toward the historic plant community.

Diagnosis: This state is characterized by low growing, multi-stemmed mesquite plants which form Coppice dunes by drifting soils from wind erosion. As grass cover decreases, windblown soils are removed from unprotected, inter-dune areas. Soils are then re-deposited on dunes which increases dune size.

Transition to Mesquite Coppice Dunes State (6): Decrease in black grama with subsequent decrease in dropseeds and threeawns due to competition with mesquite especially during drought, heavy grazing, and fire suppression. Competitive exclusion of grasses leads to wind erosion of sandy soils and dune formation of low growing mesquite plants.

Key indicators of approach to transition:
• Loss of black grama and other grass species cover
• Wind erosion as evidenced by pedestalled plants
• Bare patch expansion
• Increase of Coppice dune mesquites

Transition to Historic Plant Community (7): Transition toward the historic plant community requires mesquite removal though either herbicide application, biological control, or manual removal. In addition, seeding of native grass species with subsequent years of sufficient moisture is critical.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm Season**			315–360	
	black grama	BOER4	*Bouteloua eriopoda*	315–360	–
2	**Warm Season**			45–90	
	blue grama	BOGR2	*Bouteloua gracilis*	45–90	–
3	**Warm Season**			27–45	
	bush muhly	MUPO2	*Muhlenbergia porteri*	27–45	–
4	**Warm Season**			90–135	
	spike dropseed	SPCO4	*Sporobolus contractus*	90–135	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	90–135	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	90–135	–
5	**Warm Season**			27–45	
	threeawn	ARIST	*Aristida*	27–45	–
6	**Warm Season**			27–45	
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	27–45	–
7	**Warm Season**			27–45	
	Arizona cottontop	DICA8	*Digitaria californica*	27–45	–
8	**Warm Season**			45–72	
	silver bluestem	BOSA	*Bothriochloa saccharoides*	45–72	–
	little bluestem	SCSC	*Schizachyrium scoparium*	45–72	–
9	**Warm Season**			9–27	
	vine mesquite	PAOB	*Panicum obtusum*	9–27	–
10	**Warm Season**			9–27	
	tobosagrass	PLMU3	*Pleuraphis mutica*	9–27	–
11	**Other Perennial Grasses**			9–27	
	Grass, perennial	2GP	*Grass, perennial*	9–27	–
Shrub/Vine					
12	**Shrub**			9–45	

	yucca	YUCCA	*Yucca*	9–45	–
13	**Shrub**			9–27	
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	9–27	–
14	**Shrub**			9–27	
	fourwing saltbush	ATCA2	*Atriplex canescens*	9–27	–
15	**Shrub**			9–27	
	jointfir	EPHED	*Ephedra*	9–27	–
16	**Shrub**			9–27	
	javelina bush	COER5	*Condalia ericoides*	9–27	–
17	**Shrub**			9–27	
	sand sagebrush	ARFI2	*Artemisia filifolia*	9–27	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	9–27	–
18	**Other Shrubs**			9–27	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	9–27	–
Forb					
19	**Forb**			27–63	
	croton	CROTO	*Croton*	27–63	–
	globemallow	SPHAE	*Sphaeralcea*	27–63	–
20	**Forb**			27–45	
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	27–45	–
	woolly groundsel	PACA15	*Packera cana*	27–45	–
21	**Forb**			9–27	
	Adonis blazingstar	MEMU3	*Mentzelia multiflora*	9–27	–
22	**Forb**			27–45	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	27–45	–
	Texas stork's bill	ERTE13	*Erodium texanum*	27–45	–
23	**Other Forbs**			9–27	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	9–27	–

Animal community

This site provides habitat which support a resident animal community that is characterized by pronghorn antelope, black-tailed jackrabbit, spotted ground squirrel, black-tailed prairie dog, yellow-faced pocket gopher, Ord’s kangaroo rat, Northern grasshopper mouse, southern plains woodrat, badger, meadowlark, roadrunner, burrowing owl, white-necked raven, cactus wren, pyrrhuloxia, lesser prairie chicken, mourning dove, scaled quail, Harris’ hawk, side-blotched lizard, marbled whiptail, Texas horned lizard, prairie rattlesnake, plains spadefoot toad, and ornate box turtle.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydraulic cover conditions and hydrologic soil groups.
Hydrologic Interpretations

Soil Series Hydrologic Group
Anthony B
Berino B

Cacique C *shallow soil
Harkey B
Pajaritio B
Reakor B
Mobeetie B
Wink B
Sotim B
Vinton B
Drake B
Onite B
Alma B
Poquita B
Dona Ana B
Monahans B

Recreational uses

This site offers recreation potential for hiking, horseback riding, nature observation, and photography, bird, antelope and predator hunting. During years of abundant spring moisture, this site displays a colorful array of wildflowers.

Wood products

This site has no potential for wood products.

Other products

This site is suitable for grazing by all classes and kinds of livestock during all seasons of the year. Under retrogression, plants such as black grama, blue grama, bush muhly, plains bristlegrass, Arizona cottontop, vine mesquite, little bluestem and fourwing saltbush will decrease while the dropseeds, threeawns, tobosa, yucca, catclaw mimosa, javelinabush, mesquite and broom snakeweed will increase. This site responds well to brush management and deferment. It is best suited to a system of management that rotates the season of use.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index Ac/AUM
100 - 76 2.7 – 3.8
75 – 51 3.5 – 5.0
50 – 26 5.0 – 8.0
25 – 0 8.1 +

Inventory data references

Other References:
Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Areas of New Mexico. This site has been mapped and correlated with soils in the following soil surveys. Eddy County, Lea County, and Chaves County.

Other references

Other References:
Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Areas of New Mexico. This site has been mapped and correlated with soils in the following soil surveys. Eddy County, Lea County, and Chaves County.

Literature Cited

Ansley, R. J.; Jacoby, P. W. 1998. Manipulation of fire intensity to achieve mesquite management goals in north Texas. In: Pruden, Teresa L.; Brennan, Leonard A., eds. Fire in ecosystem management: shifting the paradigm from suppression to prescription: Proceedings, Tall Timbers fire ecology conference; 1996 May 7-10; Boise, ID. No. 20. Tallahassee, FL: Tall Timbers Research Station:195-204.

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Britton, Carlton M.; Wright, Henry A. 1971. Correlation of weather and fuel variables to mesquite damage by fire. Journal of Range Management 24:136-141.

Cable, Dwight R. 1971. Lehmann lovegrass on the Santa Rita Experimental Range, 1937-1968. Journal of Range Management 24:17-21.

Canfield, R. H. 1939. The effect of intensity and frequency of clipping on density and yield of black grama and tobosa grass. Tech. Bull. 681. Washington, DC: U.S. Department of Agriculture. 32 p.

Cox, Jerry R.; Ruyle, G.B.; Fourle, Jan H.; Donaldson, Charlie. 1988. Lehmann lovegrass—central South Africa and Arizona, USA. Rangelands 10(2):53-55

Contributors

Don Sylvester
Quinn Hodgson

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)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

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

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed August, 2021., Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, NMBGMR

ATTACHMENT 4

Gmail

Dhugal Hanton <vertexresourcegroupusa@gmail.com>

48-HR Notification Billiken 6 CTB 1, Gaucho Unit 30 CTB 1, Green Wave 20 CTB 9 Liner Inspections

Dhugal Hanton <vertexresourcegroupusa@gmail.com> Thu, Jan 13, 2022 at 1:52 PM
To: EMNRD-OCD-District1spills <emnrd-ocd-district1spills@state.nm.us>, "CFO_Spill, BLM_NM" <blm_nm_cfo_spill@blm.gov>, "Enviro, OCD, EMNRD" <OCD.Enviro@state.nm.us>
Cc: wesley.mathews@dvn.com, dale.woodall@dvn.com
Bcc: Jramirez@vertex.ca, bschafer@vertex.ca

All,

Please accept this email as 48-hr notification that Vertex Resource Services has scheduled 3 liner inspections to be conducted for the following releases:

nAPP2129845429 DOR: 10/24/2021 Site Name: Green Wave 20 CTB 9

nAPP2134155628 DOR: 12/3/2021 Site Name: Billiken 6 CTB 1

nAPP2131553617 DOR: 11/5/2021 Site Name: Gaucho Unit 30 CTB 1

This work will be completed on behalf of Devon Energy Production Company.

On Friday, January 21, 2022 at approximately 8:00 a.m., John Ramirez will be on the first site to conduct a liner inspection and continue them throughout the day. He can be reached at 575-725-1809. If you need directions to the sites, please do not hesitate to contact him. If you have any questions or concerns regarding this notification, please give me a call at 701-301-1564.

Thank you,

Brandon Schafer
Project Manager

Vertex Resource Services Inc.

P 701.645.3111 Ext. 706
C 701.301.1564
F 780.464.3731

www.vertex.ca

ATTACHMENT 5

Daily Site Visit Report

Client:	Devon Energy Corporation	Inspection Date:	1/21/2022
Site Location Name:	Billiken 6 CTB 1	Report Run Date:	1/21/2022 10:59 PM
Client Contact Name:	Wes Matthews	API #:	
Client Contact Phone #:	(575) 748-0176		
Unique Project ID		Project Owner:	
Project Reference #		Project Manager:	

Summary of Times

Arrived at Site	1/21/2022 9:55 AM
Departed Site	1/21/2022 10:20 AM

Field Notes

10:56 Arrived on site to perform liner inspection.

11:05 Inside and outside of the wall dike does not appear to have any significant damage.

11:09 The bottom of the containment does not appear to have any significant damage around and between the tanks.

11:09 There's is nothing that I see that brings up any environmental concern.

Next Steps & Recommendations

1 No recommendations at this time.

Daily Site Visit Report

Site Photos

Viewing Direction: South	**Viewing Direction**: Northwest
	
Outside the wall dike east side.	Inside the wall dike west side.
Viewing Direction: Northeast	**Viewing Direction**: South
	
Inside the wall dike north side.	West side of the containment.

Daily Site Visit Report

Viewing Direction: East

Bottom of containment between tanks 451 and 413

Viewing Direction: East

Bottom of containment between tanks 413 and 452

Viewing Direction: East

Bottom of containment between tanks 452 and 453

Viewing Direction: North

Bottom of containment between all tanks N-S

Daily Site Visit Report

Viewing Direction: East	**Viewing Direction**: North
	
Outside the wall dike north side.	Outside the wall dike west side.
Viewing Direction: East	**Viewing Direction**: North
	
Outside the wall dike south side.	Inside the wall dike east side.

Daily Site Visit Report

Viewing Direction: North

East side of the containment.

Viewing Direction: Southwest

South side of the containment.

Viewing Direction: Southeast

South side of the containment.

Viewing Direction: Southwest

Inside the wall dike south side.

Daily Site Visit Report

Daily Site Visit Signature

Inspector: Chance Dixon

Signature: 

Signature

ATTACHMENT 6

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	nAPP2134155628
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party Devon Energy Production Company	OGRID 6137
Contact Name Dale Woodall	Contact Telephone
Contact email Dale.Woodall@dvn.com	Incident # *(assigned by OCD)*
Contact mailing address 6488 Seven Rivers Hwy Artesia, NM 88210	

Location of Release Source

Latitude 32.076535 Longitude -103.411171

(NAD 83 in decimal degrees to 5 decimal places)

Site Name Billiken 6 CTB 1	Site Type Oil
Date Release Discovered 12/03/2021	API# *(if applicable)*

Unit Letter	Section	Township	Range	County
D	6	23S	35E	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) 236.28 BBLS	Volume Recovered (bbls) 236.28 BBLS
	Is the concentration of total dissolved solids (TDS) 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 Leak developed in flowline. Fluid remained in lined containment.

Form C-141
Page 2

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2134155628
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Facility ID	
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Was this a major release as defined by 19.15.29.7(A) NMAC? ☒ Yes ☐ No	If YES, for what reason(s) does the responsible party consider this a major release? The spill is over 25 BBLS.
If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)? Notice given by Dale Woodall to OCD.	

Initial Response

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

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

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

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

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

Printed Name: Kendra DeHoyos Title: EHS Associate

Signature: Kendra DeHoyos Date: 12/22/2021

email: Kendra.Ruiz@dvn.com Telephone: 575-748-0167

OCD Only

Received by: Ramona Marcus Date: 12/27/2021

NAPP2134155628

Spills In Lined Containment	
Measurements Of Standing Fluid	
Length(Ft)	100
Width(Ft)	53
Depth(in.)	4
Total Capacity without tank displacements (bbls)	314.66
No. of 500 bbl Tanks In Standing Fluid	7
No. of Other Tanks In Standing Fluid	1
OD Of Other Tanks In Standing Fluid(feet)	
Total Volume of standing fluid accounting for tank displacement.	236.28

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

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

CONDITIONS

Action 68440

CONDITIONS

Operator: DEVON ENERGY PRODUCTION COMPANY, LP 333 West Sheridan Ave. Oklahoma City, OK 73102	OGRID: 6137
	Action Number: 68440
	Action Type: [C-141] Release Corrective Action (C-141)

CONDITIONS

Created By	Condition	Condition Date
rmarcus	None	12/27/2021

District I
1625 N. French Dr., Hobbs, NM 88240
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Energy Minerals and Natural Resources Department

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

Incident ID	nAPP2134155628
District RP	
Facility ID	
Application ID	

Site Assessment/Characterization

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

What is the shallowest depth to groundwater beneath the area affected by the release?	<50 (ft bgs)
Did this release impact groundwater or surface water?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse?	☐ Yes ☒ No
Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church?	☐ Yes ☒ No
Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes?	☐ Yes ☒ No
Are the lateral extents of the release within 1000 feet of any other fresh water well or spring?	☐ Yes ☒ No
Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a wetland?	☐ Yes ☒ No
Are the lateral extents of the release overlying a subsurface mine?	☐ Yes ☒ No
Are the lateral extents of the release overlying an unstable area such as karst geology?	☐ Yes ☒ No
Are the lateral extents of the release within a 100-year floodplain?	☐ Yes ☒ No
Did the release impact areas **not** on an exploration, development, production, or storage site?	☐ Yes ☒ No

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

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

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

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Page 4

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2134155628
District RP	
Facility ID	
Application ID	

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

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

Printed Name: Dale Woodall Title: EHS Professional

Signature: Dale Woodall (Feb 3, 2022 15:52 MST) Date: Feb 3, 2022

email: Dale.Woodall@dvn.com Telephone: 575-748-1838

OCD Only

Received by: _____ Date: _____

Form C-141
Page 6

State of New Mexico
Oil Conservation Division

Incident ID	nAPP2134155628
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: Dale Woodall Title: EHS Professional

Signature: Dale Woodall (Feb 3, 2022 15:52 MST) Date: Feb 3, 2022

email: Dale.Woodall@dvn.com Telephone: 575-748-1838

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: _____ Date: _____

Printed Name: _____ Title: _____

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

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

CONDITIONS

Action 79957

CONDITIONS

Operator: DEVON ENERGY PRODUCTION COMPANY, LP 333 West Sheridan Ave. Oklahoma City, OK 73102	OGRID: 6137
	Action Number: 79957
	Action Type: [C-141] Release Corrective Action (C-141)

CONDITIONS

Created By	Condition	Condition Date
chensley	Closure report approved.	2/23/2022
chensley	NOTE: The OCD requires a copy of all correspondence relative to remedial projects be included in all proposal and/or final closure reports. Correspondence required to be included in reports may include, but not necessarily limited to, extension requests, liner inspection notifications, sample event notifications, spill/release/fire notifications, and variance requests. This will allow for notifications and requests to become a documented part of the incident file.	2/23/2022