United States Department of the Interior
Bureau of Land Management

Environmental Assessment DOI-BLM-NM-P020-2015-1267-EA
Serial Number: NM520-3150-2015-002

Delaware Basin 4A West 3D Seismic Exploration Project
Dawson Geophysical Company

Department of the Interior
Bureau of Land Management
Pecos District
Carlsbad Field Office
620 E Greene Street
Carlsbad, NM 88220
Phone: (575) 234-5972
FAX: (575) 885-9264

Confidentiality Policy
Any comments, including names and street addresses of respondents, you submit may be made available for public review. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

BLM

Carlsbad Field Office

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1. PURPOSE AND NEED FOR ACTION

1.1. Background

Dawson Geophysical Company (Dawson) has submitted a Notice of Intent and Authorization to conduct Oil and Gas Geophysical Exploration Operations (Form 3150-4) application to the Bureau of Land Management (BLM) Carlsbad Field Office (CFO) on July 02, 2015, to conduct geophysical exploration on federal lands, located approximately 16.3 miles southwest of Carlsbad, New Mexico.

1.2. Purpose and Need for Action

The purpose of the action is to provide reasonable access across BLM-managed lands for a geophysical exploration operation. The need for the action is established under BLM's responsibility under The Mineral Leasing Act of February 25, 1920, (30 U.S.C. 185), as amended, the Federal Land Policy and Management Act of 1976, Mineral Leasing Act for Acquired Lands (30 U.S.C. 341-359), and National Environmental Policy Act (42 U.S.C. 4321-4347). Further guidance comes from 43 CFR parts 3150 and 3160.

1.3. Decision to be Made

Based on the information provided in this EA, the BLM Field Manager will decide whether to grant authorization of this project with appropriate mitigation measures or alterations, or whether to reject it.

1.4. Conformance with Applicable Land Use Plan(s)

The 1988 Carlsbad Resource Management Plan, as amended by the 1997 Carlsbad Approved Resource Management Plan Amendment and the 2008 Special Status Species Approved Resource Management Plan Amendment have been reviewed, along with the current Resource Management Plan Revision (in progress) and it has been determined that the proposed action conforms with the land use plan terms and conditions as required by 43 CFR 1610.5.

Name of Plan: 1988 Carlsbad Resource Management Plan

Date Approved: September 1988

Decision: [Page 10] "In general, public lands are available for utility and transportation facility development…" [Page 13] "BLM will encourage and facilitate the development by private industry of public land mineral resources so that national and local needs are met, and environmentally sound exploration, extraction, and reclamation practices are used."

Name of Plan: 1997 Carlsbad Approved Resource Management Plan Amendment

Date Approved: October 1997

Goal: [Page 4] "Provide for leasing, exploration and development of oil and gas resources within the Carlsbad Resources Area." The proposed action aids in the development of oil and gas resources and complies with the Surface Use and Occupancy Requirements.

1.5. Scoping, Public Involvement, and Issues

The Carlsbad Field Office (CFO) publishes a NEPA log for public inspection. This log contains a list of proposed and approved actions in the field office. The log is located in the lobby of the CFO as well as on the BLM New Mexico website (http://www.blm.gov/nm/st/en/prog/planning/nepa_logs.html).

On July 02, 2015, an internal scoping meeting was held at the Bureau of Land Management, Carlsbad Field Office. In attendance were members of the Bureau of Land Management interdisciplinary team, and representatives from Suter Consulting and Dawson Geophysical Company.

A Notice of Intent (NOI) for the Delaware Basin 4A West 3D was published on the Bureau of Land Management's website beginning June 17, 2015 and ran concurrent for 30 days

No comments were received during the 30 day NOI posting period, however, no additional public outreach was performed during this period other than the website posting.

The CFO uses Geographic Information Systems (GIS) in order to identify resources that may be affected by the proposed action. A map of the project area is prepared to display the resources in the area and to identify potential issues.

The proposed action was circulated among CFO resource specialists in order to identify any issues associated with the project. The issues that were raised include:

- How would air quality be impacted by the proposed action?
- How would climate change be impacted by the proposed action?
- How would range management be impacted by the proposed action?
- How would soils be impacted by the proposed action?
- How would vegetation be impacted by the proposed action?
- How would wildlife be impacted by the proposed action?
- Could noxious weeds be introduced to the project area as a result of the proposed action?
- How would cultural resources be impacted by the proposed action?
- How would Paleontology be impacted by the proposed action?
- How would karst resource be impacted by the proposed action?
- How would Visual Resource Management be impacted by the proposed action?
- How would relevant and important values be impacted in proposed ACEC's be impacted by the proposed action?
- How would resources in Special Management Areas designated under current RMP's and RMPA's be impacted by the proposed action?

2. PROPOSED ACTION AND ALTERNATIVE(S)

2.1. Proposed Action

On July 02, 2015, Dawson Geophysical Company representing TRNCO Petroleum Corporation submitted a Notice of Intent (NOI) to Conduct Oil and Gas Geophysical Exploration Operations (Exhibit A1 – A3) for the Delaware Basin 4A West 3D Exploration project area beginning approximately 16.3 miles southwest of Carlsbad, Eddy County, New Mexico. The original outline of the seismic project is 67,998.91 acres or 106.25 square miles (Exhibit B) and will be a mix of Bureau of Land Management, State Trust Lands, and Private Lands.

Dawson Geophysical will conduct a three-dimensional seismic survey line in an area extending across all of or portions of the following 7.5 minute quadrangle maps: Otis, Kitchen Cove, Bond Draw, Black River Village, Jumping Spring, and Rattlesnake Spring areas. The NOI addressed an area of 106.25 square miles. Approximately 67,998.91 acres are contained within the project area of which 46,551.35 acres are Bureau of Land Management lands, 7,707.90 acres are State Trust lands, and 13,739.66 acres are private lands. The proposed action will only analyze the federal lands within the boundary of this project.

The source lines will be 50 feet wide and the receiver lines will be 30 feet wide. The surface disturbance for the source lines on BLM lands will be 2,456.47 acres. The surface disturbance for the receiver lines on BLM lands will be 972.24 acres. For drive arounds, an estimated 10 acres will be disturbed. Approximately 3,428.71 acres are expected to be disturbed by the source and receiver lines and adjacent roads and drive arounds on federal lands. Although the calculations have been set up for a clearance of 50 ft. wide for the source lines, it should be noted that each vibroseis machine is 10 ft.wide and if they are ran in the echelon pattern, staggering their tracks, this would amount to 30 ft. wide vegetation disruption. Each vibrosies machine would only make a track 10 ft. wide from track to track. Drive arounds are tracks that lead from one rack of source points to another. They are only used by the vibroseis operators to get from one rack to the other without having to drive down the same source line more than once. These are used to lessen multiple pass lines, decreasing surface disturbance.

In the west half of T. 24S., R. 26E., on the east side of Hwy. 62/180 and on the section line between section 01, T. 25S., R. 25E., and section 06 of T. 25S., R. 26E.., Within the Guadalupe Escarpment Scenic Area SMA, a heliport and helidrill and explosives will be used to acquire source data, instead of using vibroseis machines, shown in Exhibit D. The helidrills will be placed in the area using a helicopter., Exhibit E. The helicopter will be staged on private land in Fred Beard's private caliche pit. The helicopter will be housed and report to the Carlsbad Municipal Airport. It will also be refueled at the Carlsbad Municipal Airport The helidrill machines will drill holes along the source line, every 330 feet apart instead of the planned 165 feet apaert for the vibroseis machines. A Cave/Karst monitor will accompany the heildrill and determine if the drill site is free of cave/karst featrues. Once this attained the hole depth would be 60 ft. and would have a 5 lb. charge placed in the hole. If this depth cannot be obtained, then a 30 ft. hole will be drilled and a 2.5 lb. charge would be placed in the hole. The holes will be drilled and loaded and then left until the project progresses to that area. The general public will not be made aware of the individual shot holes to eleviate the general public from tampering with the shot holes. The electronic cap leads will be buried so they cannot be visually detected. The electronic cap can only be detonated by a special box and each cap has an individual code that is inputted into the special box for precise detonation. The caps cannot be detonated by any kind of cellular device or wireless service.

If a void or "bit drop" is encountered while drilling a hole, the drilling of the hole will cease and the BLM will be notified immediately. After examination, the BLM will provide further guidance which may include repacking the hole with cuttings and moving the drilling location to comply with stipulations attached to the permit (200 feet).

This project will be broken in to three tiers due to the length of time it takes to perform Class III cultural surveys. The first tier would be permitted after a FONSI and Decision Record is signed in conjunction with this environmental assessment. For the final two tiers a Determination of NEPA Adequacy (DNA) will be written for each remaining tier and approved once the Archaeological clearance has been accepted by the BLM archaeologist.

The project is located in Eddy County, New Mexico in the following areas:

Delaware Basin 4A West 3D

New Mexico Principal Meridian:

T. 24 S., R. 25 E., NMPM: Section 01 (S½SE¼), 12 (NE¼, N½SE¼, SW¼SE¼), 13 (SE¼), 23 (E½), 24 (All), 25 (NE¼, NW¼), 26 (E½), 35 (SE¼NE¼, SE¼) ;

T. 24 S., R. 26 E., NMPM: Section 01 (All), 04 (All), 05 (S½), 06 (S½), 07 (All except S½SW¼), 08 (All), 09 (N½SW¼), 10 (W½NE¼, NW¼) 11 (All), 12 (All), 13 (NW¼NE¼, NE¼NW¼), 14 (W½SW¼), 15 (All except N½NE¼), 17 (All except part of NW¼NE¼, 18 (All),19 (All), 20 (All except SE¼SW¼), 21 (All), 22 (W½), 24 (SE¼SW¼, S½SE¼), 25 (NE¼, NE¼NW¼, NE¼SW¼, S½SW¼, SE¼), 28 (N½NE¼, NW¼), 29 (All except N½NW¼, SW¼NW¼), 30 (All), 31 (All), 33 (S½N½, SW¼), 34 (NW¼, W½SW¼, SE¼SE¼), 35 (NE¼NE¼, S½NE¼, S½SW¼, SE¼);

T. 24 S., R. 27 E., NMPM: Section 06 (N½N½), 07 (All), 18 (N½NW¼, SW¼NW¼, N½SW¼, SE¼SE¼), 19 (All except W½NW¼), 30 through 32 (All);

T. 25 S., R. 25 E., NMPM: Section 01 (All), 11 (E½), 12 (N½N½, W½SW¼), 13 (S½NE¼, SE¼NW¼,), 23 (SE¼), 24 (S½), 25 (All), 26 (All except NW¼), 27 (All), 33 (E½NE¼, NW¼NW¼, S½NW¼, SW¼, E½SE¼), 34 (All), 35 (All);

T. 25 S., R. 26 E., NMPM: Section 01 (All), 03 (NE¼NE¼, S½NE¼, NW¼NW¼, SE¼SW¼, SE¼), 04 (N½NE¼, NW¼, N½SW¼, SW¼SW¼), 05 (All except NW¼), 06 (NW¼), 08 (All except SE¼NE¼), 09 (SE¼NE¼, E½SW¼, SE¼), 10 through 15 (All), 17 (All except N½NW¼, SE¼NW¼, 18 (NW¼NE¼, S½NE¼, E½SE¼), 19 (S½S½), 20 through 24 (All), 25 (N½NE¼, SE¼NE¼, NE¼NW¼, SW¼NW¼, W½SW¼, SE¼), 26 (SE¼NE¼, SW¼NW½, S½) 27 (All except NE¼NE¼), 28 (All exceptS½SW¼), 29 through 31 (All), 33 (All except NW¼NW¼), 34through 36 (All);

T. 25 S., R. 27 E., NMPM: Section 05 through 07 (All);

T. 26 S., R. 24 E., NMPM: Section 01 (All), 10 (NE¼NE¼, SE¼SE¼), 11 (NE¼, SE¼NW¼, NE¼SW¼, S½SW¼, SE¼), 12 through 14 (All), 15 (All

except NW¼), 22 through 27 (All), 28 (E½E½, SW¼NW¼), 33 (S½S½), 34 (All), 35 (All);

T. 26 S., R. 25 E., NMPM: Section 01 (All), 03 through 15 (All), 17 (All except NE¼), 18 through 23 (All), 24 (Except SE¼SW¼), 25 (All), 26 (All), 27 (S½), 28 (N½N½, S½S½), 29 through 31 (All), 33 through 36 (All);

T. 26 S., R. 26 E., NMPM: Section 03 through 08 (All), 17 (All except SE¼SE¼), 18 (All), 19 (All except SE¼), 20 (NW¼, NE¼, S½NW¼, SE¼), 29 through 32 (All).

BLM Form 3150-4
FS Form 2800-16
(September 2013)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
DEPARTMENT OF AGRICULTURE
FOREST SERVICE

FORM APPROVED
OMB NO. 1004-0162
Expires: July 31, 2015

NOI Case File No.

Project Name
DB-4A-WEST

NOTICE OF INTENT AND AUTHORIZATION TO CONDUCT OIL AND GAS GEOPHYSICAL EXPLORATION OPERATIONS

Lessee or Operator TRNCO Petroleum Corporation		Lessee or Operator Representative Tom Nickoloff	
Address 10 Desta Dr., Suite 190W		Do you have a bond on file with the Agency? ☑ Yes ☐ No	
City Midland	State TX	Which Agency holds the bond? ☑ BLM ☐ Forest Service	
Zip Code 79710	Phone No. *(Include area code)* 432-683-7200	Bond No. B000784	Bond Amount: $ 50,000.00
Email Address tnikoloff@trnco.net			

Geophysical Co: Dawson Geophysical		Geophysical Co. Representative Greg Dearsley	
Address 508 W Wall, Suite 800		Address 508 W Wall, Suite 800	
City Midland	State TX	City Midland	State TX
Zip Code 79701	Phone No. *(Include area code)* 432-684-3000	Zip Code 79701	Phone No. *(Include area code)* 432-684-3008
Representative's Email Address		Cell Phone No. *(Include area code)* 432-528-1655	

Party Chief/Project Point of Contact (POC) Austin Flores

POC Contact Information 432-853-1789

A separate Plan of Operations is attached addressing the items below ☑ Yes ☐ No.

1. Location Description and Maps: Give the general land description of the lands involved, limited to Meridian, Township, Range, and Section(s) or metes and bounds as appropriate. You must also submit an electronic map (in PDF) with a minimum scale of one-half inch per mile showing the general area and project location. We recommend a PDF version of a 7 1/2-minute USGS quadrangle or the scale commonly used in the area. In addition, you must submit GIS data in a locally projected Universal Transverse Mercator (UTM) North American Datum (NAD) 1983 ESRI shape file or geodatabase format (e.g., UTM zone 13N NAD83). For seismic operations, your data must include clearly attributed locations of operations and facilities, including staging areas, access routes to and within the project area, source and receiver point locations and lines, shot point locations, surface ownership, and any Federal lands under lease. You must identify the number of acres within the project area by Federal surface (by agency), state surface, fee surface, and other, and the estimated acreage of surface disturbance.

See Exhibit A

Source and Receiver lines
Receiver lines will run east/west at intervals of 825 feet
Source lines will run north/south at intervals of 825 feet

Geophone and vibrator locations
Geophone location interval will be at 165 feet
Vibrator source locations will be at 165 feet

Single pas of vibrators

2. Do you hold any Federal leases within the project area? ☐ Yes ☑ No (If yes, indicate location and lease numbers on an attached map.) There is no fee for operations conducted on your Federal lease (outside of Alaska).

3. If you are proposing seismic exploration, how many miles of source line (2-D), or acres (3-D) (to the nearest 10 acres) of survey are on:

a. Your Federal Lease N/A b. Other Federal lands _____

4. When do you expect to start exploration? As Soon As Possible How long will the project last? ~120 days.

Describe any of your critical timeframes associated with the proposed project, such as equipment or contractor availability.

No critical time frames

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any Department or agency of the United States any false, fictitious, or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2

Exhibit A1 NOI for the Delaware Basin 4A West 3D Seismic Project

Description and Type of Operations (*check all that apply*):
a. Survey Type: ☐ 2-D ☑ 3-D ☐ Gravity/Magnetic ☐ Other (explain)

Describe the survey type:

CONVENTIONAL ORTHOGONAL 3D SEISMIC SHOOT

b. Survey Method ☐ Shot hole ☑ Vibroseis ☐ Other (explain)

For shot holes

What type and amount of explosives per source will you use? N/A

What shot point pattern and spacing will you use? N/A

What will be the shot hole depth? N/A

What type of receivers (wired/wireless) will you use and how will they be transported and placed?
WILL BE EITHER A WIRED OR WIRELESS SYSTEM
TRANSPORTED BY ATV MULES AND ONE TON PICKUP TRUCKS

What will be the receiver and source spacing (in feet) and spacing between the source and receiver (in feet)?
SEE PAGE 2

Describe the survey method

OUTLINE AND PREPLOT SHAPE FILES HAVE BEEN
ELECTRONICALLY DELIVERED

c. Seismic Source and Transport Methods: ☑ Vibroseis Trucks ☑ Pick-up Truck ☐ Drill Buggy ☑ ATV ☐ Helicopter ☐ Backpack
Describe your seismic source and transportation plans, including types of vehicles, numbers of vehicles for each aspect of the project, routes, and methods you will use to access the project area

2 - SETS OF 4 VIBRATOR BUGGY UNITS
~ 12 - 4x4 SUPPORT LINE TRUCKS
~ 17 - ATV MULES
WILL USE LOCAL ROADS AND HIGHWAYS TO ACCESS PROJECT AREA

d. Operating Procedures: Describe your operating procedures, including how you will minimize surface impacts and ensure compliance with the Terms and Conditions of this NOI. Describe staging areas and support facilities you need, such as helispots, temporary camps, equipment storage; fuel storage; powder magazines, construction of roads or trails; proposed plugging procedures for shot holes; waste management and spill prevention; reclamation; and general clean-up procedures.

IN ORDER TO MINIMIZE SURFACE IMPACT WE WILL: LIMIT VEHICULAR TRAFFIC TO EXSISTING ROADS OR SOURCE AND RECEIVER LINES THAT HAVE BEE CLEARED BY THE ARCHAEOLIGIST OR MOA GUIDELINES, UTILIZE WELL LOCATIONS FOR STAGING AREAS AND NOT WORK IN WET WEATHER, WILL AVOID KNOWN ARCH SITES IN THE AREA, A PER MOA OR ARCH STUDIES. SITE LOCATIONS WILL BE ESTABLISHED WITH A RECORD CHECK.

(Continued on page 3)

Exhibit A2 NOI for the Delaware Basin 4A West 3D Seismic Project

Terms and Conditions

1. The Bureau of Land Management (BLM) or Forest Service (FS) (Agency) must approve any Surface disturbing activities in addition to those approved in the NOI, such as route changes, placement of magazines, towing with a tractor, blading, dozing, snow removal, and vegetation removal. I must notify the Agency in writing of any changes in the original proposal and have Agency approval in writing for the changes before proceeding with them. Stacking sourcepoints to avoid sensitive resources or areas does not require prior Agency approval.
2. This NOI expires on _____, unless the Agency extends it in writing before that date.
3. I understand that this NOI does not grant any exclusive right to the described lands for geophysical exploration, or other purposes. The land area described above is at all times subject to any other lawful uses by the United States, its lessees, permittees, licensees, and assigns.
4. I must notify the Agency at least 3 days, but no more than 7 days, prior to initiating the project and entering upon the public lands.
5. In the field, each seismic crew must have with it a copy of the approved NOI and its terms and conditions.
6. The Agency may suspend or terminate this NOI if there is a violation of any of its conditions.
7. I must suspend operations when the operations may unnecessarily damage the surface, such as when rutting would occur due to wet soil conditions.
8. I must indemnify the United States for any liability for damage to life or property resulting from the occupancy or use of public lands under the NOI.
9. I must take all reasonable precautions to prevent and must suppress fires. The Agency may specify in writing the fire prevention and firefighting equipment I need. At my expense, I must extinguish all fires set or caused as a result of operations under this NOI and must report all fires to the Agency.
10. I must diligently protect from unnecessary damage United States land and property covered by this NOI. I must pay the United States for any damage resulting from my or my agents' or employees' violation of the terms of this NOI or any law or regulation applicable to the lands involved.
11. I must store and handle powder magazines and explosives according to the U. S. Bureau of Alcohol, Tobacco and Firearms standards (see 27 CFR Part 55). I must properly secure loaded shot holes.
12. I must complete shot hole plugging under Agency guidelines and the guidelines of any other local, Federal or State regulatory authority.
13. I must remove all materials and equipment I placed on the premises and restore the site to the Agency's satisfaction immediately after I complete the project unless the Agency approves other arrangements.
14. I must file a Notice of Completion (NOC) Form 3150-5/2800-16a within 30 days after completing operations and reclamation. If the location of the project is different from that in the approved NOI, I must submit a revised map with the NOC (1:24,000 scale, where available), including source points.
15. I must pay to the United States $_____ per _____ according to the regulations.
16. This geophysical exploration project is subject to the attached Conditions of Approval _____ through _____ and Exhibits _____.

WARNING: If you purposely give false or misleading information, you may be fined $10,000, sent to prison, or both (see Title 18 U.S.C. 10001 statement on page 1).

I agree that I and my agents must conduct the geophysical exploration under all Federal, State and local laws, and applicable regulations and must comply with this NOI and any attached terms and conditions.

GREG DEARSLEY	S. Dearsley	6/17/15
Printed Name of Authorized Company Representative	Signature of Authorized Company Representative	Date

Printed Name of Agency Signing Officer	Signature of Agency Signing Officer	Title of Agency Signing Officer	Date

NOTICES

The Privacy Act and 43 CFR 2.48(d) require that you be furnished the following information in connection with information request by this form.

AUTHORITY: The Mineral Leasing Act (30 U.S.C. 181 – 287), Mineral Leasing Act for Acquired Lands (30 U.S.C. 341 – 359), Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 – 1782), and National Environmental Policy Act (42 U.S.C. 4321 – 4347) permit collection of the information requested by this form. The BLM collects this information in accordance with 43 CFR parts 3150 and 3160. The FS collects this information in accordance with 36 CFR part 228.

PRINCIPAL PURPOSE: The BLM or the FS will use the information to process your notice and inform you of the terms and conditions under which geophysical exploration operations may be conducted.

ROUTINE USES: The BLM will only disclose the information in accordance with the Freedom of Information Act, the Privacy Act, and the provisions at 43 CFR 2.56(b) and (c). The FS will only disclose the information in accordance with the Freedom of Information Act, the Privacy Act, and the provisions at 36 CFR 200.7 and 7 CFR 1.1.

EFFECT OF NOT PROVIDING INFORMATION: Submission of the requested information is necessary to obtain or retain a benefit. Failure to submit all of the requested information or to complete this form may result in delay or result in revocation of your right to conduct geophysical exploration operations.

The Paperwork Reduction Act requires us to inform you that:
The BLM/FS collects this information in accordance with the statutes and regulations listed above, and for the purposes listed above.
Submission of the requested information is necessary to obtain or retain a benefit.
You do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

BURDEN HOURS STATEMENT: The public reporting burden for this form is 1 hour per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. You may submit comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0162), 1849 C Street, NW, Room 2134LM, Attention: Information Collection Clearance Officer, Washington, D. C. 20240.

(BLM Form 3150-4 and FS Form 2800-16, page 3)

Exhibit A3 NOI for the Delaware Basin 4A West 3D Seismic Project

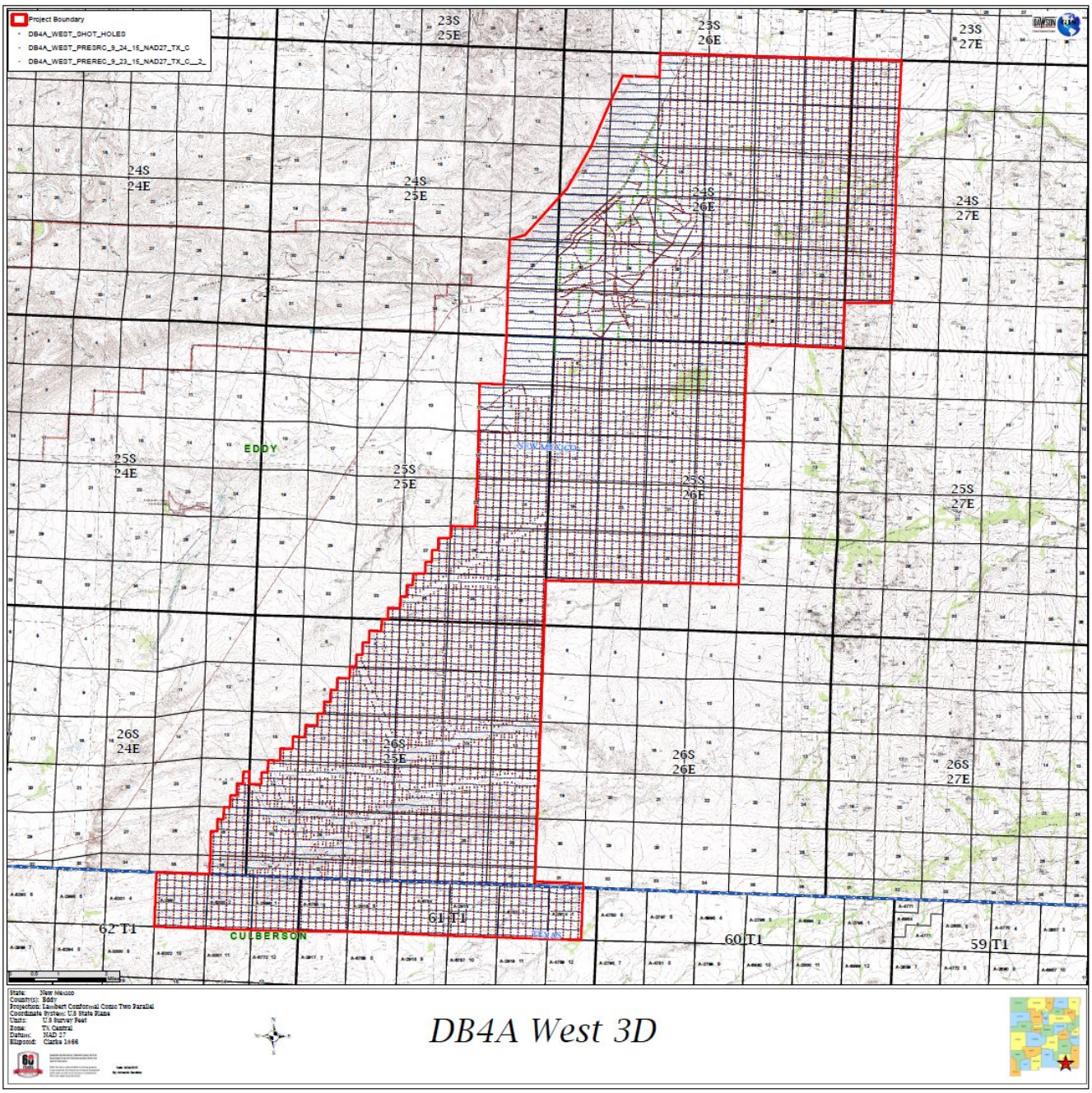

Exhibit B Boundary Map for the Delaware Basin 4A West 3D Seismic Project

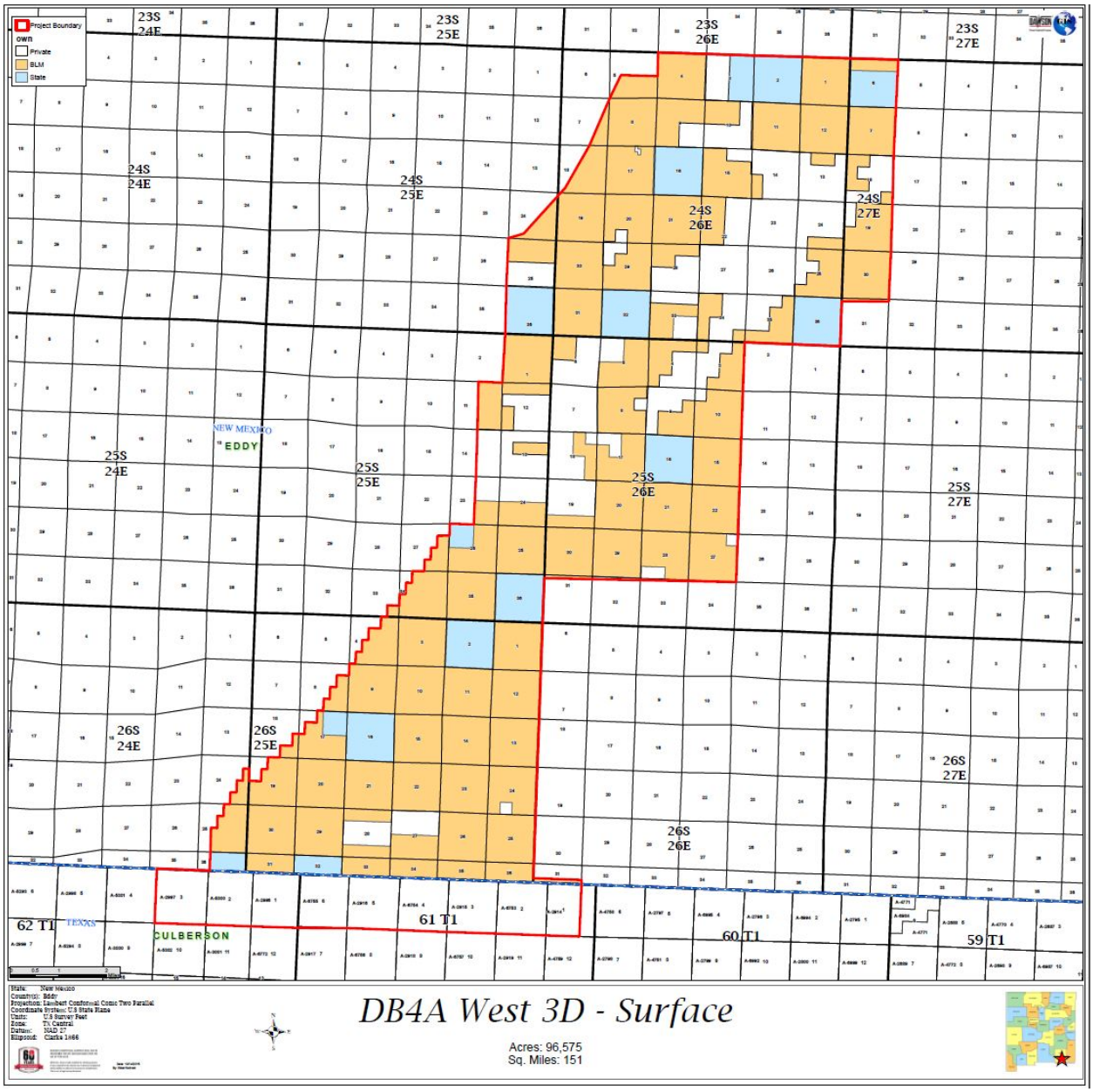

Exhibit C Source and Receiver lines within the Boundary of the Delaware Basin 4A West 3D Project

Exhibit D Example Helidrill that would be used for the Delaware Basin 4A West 3D Seismic Project

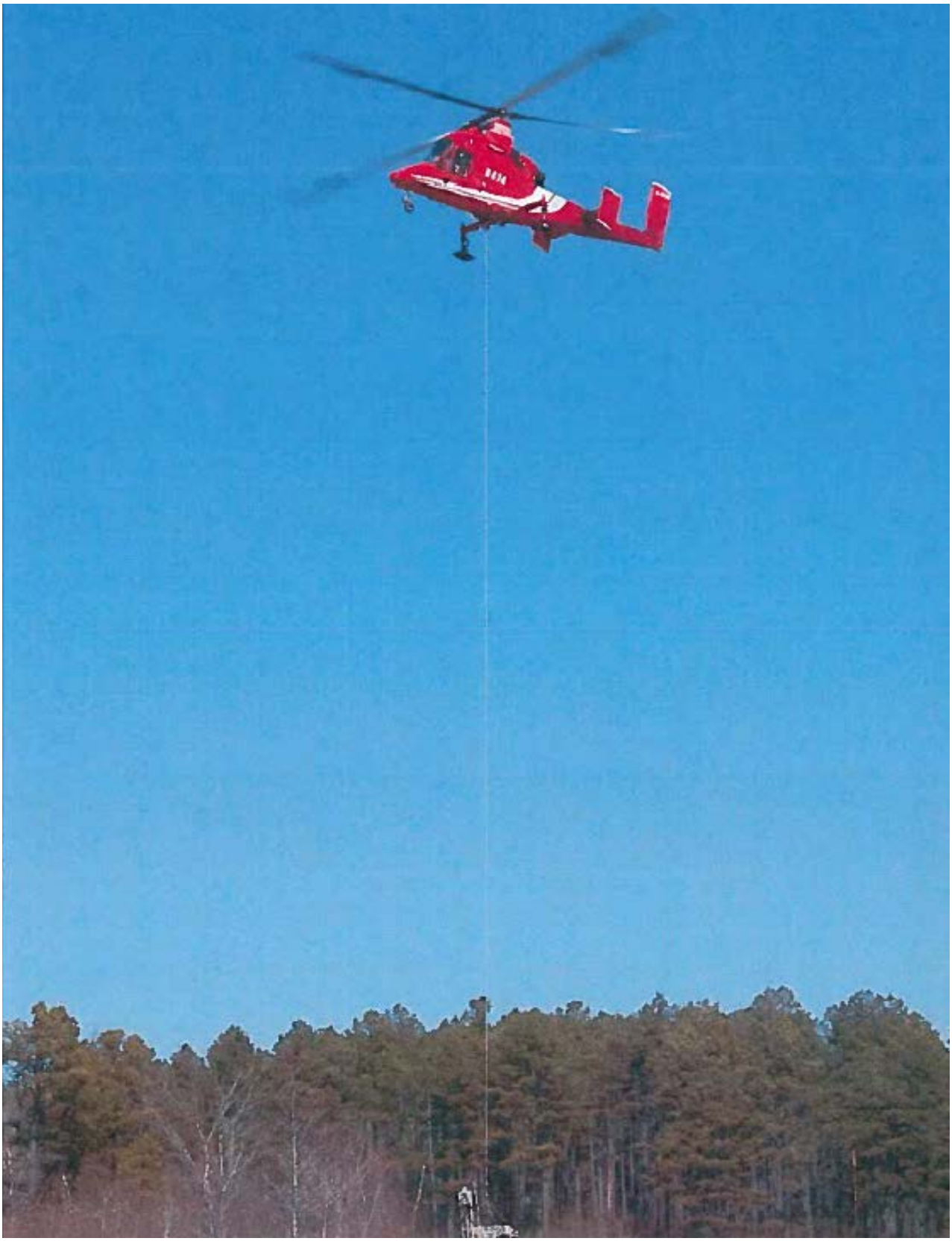

Exhibit E Example Helicopter setting a Helidrill that would be used for the Delaware Basin 4A West 3D Seismic Project

The project will consist of 85 source lines and 113 receiver lines arrayed in a box pattern. The source lines will consist of using an inline array with vibroseis used as an energy source. These lines will be oriented north to south. The receiver lines will be oriented east to west. This project will be performed using wireless technology, so there will be no wires or strings running on the ground. There will be a wireless piece of equipment known as the Fairfield Nodule at every receiver point, but no wires or geophones spreads will be laid out.

The source will consist of using vibroseis trucks or buggies in line running from north to south with intervals of 165 feet apart from one another and 825 feet apart from the next source line. The source for the area within the Guadalupe Escarpment Scenic Area Special Management Area (west half of T. 24S., R. 26E., on the east side of Hwy. 62/180 and on the section line between section 01, T. 25S., R. 25E., and section 06 of T. 25S., R. 26E..,) will be helidrills with holes drilled every 330 ft. instead of the 165 ft. apart for the vibroseis source. The geophone arrays will be laid out manually using linesmen hand placing individual geophones into the ground in an east to west direction with intervals of 165 feet apart from each one and 825 feet apart from the next receiver line. All-Terrain Vehicles (ATV's) will be transporting the geophone strings (Fairfield Nodules) and personnel up and down the lines. The linesmen would be manually packing the geophone strings to the other receiver lines. There are four phases of operation to this proposed action as described below:

The first phase consists of conducting a land survey. The survey crew usually consists of five to seven people and two pickup trucks or utility vehicles that are used to transport surveying equipment and flagging supplies. Their job is to lay out alternately colored pin flags at pre-designated intervals.

Each individual flag is then surveyed to determine the exact location of each station. This is done to correlate the work done on the ground with geographic maps and possible oil and gas structural traps under the surface. No off-road vehicular traffic shall occur until archaeological survey is completed and site avoidance reroutes are flagged.

The second phase consists of conducting all appropriate resource inventories and surveys. The entire project will have a conventional archaeological survey performed. This is also the time when the project surveyors are surveying also, this way if there is a line move or re-route, the archaeologists are in the field. Hazard survey will be performed at this time also. This is surveying for everything out in the field, such as, fences pipelines, roads, well pads, and any special surveying, such as stick nest or cave/karst surveying.

The third phase of this operation is the Data Collection phase where the seismic crew actually lays out the cables and the vibrators, or shot hole placement, move in to generate the recorded p-wave energy. The vibroseis trucks would use tires that would be most adaptable to the terrain such as sand tires, commonly referred to as "terra-tires" across any required areas.

The p-waves are detected by the geophone arrays and the signal is amplified and sent to a recording truck that takes the signal and stores it on magnetic tape along with information concerning the geometric layout of the spread. The vehicles responsible for laying out the receiver arrays would utilize the receiver lines that are in the vicinity of the source lines. This would consist of cable trucks and other utility trucks carrying supplies up and down the line. The linesmen would manually lay out the receiver arrays. These linesmen would hand place the individual geophones into the ground.

The fourth phase consists of cleaning up the survey area by removing all pin flags and survey stakes. No vehicular traffic is allowed within archaeological site boundaries except where stipulated otherwise. All trash, flagging and lath etc. would be removed and hauled to an authorized disposal site.

Reclamation, if required, will be completed at this time. All disturbed areas would be reclaimed as directed by the BLM. Reclamation of these disturbed areas would be done concurrently with the geophysical operations in so far as possible. No oil or lubricants would be drained onto the ground surface.
The proposed operations are governed by Terms and Conditions for Notice of Intent to Conduct Geophysical Exploration (Exhibit A3) that provides adequate protection for areas without specific resource concerns. Other potential mitigation measures are covered within the operator's operating plan or may be placed as a condition of approval or stipulation assigned by the BLM.

The operator would notify the BLM within five days after the operation has been completed. A Notice of Completion, as specified in 43 CFR 3150, must be filed. No blading or other earthwork would occur. Tree removal would not be allowed. No source points would be located within 100 feet of any historic trails, natural areas, identified archaeological sites, recreation areas, and wells and springs.

The operator would avoid conducting operations during wet periods. If, due to wet soil conditions, vehicles are found to be leaving any ruts greater than 3 inches in depth, operations will cease until conditions dry. During extended periods of dry weather, the operator would utilize BLM approved dust abatement methods during operations.

Mitigation Measures: Conditions of Approval and Stipulations for Notice of Intent and Authorization to Conduct Oil and Gas Geophysical Exploration Operations in the Carlsbad Field Office and Cultural Stipulations (Appendix C).

2.2. No Action

The BLM NEPA Handbook (H-1790-1) states that for Environmental Assessments (EAs) on externally initiated proposed actions, the No Action Alternative generally means that the proposed activity will not take place. This option is provided in 43 CFR 3162.3-1 (h) (2). This alternative would deny the approval of the proposed application, and the current land and resource uses would continue to occur in the proposed project area. No mitigation measures would be required.

2.3. Alternatives Considered but Eliminated from Detailed Analysis

There are no alternate routes that will have significantly fewer impacts or any clear advantages over the proposed action. Overall impacts to the natural resources, if an alternate route were required, would be substantially identical to the proposed action with only minor differences in disturbances to soil, vegetation, and wildlife occurring. Field investigation of all areas of proposed surface disturbance for Alternative A-Proposed Action were or will be inspected to ensure that potential impacts to natural and cultural resources would be minimized through the implementation of mitigation measures.

These measures are described for all resources potentially impacted in Section 4.0 of this EA. Therefore, no additional alternatives other than those listed above have been considered for this project.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Projects requiring approval from the BLM such as Notice of Intents and Authorization to Conduct Oil and Gas Geophysical Exploration Operations (NOI's) can be denied when the BLM determines that adverse effects to resources (direct or indirect) cannot be mitigated to reach a Finding of No Significant Impact (FONSI).

Under the No Action Alternative, the proposed project would not be implemented and there would be no new impacts to natural or cultural resources from the proposed project. The No Action Alternative would result in the continuation of the current land and resource uses in the project area and is used as the baseline for comparison of environmental effects of the analyzed alternatives.

During the analysis process, the interdisciplinary team considered several resources and supplemental authorities. The interdisciplinary team determined that the resources discussed below would be affected by the proposed action.

The No Action Alternative reflects the current situation within the project area and will serve as the baseline for comparing the environmental effects of the analyzed alternatives.

3.1. Air Resource

3.1.1. Affected Environment

Air Quality

Air quality is determined by atmospheric pollutants and chemistry, dispersion meteorology and terrain, and also includes applications of noise, smoke management, and visibility. The area of the proposed action is within the Pecos River airshed and is classified as a Class II Air Quality Area.

A Class II area allows moderate amounts of air quality degradation. The primary causes of air pollution in the project area are from motorized equipment and dust storms caused by strong winds during the spring.

Particulates from nearby oil and gas production, agricultural burning, recreational and industrial vehicular traffic and ambient dust can also affect air quality. Air quality in the area near the proposed action is generally considered good, and the proposed action is not located in any of the areas designated by the Environmental Protection Agency (EPA) as “non-attainment areas” for any listed pollutants regulated by the Clean Air Act.

The EPA’s Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2012 found that in 2012, total U.S. GHG emissions were over 6 billion metric tons and that total U.S. GHG emissions have increased by 4% from 1990 to 2012. The report also noted that GHG emissions fell by 3% from 2011 to 2012. This decrease was, in part, attributed to the increased use of natural gas and other alternatives to burning coal in electric power generation (U.S. Environmental Protection Agency, 2014).

Climate

The 2013 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) states that the atmospheric concentrations of well-mixed, long-lived greenhouse gases (GHGs), including carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), have increased to levels unprecedented in at least the last 800,000 years. Further, human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. It is extremely likely (95 – 100% probability) that human influence has been the dominant cause of the observed warming since the mid-20th century (Intergovernmental Panel on Climate Change, 2013).

Global mean surface temperatures have already increased 1.5 degrees F from 1880 to 2012. Additional near-term warming is inevitable due to the thermal inertia of the oceans and ongoing GHG emissions. Assuming there are no major volcanic eruptions or long-term changes in solar irradiance, global mean surface temperature increase for the period 2016 – 2035 relative to 1986-2005 will likely be in the range of 0.3 – 0.7°C (0.5 – 1.3°F). Global mean temperatures are expected to continue rising over the 21st century under all of the projected future RCP concentration scenarios. Global mean temperatures in 2081 – 2100 are projected to be between 0.3 – 4.8°C (0.5 – 8.6°F) higher relative to 1986 – 2005. The IPCC projections are consistent with reports from other organizations (e.g. NASA Goddard Institute for Space Studies, 2013; The National Academy of Sciences, 2005).

Climate change will impact regions differently and warming will not be equally distributed. Both observations and computer model predictions indicate that increases in temperature are likely to be greater at higher latitudes, where the temperature increase may be more than double the global average.

Warming of surface air temperature over land will very likely be greater than over oceans (Intergovernmental Panel on Climate Change, 2013). There is also high confidence that warming relative to the reference period will be larger in the tropics and subtropics than in mid-latitudes. Frequency of warm days and nights will increase and frequency of cold days and cold nights will decrease in most regions. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures. Models also predict increases in duration, intensity, and extent of extreme weather events. The frequency of both high and low temperature events is expected to increase. Near- and long-term changes are also projected in precipitation, atmospheric circulation, air quality, ocean temperatures and salinity, and sea ice cover.

Several activities contribute to the phenomena of climate change, including emissions of GHGs (especially carbon dioxide and methane) from fossil fuel development, large wildland fires and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of carbon dioxide can influence climate for 100 years.

3.1.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Air Quality

The winds that frequent the southeastern part of New Mexico generally disperse odors and emissions, however, air quality would be impacted temporarily from exhaust emissions, chemical odors, dust caused by vehicles traveling to and from the project area and from motorized equipment used during construction. Impacts to air quality will diminish upon completion of the construction of the proposed action.

The EPA has the primary responsibility for regulating air quality, including seven nationally regulated ambient air pollutants. The state of New Mexico has an EPA-approved state implementation plan that regulates air quality throughout the state, except on tribal lands and within Bernalillo County. The New Mexico Air Quality Bureau's (NMAQB) mission is to protect the inhabitants and natural beauty of New Mexico by preventing the deterioration of air quality. The NMAQB is responsible for: ensuring air quality standards are met and maintained; issuing air quality Construction and Operating Permits; enforcing air quality regulations and permit conditions. Any emission source must comply with the NMAQB regulations.

Impacts to air quality on lands managed by BLM in southeastern New Mexico are reduced by the following standard practices which include: utilizing existing disturbance; minimizing surface disturbance; reclaiming and quickly establishing vegetation on areas not necessary for production; periodic watering of access roads during dry periods; removal and reuse of caliche for building other projects.

Climate Change

Climate change analyses are comprised of several factors, including GHGs, land use management practices, and the albedo effect. The tools necessary to quantify incremental climatic impacts of specific activities associated with those factors are presently unavailable. As a consequence, impact assessment of effects of specific anthropogenic activities cannot be performed. Additionally, specific levels of significance have not yet been established. Qualitative and/or quantitative evaluation of potential contributing factors within the project area is included where appropriate and practicable.

When further information on the impacts to climate change in southeastern New Mexico is known, such information will be incorporated into the BLM's NEPA documents as appropriate.

Environmental and economic climate change impacts from commodity consumption are not effects of the proposed planning decisions and thus are not required to be analyzed under the NEPA. They are not direct effects, as defined by the Council on Environmental Quality (CEQ), because they do not occur at the same time and place as the action. Neither are they indirect effects because the proposed plan actions and resulting greenhouse gas emissions production are not a proximate cause of the emissions or other factors resulting from consumption. The BLM does not determine the destination of the resources produced from Federal lands. The effects from consumption are not only speculative, but beyond the scope of agency authority or control. Therefore, this document does not include analysis of the consumption of resources produced as a result of planning decisions.

Mitigation Measures and Residual Impacts

None

3.2. Lands and Realty

3.2.1. Affected Environment

The project area consists of lands with several different owner statuses. In addition to BLM lands, the project will take place on and across State Trust Lands, and privately owned lands.

Within all of these lands, a variety of rights-of-ways (ROW's), most often associated with oil and gas development, are present. These ROW's and authorizations include roads, pipelines, well locations, tank batteries, power lines, and associated infrastructure. The project area also consists of authorizations related to ranching activities including fences, livestock and wildlife freshwater pipelines, roads, watering facilities, and corrals.

3.2.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Impacts to permitted infrastructure could occur due to heavy vehicle travel and vibration associated with the geophysical project. Pipelines at or near the surface could be crushed if driven over resulting of spillage of whatever product they are carrying. Depending on what product is in these lines, this could result in harmful environmental impacts. Pipelines that are damaged below ground surface may have undetectable leaks that could leak for a significant amount of time without being fixed.

For impacts to range improvement authorizations, see the Range section of this EA. (Section 3.3)

Mitigation Measures and Residual Impacts

Prior to beginning operations in an area, Dawson Geophysical Company will survey and identify all infrastructures in the area. This infrastructure will be buffered from activity appropriately to avoid any damage. If any damage occurs, Dawson will immediately notify the BLM. Dawson will be responsible for any remediation, including repair and reclamation, as a result of damage to infrastructure caused by geophysical activities.

See Mitigations Measures (Appendix C)

3.3. Range

3.3.1. Affected Environment

The proposed project falls within the following grazing allotments:

Cass Draw Allotment No. 78086 The grazing permittee is Jerry and Betty Lackey., 110 Skinner Road, Carlsbad, NM, 88220. The allotment is grazed by cattle and supports 60 Animal Unit Months (AUMs). More importantly, this allotment supports 5 cows per year or 6 cows per section per year. This allotment covers 2.46% of the project area. This allotment covers 5,226 total federal acres. Of this total, 1,661.69 acres are in this project, which consists of 406.40 acres of BLM lands, 945.36 acres of state trust lands, and 309.92 acres of private lands.

Big Hackberry Allotment No. 78087 The grazing permittee is Ogden Farms and Cattle Company, 159 West Ogden, Loving, NM, 88256. The allotment is grazed by cattle and supports 1,676 Animal Unit Months (AUMs). More importantly, this allotment supports 285 cows per year or 9.5 cows per section per year. covers 4.93% of the project area. This allotment covers 19,543 total federal acres. Of this total, 3,338.27 acres are in this project, which consists of 2,006.48 acres of BLM lands, 1,089.9 acres of state trust lands, and 241.88 acres of private lands.

Threemile Draw Allotment No. 78089 The grazing permittee is Trent or Clint Hughes, 5057 Queens Hwy., Carlsbad, NM, 88220. The allotment is grazed by cattle and supports 475 Animal Unit Months (AUMs). More importantly, this allotment supports 60 cows per year or 6.1 cows per section per year. This allotment covers 9.16% of the project area. This allotment covers 6,251 total federal acres. Of this total, 6,201.47 acres are in this project, which consists of 4,058.86 acres of BLM lands, 660.27 acres of state trust lands, and 1,482.34 acres of private lands.

Blue Spring Allotment No. 78090 The grazing permittee is Cecil Bounds, Inc., 83 Bounds Road, Carlsbad, NM, 88220. The allotment is grazed by cattle and supports 72 Animal Unit Months (AUMs). More importantly, this allotment supports 6 (100% BLM) cows per year or 6 cows per section per year. This allotment covers 6.65% of the project area. This allotment covers 4,420 total federal acres. Of this total, 4,500.85 acres are in this project, which consists of 635.43 acres of BLM lands, 0.94 acres of state trust lands, and 3,864.48 acres private lands.

Forehand Crossing Allotment No. 78091 The grazing permittee is Ogden Farms and Cattle Company, 159 West Ogden, Loving, NM, 88256. The allotment is grazed by cattle and supports 300 Animal Unit Months (AUMs). More importantly, this allotment supports 25 cows per year or 6.0 cows per section per year. This allotment covers 3.53% of the project area. This allotment covers 2,910 total federal acres. Of this total, 2,390.13 acres are in this project, which consists of 1,768.27 acres of BLM lands, 36.46 acres of state trust lands, and 585.39 acres of private lands.

Cottonwood Springs Allotment No. 78106 The grazing permittee is Fred and Deborah Beard, 185 Means Road, Carlsbad, NM, 88220. The allotment is grazed by cattle and supports 1,458 Animal Unit Months (AUMs). More importantly, this allotment supports 164 cows per year or 7.1 cows per section per year. This allotment covers 17.0% of the project area. This allotment covers 14,555 total federal acres. Of this total, 11,445.30 acres are in this project, which consists of 8,292.86 acres of BLM lands, 1,288.45 acres of state trust lands, and 1,863.99 acres of private lands.

Jumping Spring Allotment No. 78108 The grazing permittee is Jumping Springs, LLC., P.O. Box 2, Malaga, NM, 88263. This allotment is grazed by cattle and supports 1,801 Animal Unit Months (AUMs). More importantly, this allotment supports 190 cows per year or 8.2 cows per section per year. This allotment covers 4.26% of the project area. This allotment covers 14,743 total federal acres. Of this total, 2,883.99 acres are in this project, which consists of 2,802.39 acres of BLM lands, 6.05 acres of state trust lands, and 75.56 acres of private lands.

Lobo Ranch Allotment No. 78109 The grazing permittee is Berry C. Lucas, 1412 Burgandy, Carlsbad, NM, 88220. The allotment is grazed by cattle and supports 1,576 Animal Unit Months (AUMs). More importantly, this allotment supports 196 cows per year or 8.9 cows per section per year. This allotment covers 13.04% of the project area. This allotment covers 13,978 total federal acres. Of this total, 8,828.49 acres are in this project, which consists of 5,546.22 acres of BLM lands, 1,462.34 acres of state trust lands, and 1,819.93 acres of private lands.

Nuevo Canyon East Allotment No. 78110 The grazing permittee is John A. Ballard, 80 Ballard Ranch Road, Carlsbad, NM, 88220. The allotment is grazed by cattle and supports 114 Animal Unit Months (AUMs). More importantly, this allotment supports 11 cows per year or 6 cows per section per year. This allotment covers 0.92% of the project area. This allotment covers 1,220 total federal acres. Of this total, 616.87 acres are in this project, which consists of 178.67 acres of BLM lands, and 438.20 acres of private lands.

White City Allotment No. 78111 The grazing permittee is David Maley, P.O. Box 519, Carlsbad, NM, 88221. The allotment is grazed by cattle and supports 207 Animal Unit Months (AUMs). More importantly, this allotment supports 40 cows per year or 6 cows per section per year. This allotment covers 5.98% of the project area. This allotment covers 5,055 total federal acres. Of this total, 4,048.93 acres are in this project, which consists of 1,433.20 acres of BLM lands, 975.08 acres of state trust lands, and 1,640.65 acres of private lands.

Ewing Place Allotment No. 78112 The grazing permittee is John Sirman, P.O. Box 1537, Carlsbad, NM, 88221. The allotment is grazed by cattle and supports 193 Animal Unit Months (AUMs). More importantly, this allotment supports 17 cows per year or 5 cows per section per year. This allotment covers 3.08% of the project area. This allotment covers 2,150 total federal acres. Of this total, 2,082.21 acres are in this project, which consists of 1,921.29 acres of BLM lands and 160.92 acres of private lands.

Upper Jurnigan Draw Allotment No. 78113 The grazing permittee is Grattan E. Judkins, P.O. Box 728, Carlsbad, NM, 88221. The allotment is grazed by cattle and supports 108 Animal Unit Months (AUMs). More importantly, this allotment supports 15 cows per year or 12 cows per section per year. This allotment covers 1.10% of the project area. This allotment covers 800 total federal acres. Of this total, 743.10 acres are in this project, which consists of 468.74 acres of BLM lands and 274.35 acres of private lands.

Lower Gaudalupe Ridge Allotment No. 78114 The grazing permittee is Thunder Run Land and Cattle, LLC. (George Harvick), Box 3007, Albany, TX, 76430. The allotment is grazed by cattle and supports 1,908 Animal Unit Months (AUMs). More importantly, this allotment supports 194 cows per year or 11.5 cows per section per year. This allotment covers 7.31% of the project area. This allotment covers 10,830 total federal acres. Of this total, 4,945.02 acres are in this project, which consists of 4,781.70 acres of BLM lands and 163.31 acres of private lands.

CP Hill Allotment No. 78144 The grazing permittee is Ronny Derrick, 2264 State Hwy. 128, Jal, NM, 88252. The allotment is grazed by cattle and supports 3,033 Animal Unit Months (AUMs). More importantly, this allotment supports 283 cows per year or 8 cows per section per year This allotment covers 20.71% of the project area. This allotment covers 23,588 total federal acres. Of this total, 14,022.49 acres are in this project, which consists of 12,130.95 acres of BLM lands, 1,242.87 acres of state trust lands, and 648.67 acres of private lands.

There are range improvements throughout the project area and throughout each grazing allotment. Boundary fences, cross fences, fresh water pipelines, troughs, and windmills are in these areas. They will be safeguarded and maintained at all times.

3.3.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Long term impacts to livestock forage are directly tied to the net acreage remaining disturbed after reclamation. The total disturbance anticipated from this exploration program is approximately 3,428.71 acres. This is about 7% out of approximately 48,323 acres available for livestock grazing (cattle) on the grazing allotments, which supports 12,981 AUMs. Some displacement of animals could occur during the geophysical operation. The entire disturbed area should be reclaimed within two years, providing the area receives adequate rainfall and no vehicular traffic occurs along the seismic routes. Other impacts to livestock include displacement of animals to other areas due to disturbances from the exploration activities and direct loss of livestock through collisions due to increased vehicle activity.

If a range improvement, such as a fence is damaged and not immediately repaired or the BLM or grazing allottee is not immediately notified, livestock can cross these fences which will be an added cost in time and money to gather and separate the livestock. If a freshwater pipeline or drinking trough is damaged, livestock could run out of water, resulting in stress or death.

If the project is followed by a drought, vegetation could be slow to recover and this could affect livestock carrying capacity on the numerous allotments in the project area.

Mitigation Measures and Residual Impacts

Mitigation measure to limit impacts to vegetation and by default livestock forage can be found under the vegetation section of the EA (section 3.5)

Removal or alteration of existing range improvements (fences, cattle guards, etc.) will not be allowed without prior approval of the authorized officer. Existing range improvements will be maintained by Dawson Geophysical Company in a serviceable and safe condition.

Fences shall not be cut without prior approval of the authorized officer. Before cutting through any fences, Dawson Geophysical Company shall firmly brace the fence on both sides of the cut: a temporary gate will be installed for use during the course of operations unless the fence is immediately repaired. Upon completion of operations, fences shall be restored to their original condition or better.

See Mitigations Measures Appendix C)

3.4. Soils

3.4.1. Affected Environment

The project area falls within twenty nine different soil-mapping units, all of which are in Eddy County and can be further characterized into three main soil types:

LOAMY SOILS

Anthony Sandy Loam (Aa) (0-1% slopes) – This soil occurs mainly along the Pecos River in the general area of Carlsbad. This soil is used for irrigated crops, but cultivated areas are subject to severe wind erosion if they are left bare. Rough tillage, mulching, and use of cover crops are needed. Revegetation is difficult, because of high temperatures and erratic rainfall. Seedling damage resulting from high winds can be expected. Careful management of irrigation water is needed to check water erosion and excessive leaching of plant nutrients. This soil is also used for wildlife habitat.

Arno-Harkey Complex, Saline (AH, Ak) (0-1% slopes) – This complex consists of soils affected by salinity and a fluctuating high water table. Arno silty clay loam makes up 40 to 60 percent of the acreage; Harkey very fine sandy loam, saline, and Anthony soils make up 20 to 30 percent; and pima clay loam, gray variant, makes up 10 to 20 percent. This complex occurs on floodplains of the Pecos River and its tributaries. The largest area is north of Lake McMillan. This complex is flooded periodically.

Recent deposits, as much as 3 feet thick, of reddish, clayey sediments overlie the natural soils in areas along the present river channel and in areas adjacent to the backwaters of Lake McMillan. Drainage of the subsoil is restricted by the water table, which fluctuates with the rise and fall of waters in the Pecos River and Lake McMillan. Natural springs occur at the head of drainageways in areas of the Pima soil. Some areas of the Pima soil have a seasonally fluctuating water table. The soils of this complex are generally moderately to strongly saline. The vegetation consists mainly of such salt-tolerant plants as alkali sacaton, inland saltgrass, and saltcedar. The soils are suitable for wildlife habitat.

Atoka Loam (At) (1-3% slopes) – This soil occurs on the sides of swales on the plains west of the Pecos River. Near Lakewood, about one-third of the acreage is underlain by strongly cemented gravel at a depth of 20 to 36 inches. This soil is used for irrigated crops and native pasture. It is nearly as productive as Atoka Loam, but it is subject to water erosion unless irrigation water is carefully managed. The water can more easily be controlled if the soil is bench leveled. The water holding capacity is variable; it ranges from low in shallower areas to moderately high in deeper areas.

Cottonwood-Reeves Loams, Overflow (CR) (0-3% slopes) – The Cottonwood component makes up 60 percent of the map unit. Slopes are 0 to 3 percent. This component is on uplands, hills. The parent material consists of residuum weathered from gypsum. Depth to a root restrictive layer, bedrock, paralithic, is 3 to 12 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R042XC006NM Gyp Upland ecological site. Non irrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a moderately saline horizon within 30 inches of the soil surface.

The Cottonwood component makes up 60 percent of the map unit. Slopes are 0 to 3 percent. This component is on uplands, hills. The parent material consists of residuum weathered from gypsum. Depth to a root restrictive layer, bedrock, paralithic, is 3 to 12 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R042XC006NM Gyp Upland ecological site. Non irrigated land capability classification is 6s. This soil does not meet hydric criteria.The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a moderately saline horizon within 30 inches of the soil surface.

Ector-Reagan Association (ER) (0-9% slopes) – This soil association occurs in a regular pattern along the contact zone between limestone uplands and lower lying, broad alluvial plains or fans. Ector Stony Loam, 0 to 9% slopes, makes up about 50 -80% of the acreage, and Reagan Loam, 0 to 3% slopes, makes up about 15-40%. The Ector soil is the least productive of these soils. The Reagan soil produces more forage than the other soils, but it is subject to water erosion if the vegetative cover is seriously depleted. Runoff is rapid from the soil after heavy rainfall, and good management is needed to check erosion. Revegetation is difficult because rainfall is unpredictable. All the acreage is used for native pasture and wildlife habitat.

Harkey Sandy Loam (Ha) (0-1% slopes) – This soil occurs on low terraces along the Pecos River, mainly in the Carlsbad area. It is subject to moderated wind and water erosion, and careful management of both soils and irrigation water is needed. The water holding capacity is moderate in the surface layer, but it is high in the subsoil and substratum. The water-intake rate is moderately rapid. This soil is used for irrigated crops, native pasture, and wildlife habitat.

Karro Loam (Kr) (0-1% slopes) – The soil is moderately fertile, but productivity is restricted by the high content of lime. Most of the acreage is irrigated, and nearly all of the irrigated acreage has been leveled. Deep rooted crops are suitable. Small areas are used for native pasture and wildlife habitat.

Karro Loam (Kl) (0-3% slopes) – This soil has a high content of lime. This soil is highly susceptible to wind and water erosion if the vegetative cover is seriously depleted. The water-holding capacity is high, and permeability is moderate. This soil is used for native pasture and wildlife habitat. The reestablishment of desirable species of forage is difficult because rainfall is scanty and unpredictable.

Karro Loam (Ku) (1-3% slopes) – This soil is adjacent to Karro loam. It is on relatively short side slopes along drainageways. This soil is susceptible to water erosion. It is used mainly for irrigated crops. Most of it has been bench leveled. The surface layer has been severely cut or filled in the leveling operation. Small areas of this soil are used for native pasture and wildlife habitat.

Pima Clay Loam, gray variant, (PM) (0-1% slopes) – This soil is grayer than Pima silt loam, o to 1% slopes, and is mottled and stratified. It occurs in drainageways below flowing natural springs or springs that have ceased to flow only in recent years or whose waters have been diverted for irrigation purposes. Most areas are on flood plains of the Pecos River and near Black River Village. A few small areas are saline, because they receive seepage from adjacent Arno soils. This soil is fertile but it needs protection from a high water table, salts, and periodic overflow. It is easily eroded by floodwaters if it is not protected. Permeability is slow in the subsoil, and the water-holding capacity is high. Runoff is slow. It is used for irrigated crops, native pasture, and wildlife habitat.

Pima Silt Loam (PM) (0-1% slopes) – The Pima component makes up 100 percent of the map unit. Slopes are 0 to 1 percent. This component is on alluvial plains, alluvial flats. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is moderate. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R042XC017NM Bottomland ecological site.
Nonirrigated land capability classification is 7c. Irrigated land capability classification is 1. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Reagan Loam (Rc) (0-1% slopes) – This soil has the profile described as typical of the series. It occurs on plains west of the Pecos River in the irrigated areas near Artesia and Carlsbad. This soil is susceptible to wind erosion, especially when the seedbed is being prepared and the soil is bare. Seedling damage caused by high winds is common. This soil is used mainly for irrigated crops and wildlife habitat. It is among the most productive of the irrigated soil. Cotton and most other crops grown in the area are suitable. A small acreage of this soil is used for native pasture.

Reagan Loam (RA) (0-3% slopes) – The Reagan component makes up 100 percent of the map unit. Slopes are 0 to 3 percent. This component is on uplands, alluvial fans. The parent material consists of alluvium and/or eolian deposits. Depth to a root restrictive layer is greater than 60 inches.
The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R042XC007NM Loamy ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 30 percent. The soil has a slightly saline horizon within 30 inches of the soil surface.

Reagan Loam (Rd) (1-3% slopes) – Except for the difference in slope, this soil has a similar profile to that described as typical of the series. This soil is susceptible to wind erosion when the seedbed is being prepared and the surface is bare. Seedling damage caused by high winds is common. Slight surface crusting impedes emergence of seedlings in areas where the high lime zone is exposed. This soil is used for irrigated crops, native pasture, and wildlife habitat.

Reagan-Upton Association (RE) (0-9% slopes) – The Reagan component makes up 70 percent of the map unit. Slopes are 0 to 3 percent. This component is on alluvial fans, uplands. The parent material consists of alluvium and/or eolian deposits. Depth to a root restrictive layer is greater than 60 inches.

The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R070DY153NM Loamy ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 30 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The Upton component makes up 25 percent of the map unit. Slopes are 0 to 9 percent. This component is on uplands, fans. The parent material consists of residuum weathered from limestone. Depth to a root restrictive layer, petrocalcic, is 7 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R070DY159NM Shallow Loamy ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 58 percent.

Reeves Loam (RI) (0-1% slopes) – This soil occurs in the general vicinity of Artesia, Loving, and Malaga. This soil is susceptible to wind erosion, especially after preparation of the seedbed. Seedling damage from high winds is common. The surface crusts at times, and the crust inhibits seedling emergence. This soil is used for irrigated crops, but a small acreage is used for native pasture. Most of it has been bench leveled. The rooting zone is restricted by the underlying gypsiferous material. The depth of this material varies greatly from place to place, especially in areas where the soil has been leveled. Chlorosis, or yellowing of the leaves, can be expected in severely leveled areas.

Reeves Loam (Rn) (1-3% slopes) – Except for the slope, this soil has a profile similar to that described as typical of the series. This soils is susceptible to wind erosion, especially after preparation of the seedbed. Seedling damage from high winds is common. Surface crusting inhibits seedling emergence. This soil is used for irrigated crops and native pasture. Severe cuts and fills have substantially altered the surface layer. The depth of the underlying gypsiferous material varies from place to place, but it is generally 20 to 36 inches.

Reeves-Reagan Loams (RM) (0-3% slopes) – This complex occurs on uplands, as tracts 3 to 6 miles wide. Reeves loam, which makes up about 35 to 45 percent of the acreage, has a profile similar to that described as typical of the series, except that the surface has not been disturbed.

It occurs in pockets, swales, and along drainageways. Reagan loam, 0 to 3% slopes, which makes up about 25 to 30% of the acreage, occurs mainly at or near the center of swales and drainageways.

This complex is used for native pasture and wildlife habitat. The soils are uneroded or only slightly eroded. Good range management is needed to maintain a cover of good forage. Reestablishment of native vegetation is difficult because temperatures are high and rainfall is undependable. There is little or no surface water. Ground water is hard to locate and, in places, is of poor quality.

Russler-Ector Association (RU) (0-9% slopes) – This soil association occurs in a regular pattern in the south-central part of the survey area, near the Texas state line. It occupies a gently undulating plain where small limestone knobs and hills dot the landscape. The Russler soil, which is nearly level to gently sloping, occurs on uplands. It is slightly eroded and is susceptible to further erosion if the plant cover is seriously depleted. It has a high content of gypsum in the substratum, which makes necessary special treatment or design of surface and subsurface structures. The Ector soil, which has the profile described as typical of the series, occurs on small knobs and hills. It is uneroded or only slightly eroded. This association is used for native pasture and wildlife habitat. Reestablishment of vegetation is difficult once the plant cover is lost, because temperatures are high and rainfall is undependable. Good management of the range is neededto maintain a cover of desireable forage. Surface water is lacking, except for short periods after heavy rainfall. Ground water is hard to locate and is usually scanty and of poor quality.

GYPSUM SOILS

Gypsum Land-Cottonwood Complex (GC) (0-3% slopes) – Generated brief soil descriptions are created for major soil components. The Gypsum land is a miscellaneous area. The Cottonwood component makes up 30 percent of the map unit. Slopes are 0 to 3 percent. This component is on uplands, hills. The parent material consists of residuum weathered from gypsum. Depth to a root restrictive layer, bedrock, paralithic, is 3 to 12 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R042XC006NM Gyp Upland ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Reeves-Gypsum Land Complex (RG) (0-3% slopes) - The Reeves component makes up 55 percent of the map unit. Slopes are 0 to 1 percent. This component is on uplands, hills. The parent material consists of residuum weathered from gypsum. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R042XC007NM Loamy ecological site. Nonirrigated land capability classification is 7s. Irrigated land capability classification is 3s. This soil does not meet hydric criteria.

The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface. Generated brief soil descriptions are created for major soil components. The Gypsum land is a miscellaneous area.

SHALLOW SOILS

Ector Extremely Rocky Loam (EE) (9-25% slopes) – This soil occurs on rolling to hilly uplands. It is extensive in the western part of the area. Exposed bedrock and catsteps cover 20-50% of the surface. The rock outcrops keep the soil relatively stable. This soil absorbs water readily, but the water-holding capacity is very low to low. Run off is rapid after the soil becomes saturated.

Surface water is generally lacking, but there are a few seeps and low-yielding springs in canyons. This soil is suited to native pasture and wildlife habitat. Good management is needed to maintain a cover of vegetation that will adequately control water erosion. Revegetation is difficult because rainfall is unpredictable.

Ector Stony Loam (EC) (0-9% slopes) – The Ector component makes up 100 percent of the map unit. Slopes are 0 to 9 percent. This component is on uplands, hills. The parent material consists of residuum weathered from limestone. Depth to a root restrictive layer, bedrock, lithic, is 4 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R070DY158NM Very Shallow ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent.

Limestone Rock Land (LT) – This occurs as areas of 160 to 2000 acres or more in size, along primary and secondary drainageways in the western part of the area. It consists of steep to very steep canyon walls and escarpments. The bedrock is mainly thin-bedded limestone, but there is some sandstone, siltstone, and shale. The rocks have been highly dissected by stream erosion. Natural caves occur in places. Outcrops cover 60 to 90 percent of the surface.

Small accumulations of mixed alluvial and colluvial debris occur at the base of slopes and at the bottom of narrow valleys. Most drainages are intermittent stream channels. The soil material, wherever it occurs, is stony or rocky loam. Little or none clings to the slopes. Runoff is rapid to very rapid, and the water-holding capacity is very low. There is little or no surface water. Limestone rock land is used for wildlife habitat and for limited grazing.

Reeves Loam, Shallow (Rt) (0-1% slopes) – This soil occurs throughout the central part of the area, but mainly near Artesia, Loving, and Malaga. This soil is susceptible to wind erosion, especially when the seedbed is being prepared. Seedling damage caused by high winds is common. The surface crusts at times, and the crust inhibits seedling emergence. The water-holding capacity is low. The organic-matter content is low. Shallowness restricts the effective rooting depth. This soil is used for irrigated pasture, native pasture, and irrigated crops. It is among the least productive of the irrigated soils in the area. Only salt-tolerant shallow-rooted crops are suitable. Chlorosis is common. Good management of irrigation is needed to keep the soil from becoming saline. Special treatment or design is needed for surface or buried structures.

Upton-Reagan Complex (UR) (0-9% slopes) – This complex is extensive in the northwestern part of the area. The Upton gravelly loam and Reagan loam make up this complex. The upton soils, which make up about 50 to 70 percent of the acreage, occur on uplands. They occupy the higher parts of the landscape. They are nearly level to sloping. Reagan soils, which make up about 30 to 50 percent of the acreage, occur in upland swales and drainageways. They are nearly level to gently sloping. All of this complex is used for native pasture and wildlife habitat.

The soils are intact or only slightly eroded. Good management is needed to maintain a cover of desirable vegetation. Revegetation is difficult because temperatures are high and rainfall is undependable. Surface water is lacking, except for brief periods after prolonged rainfall, which is infrequent.

Upton Gravelly Loam (UG) (0-9% slopes) – The Upton component makes up 100 percent of the map unit. Slopes are 0 to 9 percent. This component is on fans, uplands. The parent material consists of residuum weathered from limestone. Depth to a root restrictive layer, petrocalcic, is 7 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low.
This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R042XC025NM Shallow ecological site. Non-irrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 58 percent.

Upton Soils (Up) (0-1% slopes) – This undifferentiated unit consists of calcareous loam and sandy loam on uplands. These soils occur as small areas widely scattered throughout the irrigated tracts between Artesia and Lakewood and between Carlsbad and Otis. They have a profile similar to the one described as typical for the series, except that the soils are not gravelly and they are 10 to 20 inches deeper over over indurated caliche. These soils are used for irrigated pasture, native pasture, and wildlife habitat. They are moderately fertile, but their use is limited. Shallowness over caliche makes leveling difficult.

Upton Soils (Ut) (1-3% slopes) – Except for the slope, these have a profile similar to that of Upton soils. Much of the acreage is used for native pasture and wildlife habitat. The irrigated areas are suitable for tame pasture. Bench leveling is very difficult.

3.4.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Slight soil compression may occur, however this will be minimal due to the shallow A horizons found in the soil types in the proposed project area. No work will be allowed if soil moisture is high and rutting potential exists. There would be approximately 405.32 linear miles of source lines and approximately 267.37 linear miles of receiver lines across federal lands.

The light compression damage area on federal lands associated with the source lines is approximately 50 feet wide which equates to approximately 2,456.47 acres of disturbance. It should be noted that this disturbance is not total devastation, but most usually only one pass (track) by the vibroseis machine.

The light compression damage area associated with the receiver lines on federal lands is approximately 30 feet wide which equates to approximately 972.24 acres of disturbance. It is estimated less than 10 acres of additional damage may occur due to approved access routes around cultural features such as roads and pipelines. It should be noted that the disturbance of the receiver lines will be two passes (one to lay out and one to pick up) and most of this disturbance will be foot traffic, which is very minimal surface disturbance. The total acreage of disturbance on federal lands would be approximately 3,438.71 acres.

The biological soil crusts are susceptible to compression damage from the weight of vehicle and foot traffic. Vehicular traffic can disturb biological soil crusts by compression or turning over the soil. Disruption of the crust can result in decreased soil organism diversity, soil nutrient levels, soil stability, and organic matter. In this instance, these impacts are expected to be limited to travel routes.

As mentioned in the existing environment, cyanobacteria are mobile, and can often move up through disturbed sediments to reach light levels necessary for photosynthesis. Since the cyanobacteria and other BSCs in the project area are not well developed, and these crusts will be slightly compressed or overturned in the top inch or two of soil, vehicular impacts to biological soil crusts are expected to have minimal impacts to ecosystem functions.

For the four soil groups described above, the acres of each soil group within the project boundary are, Loamy, 6,714.37 acres, Gypsum, 836.52 acres, and shallow, 14,123.75.

Mitigation Measures and Residual Impacts

To reduce the impact from vehicular traffic to vegetation, a three pass rule will be in effect for all vehicular travel down surveyed lines, with ATV's being used for maintenance only if necessary. Smaller ATV's will be used for layout, troubleshooting, and equipment pick up. All larger vehicles will use established roads and two-track roads only for equipment layout.

After completion of the seismic operation, berms and/or signs will be installed as needed to deter usage of seismic lines as roads by other vehicles and the general public. Should seismic vehicle routes turn into roads, the applicant will be required to rehabilitate the first 100 yards of the disturbance to discourage further use and minimize resource damage pursuant to reclamation requirements of this seismic authorization.

The applicant is required to cross roads from an angle other than 90 degrees (dog leg) to minimize detection or tire tracks left by seismic vehicles.

All project vehicles will be washed prior to entering the project area and before leaving the Carlsbad area to avoid the spread of noxious weeds.

The proponent conducted a noxious weeds risk assessment throughout the project area. The results of this assessment came "moderate" for the presence of noxious weeds.

See Mitigations Measures (Appendix C)

3.5. Vegetation

3.5.1. Affected Environment

The vegetation characteristics for the three main soil types are listed below:

Loamy Soil Plant Community
This is a grassland site with warm season mid and short grass aspect. There is a fair scattering of shrubs and half-shrubs throughout the landscape. Forb production fluctuates greatly from season to season and year to year. Gramas, tridens, threeawns, muhlys, dropseeds, tobosa, and burrograss are the dominant grasses. The most common shrubs in the area are tarbush, creosote, mesquite, cactus, and yucca. Forbs include filaree, croton, bladderpod, and globemallow.

Shallow Soil Plant Community
Warm season, short and midgrasses make up most of the understory in the proposed project area. These include gramas, tridens, curlyleaf muhly, wolftail, dropseeds, threeawn, and green sprangletop. The shrub overstory consists primarily of sotol, agaves, cactus, catclaw, sacahuista, yucca, skunkbush, piñon/juniper, and broom snakeweed. A large variety of forbs, including croton, bladderpod, buckwheat, and globemallow can be found, with large fluctuations from season to season based on rainfall.

Gypsum Soil Type Plant Communities
The potential plant community of this category consists of gramas, gyp dropseed, and alkali sacaton. The shrub component is made up of four-wing saltbush, mormon tea, spiny althorn, javelin bush, and sumac. Forbs include gyp weed, scarlet guara, globemallow and croton. Shrubs and forbs are a minor component of the plant community.

Biological Soil Crusts - Low stability soils, such as the deep sands found within the project area, typically contain only large filamentous cyanobacteria. Few gelatinous lichen can be found near large mesquite dunes or in loamy low spots. An inventory of the area revealed this to be true. These biological soil crusts, while present in some locations, are not significant throughout the project area. An inventory of the area revealed the presence of several morphological groups of Biological Soil Crusts (BSCs). These include gelatinous lichen, and cyanobacteria. Cyanobacteria are the most common in the project area. These soil crusts are important in binding loose soil particles together to stabilize the soil surface and reduce erosion.
They also function in the nutrient cycle by fixing atmospheric nitrogen, contributing to soil organic matter, and maintaining soil moisture. In addition, they can act as living mulch that discourages the establishment of annual/invasive weeds. Structurally they form an uneven, rough carpet that reduces raindrop impact and slows surface runoff.

Below the surface, lichen, rhizines, and cyanobacterial filaments act to bind the soil surface particles just below and at the surface. Horizontally, they occur in nutrient-poor areas between plant clumps. Because they lack a waxy epidermis, they tend to leak nutrients into the surrounding soil. Vascular plants such as grasses and forbs can then utilize these nutrients.

3.5.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Direct impacts to vegetation from the proposed project include the crushing and breaking of schrubs and other woody species as well as cacti by vehicular traffic including source vehicles. Grasses tend to lay over but ultimately come back relatively quick if the vehicle traffic on the area ceases after operations. However, some more visible routes may continue to receive vehicle traffic by casual users after the seismic project is completed. Some vegetation that is crushed may take several seasons to grow back or may not grow back at all.

There is the potential for a long term increase in African Rue, Star Thistle, Spotted Knapweed and the introduction of undesirable and noxious weeds throughout the area. There is the probability of a long-term increase of weedy invaders by the species listed above. The potential introduction and spreading of noxious weeds by vehicular traffic would have a long term negative impact on vegetation, recreation, wildlife, and the livestock industry throughout the project area.

Mitigation Measures and Residual Impacts

To reduce the impact from vehicular traffic to vegetation, a three pass rule will be in effect for all vehicular travel down surveyed lines, with ATV's being used for maintenance only if necessary. Smaller ATV's will be used for layout, troubleshooting, and equipment pick up. All larger vehicles will use established roads and two-track roads only for equipment layout.

After completion of the seismic operation, berms and/or signs will be installed as needed to deter usage of seismic lines as roads by other vehicles and the general public. Should seismic vehicle routes turn into roads, the applicant will be required to rehabilitate the first 100 yards of the disturbance to discourage further use and minimize resource damage pursuant to reclamation requirements of this seismic authorization.

The applicant is required to cross roads from an angle other than 90 degrees (dog leg) to minimize detection or tire tracks left by seismic vehicles.

All project vehicles will be washed prior to entering the project area and before leaving the Carlsbad area to avoid the spread of noxious weeds.

The proponent conducted a noxious weeds risk assessment throughout the project area. The results of this assessment came "moderate" for the presence of noxious weeds.

See Mitigations Measures (Appendix C)

3.6. Wildlife

3.6.1. Affected Environment

This project occurs in the Chihuahuan Desert habitat type. The Chihuahuan desert is one of the four most biologically rich and diverse desert ecoregions in North America. Numerous plant species live in this desert. The Chihuahuan Desert stretches from the southeastern corner of Arizona across southern New Mexico and west Texas to the Edwards Plateau in the United States. It runs deep into central Mexico, including parts of the states of Chihuahua, northwest Coahuila, northeast Durango and several others. This Desert is bounded by the Sierra Madre Occidental to the west and the Sierra Madre Oriental to the east, extending as far south as San Luis Potosi and to the isolated islands of the Chihuahuan vegetation in the Mexico states of Queretaro and Hidalgo. In New Mexico, Chaves and Eddy Counties, west of the Pecos River, consist largely or entirely of Chihuahuan Desert habitat type. The dominant plant species throughout the Chihuahuan desert is creosote bush. Depending on diverse factors such as type of soil, altitude, and degree of slope, creosote bush, can be found in association with other woody and grass species. Project design features were established to avoid Threatened and Endangered species conflicts.

Wildlife

A number of big game species have the potential to occur in and around the project area including mule deer (Odocoileus hemionus), collard peccary (Peccari tajacu), and wild turkey (Meleagris gallopavo), Small game species could include scaled quail (Callipepla squamata), and northern bobwhite quail. Raccoon (Procynon lotor), badger (Taxidea taxus), long tailed weasel (Mustela frenata), gray fox (Urocyon cinereoargenteus), ringtail (Bassariscus astutus), bobcat (Lynx rufus), and muskrat (Ondatra zibethicus) also have potential to occur in the area. A number of waterfowl species may also utilize the area.

Non-game mammals with the potential to occur in the project area are desert cottontail (Sylvilagus audubonii), black-tailed jackrabbit (Lepus californicus), coyote (Canis latrans), striped skunk (Mephitis mephitis), ground squirrels, mice, rats, and schrews. Two bat species are also known to occur in or surrounding the analyzed area including Mexican free-tailed bat (Tadarida brasiliensis, and Cave Myotis (Myotis velifer).

Various reptiles and amphibians have the potential to occur in the analyzed area, including but not limited to western diamondback rattlesnake (Crotalus atrox), coachwhip (Masticophis Flagellum), coomon kingsnkae (Lampropeltis getula), bull snake (Pituophus melanoleucus), plain-bellied watersnake (Nerodia erythrogaster), checkered gartersnake (Thamnophis marcianus), round tailed horned lizard (Phrynosoma modestum), common side-blotched lizard (Uta stansburiana), common spotted whiptail (Aspidoscelis guralis), little striped whiptail (Aspidoscelis inornata), marbled whiptail (Aspidoscelis marmorata), eastern collared lizard (Crotaphytus collaris), great plains skink (Plesiodon obsoletus), leopard lizard (Gambelia wislizenni), southwestern fence lizard (Sceloporus cowlesi), ornate box turtle (Terrapene ornate), twin spotted spiny lizard (Sceloporus bimaculosus), Texas banded gecko (Coleonyx brevis), western river cooter (Pseudemys gorzugi), red-eared slider (Trachemys scripta), spiny softshell (Apalone spinifera), Northern Cricket Frog (Acris crepitans), Rio Grande Leopard Frog (Lithobates berlandieri), Plains Leopard Frog (Rana blairi), Great Plains Toad (Bufo cognatus), New Mexico Spadefoot Toad (Spea multiplicata), Couch's Spadefoot Toad (Scaphiopus couchii), and Tiger Salamander (Ambystoma tigrinum).

An abundance of non-game species are also known to occur within the analyzed area, including mammals, reptiles, and amphibians not discussed above.

In a small portion of the proposed project, a helicopter will be used to transport and pick up equipment in an area that vehicles cannot get into due to steep slopes and rough terrain. The helicopter will come from the Carlsbad Municipal Airport and fly to the staging area, which is a caliche pit on Fred Beard's private land. It will pick up a large bad of equipment that will be tethered on a 100 foot cable. It will go to a specific area that needs the equipment bag and lower it down. The field crews will unhook the bag and the equipment will be dispersed. Once the project is done in this area, the helicopter will come back to retrieve the equipment in the same manner that he dropped it off.

Wildlife Habitat Improvement Projects

In addition to natural habitat features, several wildlife habitat improvement projects have been constructed within the project area. These include structures that capture and store rainwater, drinking troughs, and shade structures. These structures are fenced off to allow for wildlife use, but to exclude livestock use. Wildlife is often found in concentrations around these structures.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918 protects migratory bird species through the implementation of various treaties and conventions between the US and Canada, Japan, Mexico, and the former Soviet Union. A migratory bird is any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle (MBTA 1918, as amended). The USFWS is responsible for administering the MBTA (USFWS 2010b).

The MBTA makes it unlawful to "pursue; hunt; take; capture; kill; attempt to take, capture, or kill; possess; offer for sale; sell; offer to barter; barter; offer to purchase; purchase; deliver for shipment; ship; export; import; cause to be shipped, exported, or imported; deliver for transportation; transport or cause to be transported; carry or cause to be carried; or receive for shipment, transportation, carriage, or export; any migratory bird, any part, nest, or egg of any such bird; or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof" (16 USC § 703 (a)). There are currently 1,026 species included on the list of migratory birds that are protected under the MBTA (USFWS 2013).

Raptor Nests

Several raptor species use the southeastern New Mexico region as either migratory or permanent resident. Potential nesting habitat includes but is not limited to escarpments, cliff faces, and any tree large enough to support a nest. Nesting territories of some raptors remain remarkably stable from year to year. Furthermore, several species seldom build new nests, but repeatedly repair and reuse old ones. Alternate nest sites are contained within territories; therefore a specific nest site may change annually. Limits of territories remain essentially constant (Newton 1979). The grasslands, riparian, and xeric-riparian areas provide hunting grounds. The area has an abundant food base to support a substantial population of raptors year round in most years.

3.6.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Wildlife

Avoidance of wildlife waters, stick nests, drainages and playas, will reduce mortality to wildlife and allow habitat to be available in the immediate surrounding area thus reducing stressors on wildlife populations at a localized level. Impacts to local wildlife populations are therefore expected to be minimal.

The helicopter will abide by the same buffers and mitigation measures as the field crew does. The helicopter will be a minimum of 100 ft. in the air at all times, including equipment drop and pick up. Stick nests will be avoided. The helicopter will not touch down in the field, unless it is at the staging area, so no animals on the ground will be impacted. The under wash from the rotor will not be an issue on the ground since the helicopter will not touch down in the field and will be a minimum of 100 ft. in the air at all times.

Wildlife Habitat Improvement Projects

Wildlife typically congregate in these areas due to the availability of water and shelter. Intrusions in and around these features such as noise, human presence, vibration, and vehicle traffic have the potential to disturb larger numbers of wildlife and discourage them from using these features and areas.

Migratory Birds

In 2007, BLM published interim guidance for implementing EO 13186, which included analysis, through NEPA, of Project effects on migratory birds and effects relative to land health in the Project area (BLM 2007b). As required by MBTA and EO 13186, BLM signed a Memorandum of Understanding with the USFWS in April 2010, which is intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds. Migratory bird species at conservation risk are identified and protected by various laws, regulations, and guidelines. Pursuant to implementing EO 13186, BLM's Instruction Memorandum No. 2008-050 (BLM 2007b) suggested that impacts to nesting migratory birds could be minimized or avoided by imposing a timing limitation on use authorizations to mitigate vegetative disturbing activities during the primary portion of the nesting season (May 15 to July 31) when most migratory birds nest, but cautioned that dates should be adjusted for the timing or intensity of breeding activity by Birds of Conservation Concern and migratory bird species affected by a project and species' environmental conditions (BLM 2007b, BLM 2013b).

The effects of human associated disturbance are a primary threat to raptor populations. Noise, human disturbance, and vibrations caused by geophysical operations have the potential to negatively impact raptor species and their nests. The specific effects and tolerance limits to disturbance on raptors vary among and within raptor species. This is due to the broad range of direct and indirect human-associated impacts and the fluctuating levels of sensitivity for individual raptors, depending on life stage and time of year.

Behavioral data suggests that adults that become sensitized to human presence are less than normally attentive to their young, which can reduce fledgling success. Furthermore, behavioral data suggests that raptors have the tendency to shift or expand their home ranges, or move to new areas (Anderson et al. 1990). Disruption of foraging areas can result in lowered hunting success, increased intraspecific encounters, and reduce food intake (Anderson 1984). Raptors displaced from foraging areas may have increased energy expenditures and less time available for other activities, and their productivity could be adversely affected (Stalmaster and Kaiser 1997). The noise caused by pump jack engines could cause potential abandonment of nests or a shift or expansion of home range. Adherence to the conditions of approval and mitigation measures is critical for the protection of this resource.

In order to minimize the human disturbance, spatial and temporal buffer zones could protect raptors during periods of extreme sensitivity. Raptors may tolerate considerable noise close to their nests if they are familiar with it, especially if humans are not visible or otherwise obviously associated with it (Schueck et al. 2001). Potentially, if a disturbance is periodic and ongoing when adults first arrive at their nests and not perceived as threatening, raptors may habituate to them.

Adult migratory birds would not be directly harmed by the proposed action and alternatives because of their mobility and ability to avoid areas of human activity. The nests observed during 2015 project area field surveys and any nests within the project area at the time of seismic activities, along with eggs and juveniles, may be directly impacted during seismic activities.

The increased human presence and noise levels may indirectly disturb or displace adults from nests and foraging habitats within and surrounding the project area.

The proposed project consists of vehicle travel and pedestrian traffic in an oil and gas populated area. Birds and bird nests will be left alone. Bird nests will be avoided and structures that house these nests will be avoided sufficient enough not to touch or come into contact with the structures. No harm or harassment of any birds will be tolerated.

Although the nests and nesting structures have been surveyed for avoidance, once project commences, if any are found that are not mapped, they will be recorded for awareness and avoidance.

Raptor Nests

The effects of human-associated disturbance are a primary threat to raptor populations. The construction and development associated with oil and gas exploration and/or development may adversely affect potential nest sites and associated foraging area that support the pairs nesting effort. The specific effects and tolerance limits to disturbance on raptors vary among and within raptor species. This is due to the broad range of direct and indirect human-associated impacts and the fluctuating levels of sensitivity for individual raptors, depending on life stage and time of year.

Behavioral data suggests that adults that become sensitized to human presence are less than normally attentive to their young, which can reduce fledging success. Furthermore, behavioral data suggests that raptors have the tendency to shift or expand their home ranges, or moved to new areas (Anderson et al. 1990). Disruption of foraging areas can result in lowered hunting success, increased intraspecific encounters, and reduced food intake (Anderson 1984).

Raptors displaced from foraging areas may have increased energy expenditures and less time available for other activities, and their productivity could be adversely affected (Stalmaster and Kaiser 1997). The noise caused by pump jack engines could cause potential abandonment of nests or a shift or expansion of home range. Adherence to the conditions of approval and mitigation measures is critical for the protection of this resource.

In order to minimize human disturbance, spatial and/or temporal buffer zones could protect raptors during periods of extreme sensitivity. Raptors may tolerate considerable noise close to their nests if they are familiar with it, especially if humans are not visible or otherwise obviously associated with it (Schueck et al. 2001). Potentially, if a disturbance is periodic and ongoing when adults first arrive at their nests and not perceived as threatening, raptors may habituate to them.

A pedestrian survey was conducted and all raptor or stick nests were identified and mapped. All active raptor/raven nests will be avoided by a minimum of 400 meters by all activities or curtail activities until pledging is complete.

If any active raptor nests are encountered, operations will cease and the BLM will be contacted. All inactive raptor/raven nests will be avoided by a minimum of 25 meters by all activities. At no time will any Raptor/raven nest, active or inactive, be destroyed.

Mitigation Measures and Residual Impacts

To reduce the chances of disturbing wildlife, no surface disturbance will be allowed within 200 meters of playa features.

No trees will be cut or otherwise downed within the project area.

Crossings of drainages with vehicle traffic will be limited to existing road crossings.

Wildlife projects (water tanks, troughs, shade structures, etc.) will be buffered by a 200 meter radius. No vehicle traffic will be allowed within this buffer. Receiver groups may be walked in on foot into the buffer zones but must avoid any areas with a project enclosure (fence) entirely.

Migratory Birds

All active raptor nests will be avoided by a minimum of 400 meters by all activities or activities will be stopped until the young birds are fledged.

If any active raptor nests are encountered, operations will cease and the BLM will be contacted. All inactive raptor nests will be avoided by a minimum of 15 meters by all activities.

At no time will any raptor nest or associated structure, active or inactive, will be destroyed.

All passerine bird nests, inactive raptor nests and the structures they are located in will be avoided by vehicles, and will be maintained in their existing condition.

A 15 meter buffer around inactive raptor nests will be maintained for all seismic activities. No raptor stick nests will be destroyed.

Raptor Nests

All active raptor/raven nests will be avoided by a minimum of 400 meters by all activities or curtail activities until pledging is complete.

If any active raptor nests are encountered, operations will cease and the BLM will be contacted.

All inactive raptor/raven nests will be avoided by a minimum of 15 meters by all activities.

At no time will any Raptor/raven nest, active or inactive, be destroyed.

See Mitigations Measures (Appendix C)

3.7. Federally Threatened and Endangered Species

3.7.1. Affected Environment

Texas Hornshell Mussel

The Texas Hornshell Mussel historically occurred in the Pecos River system from the North Spring River, near Roswell, Chaves County, New Mexico (Cockerell 1902), through the Pecos River and in the lower Rio Grande to Brownsville, Cameron County, Texas (Neck and Metcalf 1988). Currently the species inhabits approximately 12% of its historic range in New Mexico, where the population is limited to an 8.7 mile stretch, south of Carlsbad, NM, from Black River Village downstream to the Carlsbad Irrigation District (CID) dam, of the Black River in Eddy County (Carman, S.M. 2007). Much of the river habitat within the historic range of the Texas Hornshell mussel has experienced tremendous increases in salinity as a result of agricultural returns to the rivers. Salinity in particular is thought to limit Texas Hornshell distribution (Lang 2001). The habitat requirements found in the Black River study area consist of crevices under travertine shelves and boulders where soft sediment gathers (Carman, S.M. 2007). This area has the essential water quality and quantity that is a prime element of Texas Hornshell habitat. On May 11, 2004, USFWS was petitioned to list the Texas Hornshell Mussel on the Candidate list as a Federally Endangered Species.

Gypsum Wild Buckwheat

Gypsum Wild Buckwheat (Eriogonum gypsophilum) is a rare species of wild buckwheat. It is endemic to the state of New Mexico, where it is known from only three sites in Eddy County, the Seven River Hills, the Black River, and Ben Slaughter Draw, a small, sloping valley. A very recent population was also discovered on the North Fork of Hay Hollow. It is limited to a specific type of soil which is high in gypsum. The plant only grows on gypsum substrates, including outcrops of gypsum rock and areas with gypsum soils. There are few other plants in this barren, rocky habitat, except for other gypsophiles. The surrounding habitat includes creosote shrub. The plant has been federally listed as a threatened species of the United States since 1981. This plant is a perennial herb which usually reproduces vegetatively, by producing new stems from its rhizome, in effect cloning itself. Sometimes it reproduces sexually by making seed, however, the habitat and climate where it grows is often unsuitable for germination. Because many plants are clones rather than separate genetic individuals it is difficult to estimate the true number of plants existing. This wild buckwheat species produces erect stems up to 20 centimeters tall and bearing inflorescences of many tiny bright yellow flowers in headlike clusters or cymes. The base of the plant is surrounded by a mat of green leaves growing on the branching caudex.

This member of the knotweed family is a small, erect, herbaceous perennial, which measures about 8 inches high. It is a perennial herb with a branching flower stalk arising from a cluster of basal leaves (USFWS 1984). Gypsum wild-buckwheat grows in gypsum soils under semiarid conditions. On January 19th 1981, gypsum wild-buckwheat was designated as threatened with critical habitat (USFWS 1984).

Gypsum wild-buckwheat has a distribution that is limited to only Eddy County, New Mexico. It is only known to occur in four locations: Seven Rivers Hills, Black River south, Ben Slaughter Draw, and North Fork Hay Hollow. BLM-administered land in the Seven Rivers Hills area has been designated as critical habitat for the species

Black River- The habitat is composed of exposed gypsum bedrock, with the majority of the habitat being composed of gentle slopes where gypsum has eroded away to form an unconsolidated soil float. Plant populations occur as discontinuous patches along small-scale head slopes, nose slopes, and side slopes of eroded gypsum features in the valley wall. Erosional down cutting exposes the underlying gypsum, creating areas of weathered gypsum that appear to be the preferred habitat for the species. Occupied habitat is composed of the following: creosote bush *(Larrea Cav.)*, honey mesquite *(Prosopis glandulosa)*, hairy crinklemat *(Tiquilia hispidissima)*, stickleaf *(Mentzelia humilis)*, gypsum ringstem *(Anulocaulis leiosolenus)*, hartweg's sundrops *(Calylopphus hartwegii)*, soaptree yucca *(Yucca elata)*, and tobosagrass *(Hilaria mutica)*.

Ben Slaughter Draw - The habitat is composed of unconsolidated gypsum material overlying gypsum bedrock, which is exposed along the edge of the watercourse, small secondary drainages, and in areas of higher relief, where plants vary dramatically in abundance. The population occupies the erosional zone below the crest of the escarpment of the drainage channel.
Occupied habitat is present on the north and south valley walls aligning Ben Slaughter. Occupied habitat is composed of the following: honey mesquite *(Prosopis glandulosa)*, creosote bush *(Larrea Cav.)*, and viscid acacia *(Acacia neovernicosa)*. Gypsum wild buckwheat in this area is generally associated with hairy crinklemat *(Tiquilia hispidissima)*, gypsum grama *(Bouteloua breviseta Vasey)*, and stickleaf *(Mentzelia humilis)*. Gypsum ringstem *(Anulocaulis leiosolenus)*, hartweg's sundrops *(Calylopphus hartwegii)*, gypsum phacelia (*Phacelia integrifolia)*, and frosted mint *(Poliomintha incana).*

3.7.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Texas Hornshell Mussel

Since this area of the project will have setbacks and buffers to the Black river, itself, there will be no direct impact of the Texas Hornshell Mussel. Crossings of the Black River will only be at established crossings and no vehicles or equipment will come within close proximity of the river system. Monitors will be with the seismic crews when they approach the Black River and will not only monitor the river, but also the Texas Hornshell Mussel.

Gypsum Wild Buckwheat

The Gypsum Wild Buckwheat is found on an area of land measuring less than 250 acres. Much of the plants habitat is protected within the bounds of the Bureau of Land Management oversight. In addition, the BLM will manage this land through the year 2028, even if the plant loses federal protection. The main threat to the species is habitat destruction during gypsum mining and oil and gas exploration, but this is prevented in BLM territory. There was only one population of the plant known in 1981 when it was federally listed; the other three have been discovered since, increasing the known abundance. Because of good management practices on the part of the BLM, in 2007, this factor, plus the lack of threats to the species as long as BLM protection is in place, led the United States Fish and Wildlife Service (USFWS) to suggest the species be delisted, or removed from the endangered species list. As discussed with Bureau of Land Management wildlife specialists, the known populations of Gypsum Wild Buckwheat that is within the project area will be avoided. There will be a 200 meter buffer around the known populations. There is to be no vehicle or foot traffic within the buffer zone, established by the BLM. There will also be a third party contract biologist on-site, to insure there is no access within the buffer zone and to advice on new populations that are unknown.

Mitigation Measures and Residual Impacts

Texas Hornshell Mussel

Black River will be buffered by 200 meters. Within this buffer there is to be no seismic activities, including equipment and vehicles.

Third Party Wildlife Monitors will be on site and with the seismic crews during the time that they are near the Black River Area.

Black River will only be crossed at established crossings.

See Mitigations Measures (Appendix C)

Gypsum Wild Buckwheat

Third party contract wildlife monitor will be on site when the seismic crews are in the areas of the areas of the Gypsum Wild Buckwheat.

No access will be allowed within the 200 meter buffer.

Within the area of the Gypsum Wild Buckwheat there is to be no vehicle traffic and no foot traffic

See Mitigations Measures (Appendix C)

3.8. Riparian

3.8.1. Affected Environment

Riparian areas are located adjacent to rivers, creeks, lakes, springs, and wetlands. They are a transition zone between the upland and aquatic ecosystems. The increased moisture found in these areas produces unique plant communities that differ noticeably from surrounding range land. A properly functioning riparian/wetlands system has the ability to perform the following: to purify water by removing sediments and other contaminants, lessen excessive erosion, carbon sequestration, diminish the impacts of floods, preserve perennial stream flow, recharge ground water, provide corridors for flora and fauna, provide critical habitat for birds, wildlife, fish, and other aquatic organisms, and produce abundant, high quality forage for wildlife. The water of riparian areas makes them different from the adjacent terrestrial uplands. Water bodies can be natural such as streams, rivers, or lakes or they can be man-made such as ditches, canals, ponds, or reservoirs. When riparian areas are part of a system with flowing water, such as streams or rivers, they are called lotic systems. In contrast, if the water in the system is stationary or moves only slowly without wind or at a spillway, such as lakes, ponds or seeps, the riparian area is referred to as a lentic system.

3.8.2. Impacts from the Proposed Action

Direct and Indirect Impacts

The BLM uses Proper Functioning Condition (PFC), a qualitative method for assessing the condition of riparian areas and wetlands. PFC refers to both the assessment process and the on-the-ground condition of riparian areas and wetlands. The assessment process consists of an approach that considers the hydrology, vegetation, and erosion/deposition attributes of the area. The on-the-ground condition refers to how well the physical processes are functioning. This condition is a state of resiliency that allows a riparian area or wetland to hold together during high-flow events with a high degree of reliability. This resiliency allows an area to then produce desired values over time, including fish habitat, Neotropical bird habitat or forage. Riparian areas and wetlands that are not functioning properly cannot sustain these values. Black River will have a 200 foot setback and buffers along the river banks. The river will only be crossed on established roads and bridges.

Mitigation Measures and Residual Impacts

Black River will have 200 meter set back along the river banks.

The river will only be crossed on established roads and bridges.

See Mitigations Measures (Appendix C)

3.9. Noxious Weeds and Invasive Plants

3.9.1. Affected Environment

There are four plant species within the CFO that are identified in the New Mexico Noxious Weed List Noxious Weed Management Act of 1998. These species are African rue, Malta starthistle, Russian olive, and salt cedar. African rue and Malta starthistle populations have been identified throughout the Carlsbad Field Office and mainly occur along the shoulders of highway, state and county roads, lease roads and well pads (especially abandoned well pads). The CFO has an active noxious weed monitoring and treatment program, and partners with county, state and federal agencies and industry to treat infested areas with chemical and monitor the counties for new infestations.

There are populations of malta star thistle and African rue that have been treated within the project area. A weed risk assessment was performed on the project area by BLM range specialists and a compensatory amount was issued to the Eddy County Soil and Water Conservation District for use in treating and preventing noxious weeds in the area.

3.9.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Any surface disturbance could increase the possibility of establishment of new populations of invasive, non-native species. The construction of the proposed action may contribute to the establishment and spread of African rue and Malta starthistle. The main mechanism for seed dispersion would be by equipment and vehicles that were previously used and/or driven across noxious weed infested areas. Noxious weed seed could be carried to and from the project area by construction equipment and transport vehicles.

Mitigation Measures and Residual Impacts

Dawson Geophysical Company shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the area of the seismic operation, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

There will be a designated noxious weed wash at the staging area. The staging area will be in Fred Beard's private caliche pit.

All project vehicles will be washed prior to entering the project area and before leaving the Carlsbad area to avoid the spread of noxious weeds. The proponent will remain responsible for any infestation that are proven to occur as a result of the project.

3.10. Cultural and Historical Resources

3.10.1. Affected Environment

The project falls within the Southeastern New Mexico Archaeological Region. This region contains the following cultural/temporal periods: Paleoindian (ca. 11,500 – 7,000 B.C.), Archaic (ca. 6,000 B.C. – A.D. 500), Ceramic (ca. A.D. 500 – 1400), Post Formative Native American (ca. A.D. 1400 – present), and Historic Euro-American (ca. A.D. 1865 to present). Sites representing any or all of these periods are known to occur within the region. A more complete discussion can be found in The Human Landscape in Southeastern New Mexico: A Class I Overview of Cultural Resources within the Bureau of Land Management's Carlsbad Field Office Region, published in 2012 by SWCA Environmental Consultants.

Native American Religious Concerns

The BLM conducts Native American consultation regarding Traditional Cultural Places (TCP) and Sacred Sites during land-use planning and its associated environmental impact review. In addition, during the oil & gas lease sale process, Native American consultation is conducted to identify TCPs and sacred sites whose management, preservation, or use would be incompatible with oil and gas or other land-use authorizations. With regard to Traditional Cultural Properties, the BLM has very little knowledge of tribal sacred or traditional use sites, and these sites may not be apparent to archaeologists performing surveys in advance of drilling.

3.10.2. Impacts from the Proposed Action

Direct and Indirect Effects

Cultural resources on public lands, including archaeological sites and historic properties, are protected by federal law and regulations (Section 106 of the National Historic Preservation Act and the National Environmental Policy Act). Class III cultural surveys will be conducted of the area of effect for realty or oil and gas projects proposed on these lands prior to the approval of any ground disturbing activities to identify any resources eligible for listing on the National Register of Historic Places. Not all artifacts are avoided. Artifacts not associated with an archaeological site, also known as isolated manifestation, isolated occurrences, or isolated finds, are not considered eligible for listing to the National Register of Historic Places and are not avoided prior to construction of the proposed project. If unanticipated or previously unknown cultural resources are discovered at any time during construction, all construction activities shall halt and the BLM authorized officer will be immediately notified. Work shall not resume until a Notice to Proceed is issued by the BLM. All known archaeological sites will be checked for accuracy and flagged for avoidance.

Certain unimproved access routes may be utilized without prior archaeological survey if agreed upon in advance with the BLM Cultural Resources Staff or their designated representative. All identified cultural resources should be avoided by project-related activities. Source lines will be moved a minimum of 100 feet beyond known archaeological site boundaries. Receiver lines will be left in place with no vehicular traffic allowed through the site. Only pedestrian traffic is allowed within archaeological site boundaries unless stipulated otherwise. If avoidance were not feasible, geophysical activities would not be authorized until mitigating measures are developed and implemented and any necessary consultation is completed. Archaeological monitors may be required in some areas. It should be noted that this project will be done “flagless”, although small lathes will be at each known archaeological site and then the lathe will be picked up immediately after the work is performed. Archaeology sites were identified; the proposed source points were removed from within the archaeological sites. A reroute was conducted around the archaeological sites where the alternative source points may be located.

Mitigation Measures and Residual Impacts

If unanticipated or previously unknown cultural resources are discovered at any time during the project activities, all project activities shall halt and the BLM authorized officer will be immediately notified. Work shall not resume until a Notice to Proceed is issued by the BLM.

All known archaeological sites will be checked for accuracy and flagged for avoidance.

All identified cultural resources will be avoided by project-related activities.

Source lines will be moved a minimum of 100 feet beyond known archaeological site boundaries. Receiver lines will be left in place with no vehicular traffic allowed through the site.

Only pedestrian traffic is allowed within archaeological site boundaries unless stipulated otherwise.

If avoidance were not feasible, geophysical activities would not be authorized until mitigating measures are developed and implemented and any necessary consultation is completed.

Archaeological monitors will be required in some areas.

All personnel working on the Delaware Basin 4A west 3D project shall be informed that cultural sites are to be avoided by all personnel, personal vehicles, and company equipment. They shall also be notified that it is illegal to collect, damage, or disturb cultural resources.

See Mitigations Measures (Appendix C)

3.11. Paleontology

3.11.1. Affected Environment

Paleontological resources are any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth. Fossil remains may include bones, teeth, tracks, shells, leaves, imprints, and wood.

Paleontological resources include not only the actual fossils but also the geological deposits that contain them and are recognized as nonrenewable scientific resources protected by federal statutes and policies.

The primary federal legislation for the protection and conservation of paleontological resources occurring on federally administered lands are the Paleontological Resources Preservation Act of 2009 (PRPA), the Federal Land Policy and Management Act of 1976 (FLPMA), and the National Environmental Policy Act of 1970 (NEPA). BLM has also developed policy guidelines for addressing potential impacts to paleontological resources (BLM, 1998a,b; 2008, 2009). In addition, paleontological resources on state trust lands are protected by state policy from unauthorized appropriation, damage, removal, or use.

The Potential Fossil Yield Classification (PFYC) is a tool that allows the BLM to predict the likelihood of a geologic unit to contain paleontological resources. The PFYC is based on a numeric system of 1-5, with PFYC 1 having little likelihood of containing paleontological resources, whereas a PFYC 5 value is a geologic unit that is known to contain abundant scientifically significant paleontological resources. The fossil resources of concern in this area are the remains of vertebrates, which include species of fish, amphibians, and mammals.

3.11.2. Impacts from the Proposed Action Direct and Indirect Effects

Direct impacts would result in the immediate physical loss of scientifically significant fossils and their contextual data. Impacts indirectly associated with ground disturbance could subject fossils to damage or destruction from erosion, as well as creating improved access to the public and increased visibility, potentially resulting in unauthorized collection or vandalism.

However, not all impacts of construction are detrimental to paleontology. Ground disturbance can reveal significant fossils that would otherwise remain buried and unavailable for scientific study. In this manner, ground disturbance can result in beneficial impacts. Such fossils can be collected properly and curated into the museum collection of a qualified repository making them available for scientific study and education.

The location of the proposed project is within a PFYC 2. This has some likelihood of containing paleontological resources. A pedestrian survey for paleontological resources was not necessary and there should be no impacts to paleontological resources.

Mitigation Measures and Residual Impacts

See Mitigations Measures (Appendix C)

3.15. Cave/Karst Resources

3.15.1. Affected Environment

The Delaware Basin 4A West 3D is located within both gypsum and limestone karst terrain, landforms that are characterized by underground drainage through solutionally enlarged conduits. Gypsum karst terrain may contain sinkholes, sinking streams, caves, and springs and limestone karst terrain will also include lineaments. Sinkholes leading to underground drainages and voids are common. These karst features, as well as occasional fissures and discontinuities in the bedrock, provide the primary sources for rapid recharge of the groundwater aquifers of the region. Lineaments, linear or curvilinear surface features that indicate joints or fractures at depth which have reached the surface, may be present. In the Guadalupe Mountains, these features are often found in association with caves.

The BLM categorizes all areas within the Carlsbad Field Office as having either low, medium, high or critical cave potential based on geology, occurrence of known caves, density of karst features, and potential impacts to fresh water aquifers. Due to the size of the project and the area in which it is in, the project covers all three zones, critical karst, high karst, and medium karst zones. These zones are defined as: Critical Karst Resource Zone - Karst areas with a high density of significant cave systems and/or bedrock fractures and other karst features that lead to the rapid recharge of karst groundwater aquifers from surface runoff. These areas provide critical drinking water supplies for major communities, ranching operations, and springs that support rivers and vital riparian habitat.

These areas include the Capitan Reef and associated Capitan Aquifer west of the Pecos River as well as the surface outcropping of the Castile gypsum formation in southern Eddy County, High Karst Potential Occurence Zone – Areas in known soluble rock types that contain a high frequency of significant caves and karst features such as sinkholes, bedrock fractures that provide rapid recharge of karst aquifers, Medium Karst Potential Occurence Zone – Areas in known soluble rock types that exist at surface level or within 300 feet of the surface but may have a shallow insoluble overburden or soils that mask surface features. These areas may contain isolated karst features such as caves and sinkholes. Groundwater recharge may not be wholly dependent on karst features but the karst features still provide the most rapid aquifer recharge in response to surface runoff, and Low Karst Potential Occurrence Zone – Areas that do not have soluble bedrock within 300 feet of the surface. Occasional features, such as breccia pipes, may occur within these areas related to karst at depth. There may also be pseudo-karst features due to soil piping and other natural or manmade process that may present construction hazards but are not related to groundwater recharge.

Sinkholes and cave entrances collect water and can accumulate rich organic materials and soils. This, in conjunction with the stable microclimate near cave entrances, support a greater diversity and density of plant life which provides habitat for a greater diversity and density of wildlife such as raptors, rodents, mammals, and reptiles.

The interior of the caves support a large variety of troglobitic, or cave environment-dependent species. The troglobitic species have adapted specifically to the cave environment due to constant temperatures, constant high humidity, and total darkness. Some of the caves in the area contain bat colonies. Many of the caves in this area contain fragile cave formations known as speleothems.

Chosa Draw ACEC

Much of the gypsum karst lands are subject to rapid erosion. Sinks leading to underground drainages and cavernous voids are common. Cave passages and rooms exist very close to the surface and are subject to catastrophic collapse .Chosa Draw is home to the second largest cave system in the United States, Parks Ranch Cave System, and is also a major contributor to groundwater recharge through its 21 discrete entrances. Chosa Draw is also known as a xeric-riparian community, which means a “dry” riparian area. They differ from classic riparian habitats in other, more mesic areas because of the environment in which they exist.

Guadalupe Escarpment Scenic Area

This area is also in a critical cave/karst area signified by a high density of significant cave systems and/or bedrock fractures and other karst features that lead to the rapid recharge of karst groundwater aquifers from surface runoff. These areas provide critical drinking water supplies for major communities, ranching operations, and springs that support rivers and vital riparian habitat.

3.15.2. Impacts from the Proposed Action

Direct and Indirect Effects

A possibility exists for slow subsidence or sudden collapse of a sinkhole, cave passage, or void during seismic operations, with associated risks to operators, equipment, and potential for increased negative environmental impact. Opening a new entrance into a cave system can change air flow patterns, temperatures, insurgencies, mineral development, and biological community and may cause other undetermined effects on the cave ecosystem. These subsidence processes can be triggered or enhanced by intense vibrations from construction or rerouting or focusing of surface drainages.

Roads and road drainage turnouts, two track roads, and trails can direct or funnel runoff water into cave entrances or sinkholes. Contaminates from spills and general road runoff (such as oil and other petroleum products, salt water, and other debris) can be transported directly into the cave systems causing negative effects on the cave environment and ecosystem. Because cave ecosystems are extremely fragile and easily disturbed, the negative effects to the cave's biological components may include disruption of some of its species. Because karst terrains and cave systems are directly and integrally linked to groundwater recharge, contaminates spilled on roads in these areas may lead directly to groundwater contamination.

Buildup of toxic or combustible fumes in caves and cave entrances from spills on roadways may harm wildlife and cave visitors and, in extreme cases, lead to asphyxiation or rapid ignition in the rare event that the fumes are ignited by visitors.

Survey mapping of these cave entrances, sink holes, and water recharge areas have been identified and buffered to keep vehicles and personnel away from them.

Chosa Draw ACEC

Sinkholes and cave entrances provide unique habitat for flora and fauna. Due to the nature of caves these areas maintain a more stable yearly temperature, cooler in the summer and warmer in the winter. The natural exchange of moist cave air with the surface in combination with the accumulation of water and richer soils in sinkhole entrances creates a special microclimate. Xeric riparian areas are ecotones, or interfaces with aquatic and terrestrial systems where components of each system overlap. The arid characteristics of the Chihuahuan desert overlap into a riparian area, and bestows its arid characteristics on that area.

Guadalupe Escarpment Scenic Area

Within the project boundary that is within the Guadalupe Escarpment Scenic Area it has been proposed to use Heliport helidrills as the source to acquire data, since this area is a VRM class III, High-Critical Cave/karst, and fragile soils, and because many of the caves and cave passages within this area are quite shallow. The helidrills will be placed in the area with a helicopter, drill a hole for the source, and be picked up by the helicopter and moved to the next source point. In this area the source points will be 330 feet apart, instead of the 165 feet apart for the vibroseis machines. The hole would have a depth of 60 feet with a 5 lb. charge loaded in it. If this cannot be obtained a 30 ft. hole and 2.5 lb. charge will be used. A cave/Karst monitor will be with helidrill crew and will monitor where the drill holes will be. If a bit drop occurs, the bit will be withdrawn and a 50 ft. move will be done. This will need to stay within the area cleared for archaeology, or another archaeological clearance will need to be obtained.

The drill hole will be packed with natural cutting and after the project is complete in that area, the holes will be checked and if they need to be filled; only natural cutting will be used. In this area vehicles will only be used on existing roads and two tracks and only foot traffic. No off road driving in this area will be used. A 5 lb. charge set 60 ft. deep or shallower could cause irreplaceable damage to these shallow caves and cave passages, this is why the cave/karst monitor will accompany the helidrill crew. All drill holes will be GPS'd and if a bit drop (void) is encountered, the BLM will be notified immediately and a drill hole move will be exercised with the instruction of the cave/karst monitor. The hole may be required to be plugged after BLM inspection. Most of this area within the Guadalupe Escarpment Scenic Area has been removed or cut out of the proposed project. There are only a few areas along the east side of Highway 62/180,that have been cleared by the BLM Cave/Karst specialist, that Helidrills will be used.

Mitigation Measures and Residual Impacts

Ground surveys are conducted prior to vehicle travel through the area. All karst features are identified by the surveyors and placed into GIS. A 200 foot exclusion area buffer is applied to each karst feature, including known passageways. No vehicle travel will be allowed within these buffers.

In the event that any underground voids are opened up during project activities, the BLM will be notified immediately. Any passages opened up may need to be surveyed to determine safe surface routes to proceed.

Chosa Draw ACEC

Designate OHV to designated roads. Vehicle use only on roads, two-tracks and trails.

No off road vibroseis machines. Shake on roads, two tracks, or trails in this area.

Walk only in this area off road.

Guadalupe Escarpment Scenic Area

A Cave/Karst Monitor will accompany the Helidrill crew and monitor bit drops and cave/karst concerns.

Natural cuttings will be used to pack the hole before and after the data is collected.

If a bit drop occurs, a void is encountered, it will be GPS'd, and that data will be given to the BLM. Upon BLM inspection, the hole may be required to be plugged.

See Mitigations Measures (Appendix C)

3.16 Visual Resource Management

3.16.1. Affected Environment

The Visual Resource Management (VRM) program identifies visual values, establishes objectives in the RMP for managing those values, and provides a means to evaluate proposed projects to ensure that visual management objectives are met.

The entire west side of the project area occurs within the Guadalupe Escarpment Scenic Area and is a highly sensitive visual area because it is the immediate visual foreground as viewed from several key observation points along U.S. Highway 62/180. The Guadalupe Escarpment scenic area is categorized as a Visual Resource Management Class III zone. The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape can be moderate. These management activities may attract attention, but should not dominate the view of the casual observer.

The rest of the project area that is outside the Guadalupe Escarpment Scenic area is a Visual Resource Management Class IV zone. The objective of VRM Class IV is to provide management for activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic landscape elements of color, form, line and texture.

3.16.3. Impacts from the Proposed Action

Direct and Indirect Effects

This project will cause some short term and long-term visual impacts to the natural landscape. Short term impacts occur during construction operations. These include the presence of construction equipment vehicle traffic.

Long term impacts are visible to the casual observer through the life of the seismic project. These include the visual evidence of vehicle tracks which cause visible contrast to form, line, color, and texture. Those contrasts will be visible to visitors in the area when viewed during the project or recently afterwards. Once rains come into the area and vegetation grows back, these tracks will disappear.

After completion of the seismic project, “Not A Road” signs will be placed throughout the project area on tracks that are visible and easily attained by the public, so as to keep traffic off of these areas until they have time to revegetate. At the request of the Authorized Officer, at the completion of the project, it may be necessary to reseed certain areas, to help re growth, thereby eliminating visual impacts.

Short and long term impacts are minimized by best management practices such as utilizing existing surface disturbance, no blading, no fence cutting, and the use of different type tire tread, terrain dependent.

Guadalupe Escarpment Scenic Area

Within the project boundary that is within the Guadalupe Escarpment Scenic Area it has been proposed to use Heliport helidrills as the source to acquire data, since this area is a VRM class III, High-Critical Cave/karst, and fragile soils. The helidrills will be placed in the area with a helicopter, drill a hole for the source, and be picked up by the helicopter and moved to the next source point. In this area the source points will be 330 feet apart, instead of the 165 feet apart for the vibroseis machines. The hole would have a depth of 60 feet with a 5 lb. charge loaded in it. If this cannot be obtained a 30 ft. hole and 2.5 lb. charge will be used. A cave/Karst monitor will be with helidrill crew and will monitor where the drill holes will be. If a bit drop of 3 ft. occurs, the bit will be withdrawn and a 50 ft. move will be done. This will need to stay within the area cleared for archaeology, or another archaeological clearance will need to be obtained. The drill hole will be packed with natural cutting and after the project is complete in that area, the holes will be checked and if they need to be filled; only natural cutting will be used. In this area vehicles will only be used on existing roads and two tracks and only foot traffic. No off road driving in this area will be used. Most of this area within the Guadalupe Escarpment Scenic Area has been removed or cut out of the proposed project. There are only a few areas along the east side of Highway 62/180,that have been cleared by the BLM Cave/Karst specialist, that Helidrills will be used.

Mitigation Measures and Residual Impacts

After completion of the seismic project, “Not A Road” signs will be placed throughout the project area on tracks that are visible and easily attained by the public, so as to keep traffic off of these areas until they have time to revegetate. At the request of the authorized officer, at the completion of the project, it may be necessary to reseed certain areas, to help re-growth, thereby eliminating visual impacts.

The applicant is required to cross roads from an angle other than 90 degrees (Dogleg) to minimize detection or tire tracks left by seismic vehicles.

A Cave/Karst Monitor will accompany the Helidrill crew and monitor bit drops and cave/karst concerns.

Natural cuttings will be used to pack the hole before and after the data is collected.

If a bit drop occurs, a void is encountered, it will be GPS'd, and that data will be given to the BLM. Upon BLM inspection, the hole may be required to be plugged.

See Mitigations Measures (Appendix C)

3.17. Water Resources

3.17.1. Affected Environment

The area of the proposed action drains in a southeastern direction from mountains to the west, flowing towards the Black river and several draws and springs, finally ending up within the Hay Hollow Area. Stream flow occurs in and around Black River, Blue Spring, Cottonwood Spring, Ben Slaughter Draw, and Hay Hollow during times of heavy rain, and it is likely a source of groundwater recharge. The ground water recharge is from local precipitation entering through playas, sinkholes and swallets. Water quality and quantity is influenced by physical, chemical, and biological reactions that occur as water moves over and through the land surface toward streams and into aquifers. The rate at which water moves through the watershed strongly affects these reactions.

3.17.2. Impacts from the Proposed Action

Direct and Indirect Effects

Ephemeral surface water from local rain events will wash down-slope through the area of the proposed action. Localized decreases in vegetative surface cover could result in decreased infiltration rates and increased runoff volume and velocity. This causes increased erosion, top soil loss, and sedimentation. Water quality can be adversely affected following the occurrence of an undesirable event such as a leak or spill.

Standard practices or design features of the proposed project that minimize impacts to the watershed and water quality include: vehicle travel on perennial streams, ponds, and riparian areas will utilize existing roads or designated crossing areas, no wetland/riparian vegetation would be removed during the placement of geophones, utilizing existing surface disturbance, minimizing vehicular use, and reclaiming the areas not necessary for production and quickly reestablishing vegetation on the reclaimed areas.

Blue Spring ACEC and Cottonwood Spring are within the project area. Blue Spring is predominately private land but has some BLM lands so it is managed by the BLM prescriptions and is the largest spring in the area. Cottonwood Spring is a spring system that is in Cottonwood Draw. Approximately 5 acres is fenced off around the spring itself and all springs are buffered by 200 meters. In the area of the springs all traffic is limited to roads and trails outside of the 200 meter buffer. The 200 meter buffer will keep all vehicle and equipment away from the springs and away from the banks or steep edges of the spring system. Foot traffic only will be allowed around the spring systems

Mitigation Measures and Residual Impacts

There will be a 200 meter buffer on all springs. Cottonwood Spring is fenced off, but only foot traffic within the fenced in area.

Steep slopes will be adhered to with the 200 meter buffer.

See Mitigations Measures (Appendix C)

3.18. Human Health and Safety

3.18.1. Affected Environment

The project area, while rural, is located south of Carlsbad, NM and the white City, NM area and includes some residential areas and ranch houses along with heavily travelled lease roads, county roads, and highways. The primary users of rural roads in the area are those working in the oil and gas industry, the ranching community, and the general public. Heavy traffic consists of passenger vehicles as well as tractor trailer trucks and heavy machinery. One developed BLM recreational area, Black River Recreational Area, occurs within the project area. This area along with hunting, fishing, hiking, and camping in the entire project area receive regular recreational uses.

3.18.2. Impacts from the Proposed Action

Direct and Indirect Effects

Impacts of the proposed project on human health and safety are largely related to vehicle travel. Due to the grid pattern characteristics of 3D geophysical work, Dawson will be crossing many heavily travelled roads several times a day with heavy machinery and other vehicles. This increases the likelihood of collisions between the project vehicles and other vehicles.

Mitigation Measures and Residual Impacts

To reduce the likelihood of vehicle collisions and accidents, Dawson Geophysical Company will use flagmen and signage when working in the vicinity of any improved road or highway.

When moving heavy machinery on roads, Dawson Geophysical Company will use vehicle escorts to accompany the equipment convoy.

See Mitigations Measures (Appendix C)

3.18. Special Designations Nominated ACEC

3.18.1. Affected Environment

Within the boundary of the proposed project are three nominated Areas of Critical Environmental Concern (ACEC). ACEC designations highlight areas where special management attention is needed to protect, and prevent irreparable damage to relevant and important values. The ACEC designation indicates to the public that the BLM recognizes that an area has significant values and has established special management to protect those values. The three Areas of Critical Environmental Concern are listed below along with a description of the individual area, resources involved, and the specific relevant and important values associated with each.

Carlsbad Chihuahuan Desert Rivers ACEC

The proposed project that is within the Chihuahuan Desert Rivers ACEC boundary is the southwest corner of T. 26S., R. 24E., east of highway 62/180, all of T26S., R. 25E., excluding the northwest corner, southwest corner of T25S., R. 25E., and sections 27 through 30 of T. 25S., R. 26E. The project falls within the cultural, scenic, karst, soils, and wildlife resources, for special status plants. The specific resources and associated relevance and important values that are within the project boundary are cultural values which contain prehistoric archaeological sites and areas of traditional cultural importance to Native American tribes. The archaeological sites are characterized by chipped stone and ceramic artifacts, bedrock mortars, thermal features, and small stone enclosures. The importance of the cultural values is that it exhibits qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. Portions of the Pecos, Black, and Delaware Rivers provide unique scenic values that are enhanced by topographic and riparian diversity not commonly found in the planning area. Unique soils, geology, and hydrogeological processes give the Black River an aqua blue color that is not seen elsewhere in southeastern New Mexico.

For fish or wildlife resources there are several species within the nominated ACEC that are either Threatened, Endangered, or considered to be Species of Concern by either the BLM or State of New Mexico. Some of these include Allthorn, Texas Hornshell Mussel, Bigscale Logperch, Gray Redhorse Minnow, Blue Sucker, Mexican Tetra, Roundnose Minnow, Headwater Catfish, Pecos Pupfish, Barking Frog, Western River Cooter, Plainbelly Watersnake, Bald Eagle, Ferruginous Hawk, Peregrine Falcon, Yellow-billed Cuckoo, and Bell's Vireo. A single Cave Swallow colony on the edge of the area was the first recorded lowland, non-cave site in southeastern New Mexico. In dry climates with little rainfall, desert rivers are used as breeding, feeding, and sheltering grounds for most of the species that exist near them. These rivers are significant stops along the seasonal migratory path of birds. The importance of this resource is that it has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. This nominated ACEC contains hydrologically important gypsum karst. It has significant caves, sinking streams, springs, and numerous sinkholes. The area is sensitive to soil erosion and surface disturbing activities. The cave resources provide recreational opportunities as well as habitat for cave-adapted animal species and point sources for groundwater recharge. The southern gypsum escarpment area contains several hundred caves and other karst features. Parks Ranch Cave falls within the nominated ACEC. At 4.2 miles in length, Parks Ranch Cave is the longest gypsum cave on federal lands in the United States. Parks Ranch Cave is also the most visited cave within the planning area. The importance of this resource is that it has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource. It also has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. Riparian areas in New Mexico, especially those in the Chihuahuan Desert, are some of the more biologically rich areas in temperate regions. Most of the organisms on the New Mexico list of threatened and endangered species are either riparian dependent or are high users of riparian areas. Riparian areas in the nominated ACEC include the Delaware, Pecos, and Black Rivers.

The importance of the riparian areas is that they have more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource. They also have qualities or circumstances that make them fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened or vulnerable to adverse change. The soils resources are of particular interest because this area is an excellent representative of the uniquely exposed castile formations within the Chihuahuan Desert ecosystem. Most of the area consists of bare, steep slopes and deep eroded arroyos covered by microbiotic soil crusts, a rare and very fragile soil cover. Microbiotic soil crust is a highly specialized community of mosses, lichen, and cyanobacteria. In addition to covering the surface of the soil, it also serves to break down rock material, absorb water, slow soil erosion, and provide an environment in which other plants germinate. Microbiotic soils are extremely fragile. While found across the proposed ACEC, this soil type is best demonstrated in the western portion of the old Yeso Hills Research Natural Area. The importance of this resource is that it has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. Special Status Plants are within this nominated ACEC and proposed poject boundary. This area contains Gypsum Wild Buckwheat, a federally listed threatened species. The area also contains three species of concern; Gypsum Milkvetch, Gypsogenus Ringstem, and the Yeso Hills Linum. All of these species are found on gypsum soils and are sensitive to loss or alteration of the habitat. This is especially important because this soil type as it is slow to recover and reclamation efforts are often less than ideally successful. The importance of the special status plants is that it has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. There are also natural hazards that exist throughout the area. All undeveloped caves contain some hazards including total darkness, loose rocks, low ceilings, low, tight passages, slippery surfaces, and unstable and uneven floors. In addition, several of the caves in the Chosa Draw area contain steep pit entrances posing a hazard to surface users. These areas are also subject to sudden surface collapse which can be triggered by surface use or by natural processes. Gypsum caves are subject to flash flooding, creating a drowning hazard to cave visitors. Harmful water borne bacteria is also present in some gypsum caves. The importance of the natural hazards is that they pose a significant threat to human life and safety or to property.

Gypsum Soils ACEC

The proposed project that falls within the Gypsum Soils ACEC is all of T. 26S., R. 25E., a very small portion of the southeast corner of T. 25S., R. 25E., a small portion in the southwest and north central part of T. 25S., R. 26E., and finally a small portion in the southeast portion of T 24S., R. 26E. This ACEC is almost entirely encompassed within the Chihuahuan Desert Rivers ACEC that was previously described. The significant resources that are established with the nominated ACEC are Cultural, Scenic, Karst, Soils, and Special Status Plants. The relevance of the cultural value is that it is an area that contains prehistoric archaeological sites and areas of traditional cultural importance to Native American tribes. Archaeological sites have been recorded within the area and archaeological surveys have been conducted on the area of concern. The archaeological sites are characterized by chipped stone and ceramic artifacts, bedrock mortars, thermal features, and small stone enclosures. The importance of the cultural value within this ACEC is that it exhibits qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. The relevance of the scenic value, although it is south of the Black River, is enhanced by topographic and riparian diversity not commonly found in the planning area. Riparian landscapes display dramatic transitions from stark, white gypsum soils and sparse vegetated sandy flats to rolling hills and deep drainages. The Guadalupe escarpment provides a dramatic background with sheer, rugged peaks that extend 2,000 feet above the desert floor. As it extends off of the peaks and into the flats, it is referred to as the Guadalupe Scenic Byway. The Guadalupe Scenic Byway is the portion that is involved in the gypsum soils ACEC. The importance of the scenic value is that it exhibits more than locally significant which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource. It also has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. The relevance of karst resources within this nominated ACEC is that it contains hydrologically important gypsum karst. It has significant caves, sinking streams, springs, and numerous sinkholes.

The area is sensitive to soil erosion and surface disturbing activities. The cave resources provide recreational opportunities as well as habitat for cave-adapted animal species and point sources for groundwater recharge. The southern gypsum escarpment area contains several hundred caves and other karst features. Park Ranch Cave falls within the nominated ACEC. At 4.2 miles in length, Parks Ranch Cave is the longest gypsum cave on federal lands in the United States. Parks Ranch Cave is also the most visited cave within the planning area. The importance of karst resources within this ACEC is that it has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause of concern, especially compared to any similar resource. It also exhibits qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. The relevance of the soils value within this ACEC is that it is an excellent representative of the uniquely exposed Castile formation within the Chihuahuan Desert ecosystem. Most of the area consists of bare steeo slopes and deep eroded arroyos covered by microbiotic soil crusts, a rare and very fragile soil cover. Microbiotic soil crust is a highly specialized community of mosses, lichen, and cyanobacteria. In addition to covering the surface of the soil, it also serves to break down rock material, absorb water, slow soil erosion and provide an environment in which other plants germinate. Microbiotic soil crusts are extremely fragile. While found across the proposed ACEC, this soil type is best demonstrated in the western portion of the area, the old Yeso Hills Research Natural Area. The importance of the soils value in this ACEC in this area is that it has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. The relevance of the Special Status Plants value is because this area contains Gypsum Wild Buckwheat, a federally threatened species. The area also contains three species of concern; Gypsum Milkvetch, Gypsogenus Ringstem, and the Yeso Hills Linum. All of these species are found on gypsum soils and are sensitive to loss or alteration of habitat. This especially important because this soil type as it is slow to recover and reclamation efforts are often less than ideally successful. The importance of the special status plants value in this ACEC is that it has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. The relevance of the natural hazards is that all undeveloped caves contain some hazards including total darkness, loose rocks, low ceilings, low tight passages, slippery surfaces, and unstable and uneven floors.

In addition, several of the caves in the Chosa Draw areas contain steep pit entrances posing a hazard to surface users. These areas are also subject to sudden surface collapse which can be triggered by surface use or by natural processes. Gypsum caves are subject to flash flooding, creating a drowning hazard to cave visitors. Harmful water borne bacteria is also present in some gypsum caves. The importance of natural hazards is that it poses a significant threat to human life and safety or to property.

Cave Resources ACEC

Within this ACEC are several known and significant caves. The one of importance and that is in the boundary of the proposed project is Chosa Draw Caves. It is in the southern half of T. 25S., R. 25E., and of this part, the portion of the boundary that is east of highway 62/180 is in the proposed project. The relevance of Chosa Draw Caves is that several hundred gypsum caves are located within the nominated ACEC. Parks Ranch Cave is the longest at 4.2 miles in length. The cave contains 21 known entrances and is the most visited cave in the planning area. It is also the longest gypsum cave on federal lands in the United States and is the second longest gypsum cave in North America. Generally, overland water flow enters cave and karst features, travelling for several miles in some cases, and is discharged back to the surface in Chosa Draw resulting in sensitive riparian areas in an otherwise dry desert environment. Documentation of karst features in the Chosa Draw area has shown that it is the most dense karst terrain in terms of features per area in the United States. The importance of Chosa Draw Caves is that it has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause of concern, especially compared to any similar resource. It also exhibits qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. The relevance of natural hazards is that all undeveloped caves contain some hazards including total darkness, loose rocks, low ceilings, low tight passages, slippery surfaces, and unstable, uneven floors. In addition, several of the caves in the Chosa Draw area contain steep pit entrances posing a hazard to surface users. These areas are also subject to sudden surface collapse which can be triggered by surface use or by natural processes.

Gypsum caves are subject to flash flooding, creating a drowning hazard to cave visitors. Harmful water borne bacteria is also present in some gypsum caves. The importance of natural hazards is that it has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.

3.18.2. Impacts from the Proposed Action

Direct and Indirect Effects

Carlsbad Chihuahuan Desert Rivers ACEC

For impact analysis of the proposed project on cultural values see the cultural section, 3.13.1. The entire area has been archaeologically cleared by a contract archaeologist. The source and receiver lines have been cleared 100 ft. wide, and if archaeology has been observed, the lines have been re-routed and re surveyed. Receiver lines only can be laid through archaeological sites and only foot traffic will be allowed, no vehicular traffic in archaeological sites.

For impact analysis of the proposed project on scenic values see the Soils section 3.4.2 Vegetation section, 3.5.1, Federally Threatened and Endangered Species(Texas Hornshell Mussel) section 3.7.1, Federally Threatened and Endangered Species(Gypsum Wild Buckwheat) section 3.8.1, Riparian section 3.10.1, Visual Resource Management section 3.16.1, and Water Resources 3.17.1. This proposed project is east of Hwy. 62/180, so the river that will be affected will be the Black River. The buffer zones and walk only areas that are in place around Black river and the Gypsum Wild Buckwheat area will greatly reduce the impacts in this area. The one pass rule for driving vibroseis machines and other vehicles will greatly reduce the impacts to the fragile soils and scenic values of this area.

For impact analysis of the proposed project on fish or wildlife resources see the Federally Threatened and Endangered Species(Texas Hornshell Mussel) section 3.7.1, Riparian section 3.10.1, and Water Resources 3.17.1. The buffer that is placed on the banks of the Black river will greatly reduce the impacts to not only the river, but to the Texas Hornshell Mussel and riparian areas as well. . For impact analysis of the proposed project on karst resources see the Cave/Karst Resources section 3.15.1 and Visual Resource Management section 3.16.1. The buffers around cave/karst features, along with the cave/karst monitor accompanying the crews; will significantly reduce the impacts to the resource. For impact analysis of the proposed project on riparian areas see the riparian areas section 3.10.1 and the water resources section 3.17.1. With the 200 meter buffers on the bank of Black River, steep slopes, and on all springs, the impacts to riparian areas will be greatly reduce or eliminated. For impact analysis of the proposed project on soil resources see the vegetation section 3.5.1. Minimizing off road vehicular traffic and utilizing pedestrian traffic as much as possible and having the three pass rule in affect, will reduce the fragile soils in this area. For impact analysis of the proposed project on special status plants see the Federally Threatened and Endangered Species (Gypsum Wild Buckwheat) section 3.8.1. The 200 meter buffer that is in place around all known areas of Gypsum Wild Buckwheat and the fact that a wildlife monitor will be on hand throughout the area, will greatly reduce the impacts to this threatened and endangered plant. For impact analysis of the proposed project on natural hazards, see the cave/karst section 3.15.1, which also includes the Chosa Draw ACEC.

Gypsum Soils ACEC

For impact analysis of the proposed project on cultural values see the cultural section, 3.13.1. The entire area has been archaeologically cleared by a contract archaeologist. The source and receiver lines have been cleared 100 ft. wide, and if archaeology has been observed, the lines have been re-routed and re surveyed. Receiver lines only can be laid through archaeological sites and only foot traffic will be allowed, no vehicular traffic in archaeological sites. For impact analysis of the proposed project on scenic values see the Soils section 3.4.2, and Vegetation section, 3.5.1. The three pass rule will be in effect, so that multiple passes will not be driven in fragile soils. Dog legs (90 degree) turns will be initialized off maintained roads so that the general public will not see these tracks and use them as roads, most all of the project will be walk only and due to buffer areas around caves, Gypsum Wild Buckwheat, draws, Black River, and steep slopes, vehicular traffic will be minimized in these areas.

For impact analysis of the proposed project on karst resources see the Cave/Karst Resources section 3.15.1 and Visual Resource Management section 3.16.1. The buffers around cave/karst features, along with the cave/karst monitor accompanying the crews; will significantly reduce the impacts to the resource. For impact analysis of the proposed project on soil resources see the vegetation section 3.5.1. Minimizing off road vehicular traffic and utilizing pedestrian traffic as much as possible and having the three pass rule in affect, will reduce the fragile soils in this area. For impact analysis of the proposed project on special status plants see the Federally Threatened and Endangered Species (Gypsum Wild Buckwheat) section 3.8.1. The 200 meter buffer that is in place around all known areas of Gypsum Wild Buckwheat and the fact that a wildlife monitor will be on hand throughout the area, will greatly reduce the impacts to this threatened and endangered plant. For impact analysis of the proposed project on natural hazards, see the cave/karst section 3.15.1, which also includes the Chosa Draw ACEC.

Cave Resources ACEC

For impact analysis of the proposed project on Chosa Draw Caves and natural hazards see the Cave/Karst section, 3.15.1, which also includes the Chosa Draw ACEC. The 200 meter buffer zone around caves and karst features and the cave/karst monitor that will be accompanying the crews, the impacts to these cave resources will be greatly reduces.

Within the Chosa Draw ACEC, there is no vehicles off road, only pedestrian traffic, and the vibroseis will only vibrate for source on the established roads, two tracks, or trails, which will greatly reduce the impacts in this area as well. This is a surface activity and no traffic, vehicle or pedestrian, is authorized to be within the buffer areas of these cave and karst features. Although important, there should be no human activity in or near any of the cave entrances.

Mitigation Measures and Residual Impacts

To reduce the impact from vehicular traffic to vegetation, a three pass rule will be in effect for all vehicular travel down surveyed lines, with ATV's being used for maintenance only if necessary. Smaller ATV's will be used for layout, troubleshooting, and equipment pick up. All larger vehicles will use established roads and two-track roads only for equipment layout.

After completion of the seismic operation, berms and/or signs will be installed as needed to deter usage of seismic lines as roads by other vehicles and the general public. Should seismic vehicle routes turn into roads, the applicant will be required to rehabilitate the first 100 yards of the disturbance to discourage further use and minimize resource damage pursuant to reclamation requirements of this seismic authorization.

The applicant is required to cross roads from an angle other than 90 degrees (dog leg) to minimize detection or tire tracks left by seismic vehicles.

All project vehicles will be washed prior to entering the project area and before leaving the Carlsbad area to avoid the spread of noxious weeds.

The proponent conducted a noxious weeds risk assessment throughout the project area. The results of this assessment came "moderate" for the presence of noxious weeds. This indicates that there is a need to develop preventative management measures for the proposed project to reduce the risk of introduction or spread of noxious weeds into the area. Preventative management measures should include modifying the project to include seeding the area to occupy disturbed sites with desirable species. Monitor area for at least 3 consecutive years and provide for control of newly established populations of noxious weeds and follow-up treatment for previously treated infestations. The proponent contributed funds to the Carlsbad Soil and Water Conservation District for the treatment of noxious weeds within the project area as needed.

Black River will be buffered by 200 meters. Within this buffer there is to be no seismic activities, including equipment and vehicles.

Third Party Wildlife Monitors will be on site and with the seismic crews during the time that they are near the Black River Area.

Black River will only be crossed at established crossings.

Third party contract wildlife monitor will be on site when the seismic crews are within the areas of the Gypsum Wild Buckwheat.

Within the area of the Gypsum Wild Buckwheat there is to be no foot traffic, no entrance at all.

The buffer on Gypsum Wild Buckwheat area will be 200 meters. No vehicle or foot traffic will be allowed within this buffer area.

Black River will have 200 meter set back along the river banks.

The river will only be crossed on established roads and bridges.

If unanticipated or previously unknown cultural resources are discovered at any time during the project activities, all project activities shall halt and the BLM authorized officer will be immediately notified. Work shall not resume until a Notice to Proceed is issued by the BLM.

All known archaeological sites will be checked for accuracy and flagged for avoidance.

Certain unimproved access routes may be utilized without prior archaeological survey if agreed upon in advance with the BLM Cultural Resources Staff or their designated representative.

All identified cultural resources should be avoided by project-related activities.

Source lines will be moved a minimum of 100 feet beyond known archaeological site boundaries. Receiver lines will be left in place with no vehicular traffic allowed through the site.

Only pedestrian traffic is allowed within archaeological site boundaries unless stipulated otherwise.

If avoidance were not feasible, geophysical activities would not be authorized until mitigating measures are developed and implemented and any necessary consultation is completed.

Archaeological monitors may be required in some areas.

It should be noted that this project will be done “flagless”, although small lathes will be at each known archaeological site and then the lathe will be picked up immediately after the work is performed.

Archaeology sites were identified; the proposed source points were removed from within the archaeological sites. A reroute was conducted around the archaeological sites where the alternative source points may be located.

All personnel working on the Delaware Basin 4A west 3D project shall be informed that cultural sites are to be avoided by all personnel, personal vehicles, and company equipment. They shall also be notified that it is illegal to collect, damage, or disturb cultural resources.

There will be three archaeological tiers to this project. Each tier will require its own archaeological clearance and NEPA document. Tier one will be this EA tier two and three will be a DNA.

Ground surveys are conducted prior to vehicle travel through the area. All karst features are identified by the surveyors and placed into GIS. A 200 foot exclusion area buffer is applied to each karst feature, including known passageways. No vehicle travel will be allowed within these buffers.

In the event that any underground voids are opened up during project activities, the BLM will be notified immediately. Any passages opened up may need to be surveyed to determine safe surface routes to proceed.

Chosa Draw ACEC

Designate OHV to designated roads. Vehicle use only on roads, two-tracks and trails.

No off road vibroseis machines. Shake on roads, two tracks, or trails in this area.

Walk only in this area off road.

After completion of the seismic project, “Not A Road” signs will be placed throughout the project area on tracks that are visible and easily attained by the public, so as to keep traffic off of these areas until they have time to revegetate. At the request of the authorized officer, at the completion of the project, it may be necessary to reseed certain areas, to help re-growth, thereby eliminating visual impacts.

The applicant is required to cross roads from an angle other than 90 degrees (Dogleg) to minimize detection or tire tracks left by seismic vehicles.

A Cave/Karst Monitor will accompany the Helidrill crew and monitor bit drops and cave/karst concerns.

Natural cuttings will be used to pack the hole before and after the data is collected.

If a bit drop occurs, it will be GPS’d, and that data will be given to the BLM.

There will be a 200 meter buffer on all springs. Cottonwood Spring is fenced off, but only foot traffic within the fenced in area.

Steep slopes will be adhered to with the 200 meter buffer.

See Mitigations Measures (Appendix C)

3.19. Impacts from the No Action Alternative

The No Action Alternative is used as the baseline for comparison of environmental effects of the analyzed alternatives. Under the No Action Alternative, the proposed project would not be built or constructed and there would be no new direct or indirect impacts to natural or cultural resources from oil and gas production

The natural and cultural resources in the project area would continue to be managed under the current land and resource uses.

3.20. Cumulative Impacts

Cumulative impacts are the combined effect of past projects, specific planned projects, and other reasonably foreseeable future actions within the project study area to which oil and gas exploration and development may add incremental impacts. This includes all actions, not just oil and gas actions that may occur in the area including foreseeable non-federal actions.

The combination of all land use practices across a landscape has the potential to change the visual character, disrupt natural water flow and infiltration, disturb cultural sites, cause minor increases in greenhouse gas emissions, fragment wildlife habitat and contaminate groundwater.

However, the likelihood of these impacts occurring is minimized through standard mitigation measures, special Conditions of Approval and ongoing monitoring studies.

All resources are expected to sustain some level of cumulative impacts over time; however these impacts fluctuate with the gradual abandonment and reclamation of wells. As new wells are being drilled, there are others being abandoned and reclaimed. As the oil field plays out, the cumulative impacts will lessen as more areas are reclaimed and less are developed.

As a result of the 200 meter buffer on the springs, Black River, and steep slopes, there will be no sloughing of the banks and there will be a “no effect” to the Texas Hornshell Mussel.

Since there will be a 200 meter buffer around the Gypsum Wild Buckwheat habitat areas and there will be no entrance, vehicle or foot traffic, within the buffer zone and wildlife monitors will be on site, there is a “no effect” to this area.

Currently, only Tier I have been inventoried for cultural resources for the proposed undertaking. Tier II and III will come at a later date and will be analyzed with a Determination of NEPA Adequacy (DNA).

4. SUPPORTING INFORMATION

4.1. List of Preparers

Prepared by: Todd A. Suter, Suter Consulting
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The following individuals aided in the preparation of this document:

George MacDonell, CFO Field Manager, BLM-CFO

Cody Layton, AFM Resource Supervisor, BLM-CFO

Robert Gomez, Multi Resource Supervisor, BLM-CFO

Tessa Cisneros, Realty Specialist, BLM-CFO

Stacy Galassini, Archaeologist, BLM-CFO

Johnny Chopp, Wildlife Biologist, BLM-CFO

Aaron Stockton, NEPA Coordinator, BLM-CFO

Steve Daly, Soil, Water, and Air Specialist, BLM-CFO

Marissa Klein, GIS Specialist, BLM-CFO

Record of Persons, Groups, and Agencies Contacted

Greg Dearsley, Dawson Geophysical Company

Dave Swafford, Dawson Geophysical Company

Johnny Kolster, Dawson Geophysical Company

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