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Cluster 9
Lybrook E33-2307
Lybrook L33-2307
Lybrook P32-2307
Lybrook Access Road #2 Upgrade

Lease Numbers:

NM 16586, NM LG-3924, NM V-1697

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ACRONYMS

°F	degrees Fahrenheit
µg/m³	micrograms per cubic meter
APD	Application for Permit to Drill
AUM	animal unit month
bbl	barrels
BLM	Bureau of Land Management
BOP	blowout preventer
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COA	Conditions of Approval
EA	Environmental Assessment
Ecosphere	Ecosphere Environmental Services
Encana	Encana Oil & Gas (USA) Inc.
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FFO	Farmington Field Office
GHG	greenhouse gas
HAP	hazardous air pollutant
LAC	La Plata Archaeological Consultants, LLC
MLA	Mineral Leasing Act
NAAQS	National Ambient Air Quality Standards
NATA	National Scale Air Toxics Assessments
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NMAAQS	New Mexico Ambient Air Quality Standards
NMPIF	New Mexico Partners in Flight
NMPM	New Mexico Principal Meridian

NO_2	nitrogen dioxide
NO_x	nitrous oxides
PFYC	Potential Fossil Yield Classification
PL	Public Law
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
ppb	parts per billion
ppm	parts per million
PRMP	Proposed Resource Management Plan
RFDS	Reasonable Foreseeable Development Scenario
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
SDA	specially designated area
SO_2	sulfur dioxide
TUA	temporary use area
U.S.	United States
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compound

1. PURPOSE AND NEED FOR ACTION

1.1 Background

Encana Oil & Gas (USA) Inc. (Encana) is proposing to develop the Lybrook E33-2307, Lybrook L33-2307, and Lybrook P32-2307 well pads and to upgrade the existing Lybrook Access Road #2 (Cluster 9) in Sandoval and San Juan counties, New Mexico. The proposed project would be located on Bureau of Land Management (BLM) and state of New Mexico land and would access minerals administered by the BLM Farmington Field Office (BLM/FFO) and state of New Mexico. Encana filed right-of-way (ROW) grants with the BLM/FFO for the Lybrook L33-2307 01H, Lybrook E33-2307 01H and 02H, and the Lybrook P32-2307 01H well pads, access roads, and well-tie pipelines. Encana filed an APDs with the New Mexico Oil Conservation Division to drill the Lybrook L33-2307 01H, Lybrook E33-2307 01H and 02H, and the Lybrook P32-2307 01H. An existing ROW grant with the BLM/FFO would be revised to upgrade an existing road (Lybrook Access Road #2). Encana also applied for an Off-Lease Well Pad Business Lease Easement with the New Mexico State Land Office to construct portions of the proposed Lybrook P32-2307 well pad and access road. Encana also applied for a revision to an existing ROW grant with the New Mexico State Land Office to upgrade those portions of the Lybrook Access Road #2 on state land.

Surface-disturbance activities associated with well drilling would include construction of three well pads, three access roads, three subsurface well-tie pipelines, and six temporary use areas (TUAs) in addition to improvement of the existing Lybrook #2 access road. The proposed project would be located in the headwaters of Escavada Wash, approximately 3.5 miles south of Lybrook, and approximately 7 miles west/southwest of the community of Counselor.

1.2 Purpose and Need for Action

The purpose of the proposed action is to provide Encana with reasonable access to BLM-managed federal mineral leases (NM 16586, NM LG-3924, and NM V-1697) to construct the proposed well pads, access roads, and pipelines, and to drill the proposed wells.

The need for the action is BLM's responsibility under the Mineral Leasing Act (MLA) of 1920, as amended (30 United States Code [USC] 181 et seq.), to respond to the APDs and ROW applications. The MLA authorizes the BLM to issue oil and gas leases for the exploration of mineral resources and permit the development of those leases. The need for the action also is established by the BLM's authority under Title V of the Federal Land Policy and Management Act, as amended (43 USC 1761-1771), and Section 28 of the MLA (43 USC 185).

1.3 Decision to be Made

Based on the information in this Environmental Assessment (EA), the BLM/FFO will decide whether to approve the ROW grants, and if so, under what terms and conditions. In compliance with the MLA, the decision to be made is how resource development should occur. Under the National Environmental Policy Act (NEPA), as amended (Public Law [PL]. 91-90, 42 USC 4321 et seq.), the FFO must determine if there are any significant environmental impacts associated with the proposed action, warranting further

analysis in an Environmental Impact Statement (EIS). The BLM/FFO Field Manager is the responsible officer who will make one of the following decisions:

- Approve ROW grants with design features as submitted
- Approve ROW grants with additional mitigations
- Analyze the effects of the proposal in an EIS
- Deny the ROW grants

1.4 Conformance with Applicable Land Use Plan(s)

Pursuant to 40 Code of Federal Regulations (CFR) 1508.28 and 1502.21, this EA incorporates the information and analysis contained in the 2003 Farmington Proposed Resource Management Plan (PRMP)/Final Environmental Impact Statement (FEIS) (USDI/BLM 2003a). The proposed action would be in conformance with the oil and gas leasing and development management actions in the Resource Management Plan (RMP)/Record of Decision (ROD) signed in December 2003 and updated later that month (USDI/BLM 2003b). The proposed action would be in conformance with the 2003 RMP/ROD that states, to the extent possible, new ROWs will be located within or parallel to existing ROWs or corridors to minimize resource impacts (USDI/BLM 2003b, page 2-11).

The PRMP/FEIS and ROD are available for review at the FFO in Farmington, New Mexico or electronically at http://www.blm.gov/pgdata/etc/medialib/blm/nm/field_offices/farmington/farmington_planning/ffo_prmp_docs.Par.89022.File.dat/Farmington_ROD.pdf. This project EA addresses site-specific resources and/or impacts not covered within the PRMP/FEIS, as required by NEPA.

Oil and gas development is recognized as an appropriate use of public lands in the FFO planning area (USDI/BLM 2003b). The RMP adheres to the federal mandates contained in the Energy Policy and Conservation Action (42 USC 6217) and Executive Order 13212, that direct federal land management agencies to expedite production of the federal mineral estate for development of reliable domestic energy sources (USDI/BLM 2003b, pages 1 and 11). The proposed project would not conflict with any local, county, or state plans.

A Reasonable Foreseeable Development Scenario (RFDS) developed for the 2003 RMP estimated foreseeable oil and gas development in the New Mexico portion of the San Juan Basin, beginning in January 2002 and lasting 20 years. The RFDS also contemplated that technological advances could alter development of the basin during that 20-year period. The Mancos Shale reservoir was analyzed in the RFDS as an emerging gas play over much of the basin where it had not been developed previously (Engler et al. 2001). The PRMP/FEIS for lands managed by the BLM/FFO indicates development of 9,942 new oil and gas wells from 2003 to 2023 in the San Juan Basin, allowing for about 16,100 acres of long-term disturbance. The ROD approving the final plan acknowledged these and future projected impacts, when balanced against the nation's need for domestic energy sources (USDI/BLM 2003a, 2003b, page 12). The proposed action is within the scale and pace of the RFDS; therefore, cumulative impacts from the proposed action were included and analyzed in the Farmington PRMP/FEIS (USDI/BLM 2003a).

1.5 Relationship to Statutes, Regulations, or Other Plans

Encana would comply with all applicable federal, state, and local laws and regulations, and would obtain the necessary permits for installation and operation of the pipeline. These laws and regulations include, but are not limited to:

- Antiquities Act of 1906, as amended (PL 52-209; 16 USC 431-433)
- American Indian Religious Freedom Act of 1978 (PL 95-431; 92 Stat. 469; 42 USC 1996)
- Archaeological Resources Protection Act of 1979 (PL 96-95; 93 Stat. 721; 16 USC § 470aa et seq.), as amended (PL 100-555; PL 100-588)
- Bald and Golden Eagle Protection Act of 1940, as amended (PL 86-70, PL 87-884, PL 92-535, PL 95-616; USC 668-668d)
- Clean Air Act, as amended (PL 88-206; 42 USC § 7401 et seq.)
- Clean Water Act, as amended (PL 107-303; 33 USC § 1251, et seq.)
- Colorado River Salinity Control Act, as amended (PL 93-320; 7 CFR Part 702)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (PL 96-510; 42 USC § 9601; 40 CFR Part 307)
- Endangered Plant Species Act (N.M. Stat. 1978 § 75-6-1)
- Endangered Species Act of 1973 (PL 93-205; 16 USC § 1531 et seq.)
- Executive Order 11988 Floodplain Management
- Executive Order 11990 Protection of Wetlands
- Executive Order 12898 Environmental Justice
- Executive Order 13007 Indian Sacred Sites
- Executive Order 13112 Invasive Species
- Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds
- Migratory Bird Treaty Act of 1918, as amended (16 USC §§ 703-712; 50 CFR Part 21)
- Native American Graves Protection and Repatriation Act of 1990 (PL 101-601; 104 Stat. 3048; 25 USC 3001; 43 CFR Part 10)
- New Mexico Oil and Gas Act (N.M. Stat. § 70-2-1–38) and related statutory provisions
- Paleontological Resources Preservation Act as part of the Omnibus Public Land Management Act (PL 111-011, Title VI, Subtitle D)
- Safe Drinking Water Act, as amended (PL 93-523; 42 USC 300F-300-9), 40 CFR Parts 144 and 147).
- Section 106 of the National Historic Preservation Act of 1966 (PL 89-665; 80 Stat. 915; 16 USC 470 et seq.), as amended (implemented under regulations of the Advisory Council on Historic Preservation, 36 CFR Part 800)
- Wildlife Conservation Act (N.M. Stat. 1978 § 17-2-37 et seq.)

1.6 Scoping, Public Involvement, and Issues

The Council on Environmental Quality (CEQ) defines scoping as "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action alternative" (40 CFR 1501.7). Scoping is the process by which the BLM solicits internal and external input on the issues, impacts, and potential alternatives that will be addressed in an EIS or EA. As outlined in the BLM NEPA Handbook, it is optional for the BLM to conduct external scoping on actions analyzed by an EA (USDI/BLM 2008a, Section 6.3.2).

The BLM/FFO Interdisciplinary Team was integrally involved in the internal scoping to identify potential issues, understand the proposal, develop the purpose and need, and develop a range of alternatives.

For the purpose of the BLM's NEPA analysis, an "issue" is a point of disagreement, debate, or dispute with a proposed action based on some anticipated environmental effect. Preliminary issues are frequently identified during development of the proposed action through scoping.

The following were identified as potential issues of concern by the Interdisciplinary Team during internal scoping:

- How would the alternatives affect air quality in the area?
- How would the alternatives affect soils?
- How would the alternatives affect water resources?
- How would the alternatives affect upland vegetation and noxious weeds?
- How would the alternatives affect wildlife, BLM special management species, state of New Mexico-listed species, and migratory birds?
- How would the alternatives affect cultural resources?
- How would the alternatives affect paleontological resources?
- How would the alternatives affect livestock grazing?

As outlined in the BLM NEPA Handbook, it is optional for the BLM to conduct external scoping on actions analyzed by an EA (USDI/BLM 2008a, Section 6.3.2). External scoping was conducted through posting this project on the FFO's online NEPA log. The log is located on the BLM New Mexico website (http://www.blm.gov/nm/st/en/prog/planning/nepa_logs.html). The log contains a list of proposed and approved actions in the FFO. The public is encouraged to provide comments or request information on projects listed in the logs.

1.6.1 Issues Considered but Not Analyzed

CEQ regulations (40 CFR § 1501.7) state that the lead agency shall identify and eliminate from detailed study the issues that are not important or have been covered by prior environmental review, narrowing the discussion of these issues in the document to a brief presentation of why they would not have a significant effect on the human or natural environment, or providing a reference to their coverage elsewhere.

The following resources were identified by the Interdisciplinary Team during internal scoping as potential issues of concern that would not be significantly impacted or have been evaluated in previous analyses.

For the proposed action, identification of Native American Religious Concerns was limited to reviewing existing, published, and unpublished literature (Van Valkenburgh 1941, 1974; Brugge 1993; Kelly et al. 2006); the site-specific Class III survey report prepared for the proposed action; and a review by the BLM's cultural resources program regarding the presence of traditional cultural properties identified through ongoing BLM tribal consultation efforts. Currently, there are no known remains that fall within the purview of the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) or the Archaeological Resources Protection Act (16 USC 470) within the proposed action area. The proposed action would not impact any known traditional cultural properties, prevent access to sacred sites, prevent the possession of sacred objects, or interfere with or hinder the performance of traditional ceremonies and rituals pursuant to the American Indian Religious Freedom Act of 1978 (42 USC 1996) or Executive Order 13007.

No federally listed species potentially occurring in Sandoval or San Juan counties or potential habitats for federally listed species were observed within the proposed project area. Furthermore, no designated critical habitat for any federally listed species occurs within the proposed project area. Water for drilling and completions would be sourced from a private water well that has been permitted by the state of New Mexico (POD Number SJ 01979-S4 as designated by the New Mexico Office of the State Engineer). Approximately 1.3 million gallons of water would be used for drilling and completions per well. No new water depletions would occur. No further consultation with the United States (U.S.) Fish and Wildlife Service (USFWS) is required. The FFO reviewed and determined that the proposed action is in compliance with listed species management guidelines outlined in the September 2002 Biological Assessment (Cons. No. 2-22-01-I-389) (USDI/BLM 2002).

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

Encana is proposing development of the Cluster 9 well pads, well-tie pipelines, access roads, upgrading the existing Lybrook Access Road #2, and six TUAs to access the mineral estate administered by the BLM/FFO and state of New Mexico. The proposed well pads would be located in the headwaters of Escavada Wash, approximately 3.5 miles south of Lybrook and approximately 7 miles west/southwest of the community of Counselor in Sandoval County, New Mexico. A project vicinity map is provided as Figure 1 (see Appendix A). Figure 2 shows the proposed action on the Lybrook and Lybrook NW, New Mexico U.S. Geological Survey (USGS) 7.5-minute topographic maps. Figures 3 and 4 displays the proposed action on the Lybrook and Lybrook NW, New Mexico 2010 digital photo orthoquad (see Appendix A). Photographs of the proposed action are provided in Appendix A. The legal descriptions of the proposed action components are listed in Table 2-1.

Table 2-1. Proposed action component legal descriptions

Component	Legal Description
Lybrook E33-2307 well pad	SW ¼ NW ¼ of Section 33, Township 23 North, Range 7 West, New Mexico Principal Meridian (NMPM)
Lybrook E33-2307 access road and pipeline	W ½ of Section 33, Township 23 North, Range 7 West, NMPM
Lybrook L33-2307 well pad and TUA	NW ¼ SW ¼ of Section 33, Township 23 North, Range 7 West, NMPM
Lybrook L33-2307 access road and pipeline	W ½ SW ¼ of Section 33, Township 23 North, Range 7 West, NMPM
Lybrook P32-2307 well pad	SE ¼ SE ¼ of Section 32, Township 23 North, Range 7 West, NMPM
Lybrook P32-2307 access road and pipeline	SE ¼ SE ¼ of Section 32 and SW ¼ SW ¼ of Section 33, Township 23 North, Range 7 West, NMPM
Lybrook Access Road #2 road upgrade and TUAs	N ½ N ½ of Section 3, N ½ N ½ of Section 2, N ½ N ½ of Section 1, Township 22 North, Range 8 West, NMPM (San Juan County) N ½ NW ¼ of Section 6, Township 22 North, Range 7 West, NMPM SE ¼ SW ¼, S ½ SE ¼ of Section 31, S ½ SW ¼, E ½ SE ¼ of Section 32, SW ¼ SW ¼ of Section 33, Township 23 North, Range 7 West, NMPM (Sandoval County)

As proposed, one or two oil wells would be horizontally drilled from each proposed well pad. Activities associated with the proposed project would include construction of access roads and well pads; drilling, stimulation, and completion of the proposed oil wells; installation of surface facilities necessary to produce the wells; and installation of pipelines to transport natural gas to markets. These activities are detailed below.

Construction

Construction of access roads and well pads would take approximately 1 to 2 weeks per location.

Table 2-2 provides a summary of disturbance that would occur under the proposed action. The total surface disturbance associated with the proposed action would be approximately 24.03 acres with 5.1 acres of disturbance remaining after interim reclamation for access and operation.

Table 2-2. Summary of proposed disturbance

Project Component	Dimensions	Area (acres)
Lybrook E33-2307		
Well Pad	430 x 400 feet 50-foot-wide construction zone around perimeter	6.08
Access Road and Pipeline	Road: 123 feet x 30-foot-wide ROW Pipeline: 2,665 feet x 40-foot-wide ROW Total width: 50 feet where parallel	2.46
	Total Disturbance	8.54
	Existing Disturbance	1.14
Lybrook L33-2307		
Well Pad	300 x 300 feet 50-foot-wide construction zone around perimeter	3.67
Well Pad TUA	100 x 400 feet	0.92
Access Road and Pipeline	Road: 117 feet x 30-foot-wide ROW Pipeline: 309 feet x 40-foot-wide ROW Total width: 50 feet where parallel	0.35
	Total Disturbance	BLM: 6.43 State: 1.06 Total: 7.48
	Existing Disturbance	0.48
Lybrook P32-2307		
Well Pad	350 x 400 feet 50-foot-wide construction zone around perimeter	BLM: 2.28 State: 2.88 Total: 5.16
Access Road and Pipeline	Road: 422 feet x 30-foot-wide ROW Pipeline: 617 feet x 40-foot-wide ROW (BLM), 30-foot ROW (State) Total width: 50 feet where parallel	BLM: 0.19 State: 0.42 Total: 0.61
	Total Disturbance	BLM: 2.47 State: 3.30 Total: 5.77
	Existing Disturbance	0
Lybrook Access Road #2 TUAs		
Access Road TUAs	BLM 623 x 60 feet 168 x 50 feet 116 x 50 feet State 235 x 50 feet 687 x 50 feet	BLM: 1.18 State: 1.06 Total: 2.24

Encana would improve an existing access road, Lybrook Access Road #2, which crosses BLM and state of New Mexico lands. The road would be upgraded for approximately 27,241 feet (5.16 miles), approximately 21,577 feet (4.09 miles) on BLM lands and approximately 5,664 feet (1.07 miles) on state land. Five TUAs would be located along this road and would be used to stage equipment and supplies needed to make improvements including upgrading two cattle guards and installing 24-inch corrugated metal pipe culverts at 23 locations along the road (refer to Table 2-2). No widening of the existing road would occur.

Drilling the proposed Lybrook E33-2307 01H and 02H wells would require construction of a 430-foot by 400-foot well pad with a 50-foot-wide construction zone around the perimeter. The proposed well pad would be located off-lease and would be permitted through a BLM/FFO ROW grant. The maximum cut would be approximately 3 feet on the northeast corner (Corner 2) and the maximum fill would be approximately 3 feet on the west side midline (B). To access the site, Encana would construct an approximately 123-foot-long access road with a permitted 30-foot-wide ROW. The proposed well-tie pipeline would be approximately 2,655 feet long and would be constructed within a 40-foot-wide ROW on BLM-managed lands. Total construction width of the pipeline and access road where the alignments are parallel would be 50 feet (designated as 20 feet of disturbance adjacent to the road and 30 feet of disturbance on the road).

Drilling the proposed Lybrook L33-2307 01H well would require construction of a 300-foot by 300-foot well pad with a 50-foot-wide construction zone around the perimeter. The maximum cut would be approximately 1 foot on the northwest corner (Corner 6) and the maximum fill would be approximately 5 feet on the southwest corner (Corner 3). An approximately 100-foot by 400-foot TUA would be utilized along the southern well pad boundary. The proposed well pad and TUA would be located off-lease and would be permitted through a BLM/FFO ROW grant. The TUA would be used to stage trucks during drilling and completion. To access the site, Encana would construct an approximately 117-foot-long access road within a permitted 30-foot-wide ROW. The proposed well-tie pipeline would be approximately 309 feet long and would be constructed within a 40-foot-wide ROW on BLM-managed lands. The proposed pipeline would parallel the proposed access road, with a total construction width of 50 feet.

Drilling the proposed Lybrook P32-2307 01H well would require construction of a 350-foot by 400-foot well pad with a 50-foot-wide construction zone. The proposed well pad would be located off-lease and would be permitted through a BLM/FFO ROW grant and an Off-Lease Well Pad Business Lease Easement with the New Mexico State Land Office. The maximum cut would be approximately 4 feet on the southeast corner (Corner 5) and the maximum fill would be approximately 9 feet on the north mid-line (B'). Encana would construct an approximately 422-foot-long access road (approximately 168 feet on BLM-managed land and 254 feet on state land). Encana would construct and operate an approximately 616-foot-long proposed well-tie pipeline (approximately 189 feet on BLM-managed land and 428 feet on state land). The pipeline would be constructed within a 40-foot-wide ROW on BLM-managed land and within a 30-foot-wide ROW on state land. The proposed pipeline would parallel the proposed access road.

Following interim reclamation, approximately 1.6 acres would be needed for well operation. Access roads also would contribute to long-term disturbance; however, upgrading the existing Lybrook Access Road

#2 would not contribute to long-term disturbance. Table 2-3 shows short- and long-term disturbance by land status.

Table 2-3. Short- and long-term disturbance per land status for the proposed action

Land Status	Short-term Disturbance (acres)	Long-term Disturbance (acres)[1]
Bureau of Land Management	20.73	4.28
State of New Mexico	3.30	0.82
Total	24.03	5.1

[1] Based on 20-foot-wide access roads and 1.6 acres per well for operation

Drilling and Completion

After well pad construction is complete, Encana would mobilize a drilling rig to drill wells from each pad. During drilling operations, equipment on the site would include:

- The drilling rig
- Stockpiles of drill pipe and casing
- A closed-loop system and aboveground tanks for collecting cuttings and fluid
- Mud shakers to separate the cuttings from the fluid
- Generators to provide power to the drilling rig
- Office trailers equipped with sleeping quarters for essential personnel

Drilling activities would occur continuously for approximately 2 weeks per well and would require on-site supervision 24 hours a day. Completion activities are expected to take 1 to 3 weeks per well.

Drilling operations would be conducted in compliance with all Federal Onshore Oil and Gas Orders, all applicable federal and state of New Mexico rules and regulations, and BLM Notice to Lessees. The proposed wells would be horizontal wells targeting the Alamito-Gallup and Basin Mancos pools. The wells are proposed to be drilled to a total vertical depth (shown in Table 2-4) and then horizontally drilled.

Table 2-4. Proposed total vertical depths for Cluster 9 wells

Well	Total Vertical Depth (feet)
Lybrook E33-2307 01H	5,079
Lybrook E33-2307 02H	5,061
Lybrook L33-2307 01H	5,057
Lybrook P32-2307 01H	5,043

Using a freshwater-based drilling mud system, surface casing would be set to an approximate depth of 500 feet. After the surface casing is installed, it would be cemented in place by pumping cement down the casing, circulating the cement back up the outside of the casing to create a cement sheath around the entire casing, and then tested to ensure the quality and integrity of the cement. Prior to drilling below the

surface casing, a blowout preventer (BOP) would be installed on the surface casing, and both the BOP and surface casing would be pressure tested for integrity. After installation and testing of the BOP, a string of intermediate casing would be installed to the kick-off point of the lateral. The intermediate casing would be cemented and then tested to ensure the quality and integrity of the cement.

After cementing the intermediate string, a synthetic oil-based drilling mud system would be used to drill the horizontal portion of the wellbore. Additives may be mixed with the mud system to achieve borehole stability, minimize possible damage to geologic formations, provide adequate viscosity to carry the drill cuttings out of the wellbore, and reduce downhole fluid losses.

After drilling the wellbore to its final depth, a production liner would be run and secured in place utilizing an external swell packer system. The production liner provides additional isolation of the wellbore and creates a pathway for natural gas or liquids to travel from the formation to the surface.

After the production liner has been secured in place, the drilling rig would be removed and a completion rig moved to the site. The completion rig would run a completions string of the same size, weight, and grade as the production liner into the wellbore to tie-in to the liner/liner hanger, providing a secondary barrier during completions that protects intermediate casing from pressures needed to pump into the formation. During completion activities, the well pads would have completions rigs, completions command centers, steel storage tanks, pump trucks and transports, blending and mixing facilities, and related ancillary completions equipment.

Completing the well would require hydraulic fracturing— the process of injecting water, sand, and a small amount of fluid additives into the wellbore under very high pressure to fracture the formation and release the oil. A series of charges would be set through the producing interval in the horizontal portion of the wellbore to perforate the production liner and casing and create small fractures in the target formation. A fluid and sand mixture would be injected at high pressure into the formation to create cracks or fractures; the sand would act as a proppant to keep the fractures open and allow gas or liquid hydrocarbons to move more efficiently into the wellbore. The fracturing process would be done in stages, with each stage continuing in the same manner along the horizontal portion of the wellbore, using a series of plugs to isolate portions of the well that were previously fractured. After all of the stages are completed, the plugs would be drilled out to allow gas or fluids to flow to the wellhead.

Completions would be designed with nitrogen foam to minimize water usage and improve fluid recoveries post-completions. Water would be sourced from a private water well located in the SW ¼ NE ¼ of Section 32, Township 25 North, Range 9 West, NMPM. This well has been permitted by the state of New Mexico. The well has been assigned the Point of Diversion Number SJ 01979-S4 by the New Mexico Office of the State Engineer. Water would be stored on site in up to 15 steel storage tanks.

Production

Production facilities at the well pads would consist of wellheads, metering units, separators, aboveground condensate and produced water tanks (two tanks per well), and compressors. If artificial lift is required, conventional pumping units (pump jacks) and/or gas lift systems would be installed.

Tank batteries would be placed within corrugated steel secondary containment berms and sized to contain a minimum of 110 percent of the storage capacity of the largest tank within the berm. Containment berms

would include an impermeable liner attached to the rings and laid under the tanks. All loading lines would be placed inside the containment berm or would have secondary containment vessels.

Installation of production equipment would take 2 to 3 weeks per well pad. Production facilities would be in place for the life of the wells (30 to 50 years).

Pipeline Installation

The proposed well-tie pipelines would be up to 6-inch outside diameter buried steel pipelines with a maximum allowable operating pressure of 500 pounds per square inch gauge. Related aboveground appurtenances installed within the pipeline workspace would include cathodic protection equipment, futures, and block valves with blowdowns.

The trench line, or ditch, would be excavated and sloped in accordance with Occupational Safety and Health Administration specifications. The cover from top-of-pipe to ground level would be a minimum of 36 inches through typical soil and rock, and a minimum depth of 48 inches at road crossings. Excavated material would be stockpiled at the edge of the workspace.

The trenching operation would be followed by pipe installation, which would include stringing, bending for horizontal or vertical angles in the alignment, welding pipe segments together, inspection, coating joint areas to prevent corrosion, and lowering into the trench. Backfilling would begin after a section of pipe has been successfully placed in the ditch and final inspection has been completed.

Cleanup activities would be initiated as soon as practicable after backfilling activities have been completed. The pipelines would be seeded with the seed mix and rates provided in the Reclamation Plan attached to the APDs for the well pads.

Construction and pipeline installation activities would take 4 to 6 weeks per pipeline and reclamation activities would take 1 to 2 weeks per pipeline. The pipelines and related aboveground appurtenances would be in place for the life of the wells (30 to 50 years).

Interim Reclamation

After production facilities are installed at the pads, the well pads would be reduced to the minimum surface area needed for production facilities and future operations. Interim reclamation would consist of grading and re-contouring the portion of the well pad not needed for production facilities/future operations to blend with adjacent natural surroundings as much as practicable, covering with salvaged topsoil material, and seeding to reestablish vegetation. Seed mixtures and rates would be in accordance with the Reclamation Plan for the proposed action. Sediment- and erosion-control measures would be implemented, as necessary. Interim reclamation would reduce the disturbed area to approximately 1.6 acres per pad. The proposed pipeline ROWs would be reclaimed where they do not overlap the access roads.

Interim reclamation activities would be initiated within 120 days of final operations and would take 2 to 4 weeks per well pad.

Abandonment and Final Reclamation

Upon abandonment of the wells, the wellbores would be plugged with cement and the production facilities would be removed. Federal and state of New Mexico standards would be followed, and Encana would provide the BLM with technical and environmental aspects of the final plugging, abandonment, and reclamation procedures. The well pads and access roads would be graded and re-contoured to blend with adjacent natural surroundings as much as practicable, covered with salvaged topsoil material, and seeded to reestablish vegetation. Sediment- and erosion-control measures would be implemented, as necessary.

2.1.1 Design Features

All areas of proposed surface disturbance were inspected in the field to ensure that potential impacts to natural resources would be minimized by implementing design features. For a detailed description of the design and construction practices associated with the proposed action, refer to the APDs in Appendix B. For the proposed action, standard and project-specific design features include, but are not limited to, the following:

- Pre-construction surveys will be conducted to identify any active nests within the proposed project area should construction occur between May 15 and July 31.
- Roads would be maintained in the same or better condition as existed prior to commencement of operations. Road maintenance will continue until final abandonment and reclamation of the well location.
- Two existing cattle guards within the existing road will be replaced.
- Dust emissions will be controlled on the roads and other locations, as necessary, with the application of dust suppressants (e.g., magnesium chloride) and/or water.
- Access roads will be designed and constructed as a Resource Road in accordance with the BLM Gold Book standards (USDI/USDA 2007), BLM 9113-1 (Roads Design Handbook), and BLM 9113-2 (Roads National Inventory and Condition Assessment Guidance and Instructions Handbook). Construction will include ditching, draining, installing culverts, and crowning and capping or sloping and dipping the roadbed, as necessary, to provide a well-constructed and safe road.
- All FFO cultural resources stipulations will be followed as indicated in the Cultural Resource Records of Review, attached to the Conditions of Approval (COA) in the APD/ROW, as necessary. These stipulations may include, but are not limited to, installation of temporary or permanent fencing or other physical barriers, monitoring earth-disturbing construction, reducing the project area, establishing specific construction avoidance zones, and educating employees. The project proponent will inform all project employees, contractors, and sub-contractors that: cultural sites are to be avoided by all personnel, personal vehicles, and company equipment; that it is illegal to collect, damage, or disturb cultural resources; and that such activities are punishable by criminal and/or administrative penalties under the provisions of the Archaeological Resources Protection Act. If a possible cultural resource is discovered during construction, the project proponent will immediately stop all construction activities near the discovery and immediately notify the archaeological monitor, if present, or the BLM. The BLM will then evaluate the site or instigate the site to be evaluated. Should a discovery be evaluated as significant (e.g., per the

National Register, Native American Graves Protection and Repatriation Act, Archaeological Resources Protection Act), it will be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM.

- Prior to construction, the pipeline ROW will be staked at 100- to 200-foot intervals; when applicable, BLM boundaries will be marked with station numbers at the entrance to and exit from BLM lands.
- Grazing permittees will be notified when construction is scheduled to begin. All hazards to livestock will be fenced or contained.
- All project activities will be confined to permitted areas only.
- Where pipeline construction parallels or crosses public roads, warning signs will be placed to alert motorists of construction. Safety measures also will be implemented along the construction workspace either by using the topsoil or subsoil piles or strung pipe as a barrier. Trenches left open at road crossings will be fenced with orange safety fence and barricades will be installed, if needed.
- Vegetation clearing, topsoil removal, and grading will be limited to the minimum area required for safe and efficient construction.
- Trees larger than 3 inches in diameter will be cut at ground level and delimbed. The wood may be donated to the local Chapter houses for the elderly and needy. The operator would need to purchase a commercial wood permit to be able to donate the wood. Stumps will be cut as close to the ground as possible. Stumps and root balls will be hauled to an approved disposal site or stockpiled at the edge of the well pad and buried in the cut slopes of the pad during interim reclamation.
- Trees smaller than 3 inches in diameter, slash, and brush will be chipped, shredded, or mulched and incorporated into the topsoil for later use in interim reclamation.
- Remaining brush will be brush-hogged or scalped at ground level prior to ground disturbance.
- Topsoil will be segregated and stockpiled at the edge of the workspace. Topsoil is defined as the top 6 inches of soil. Vehicle/equipment traffic will be prevented from crossing topsoil stockpiles.
- If a location becomes prone to wind or water erosion, Encana will take appropriate measures to prevent topsoil loss. Such measures may include using tackifiers, blankets, straw bales, straw wattles or water to wet the topsoil stockpile to create a crust across the exposed soil to prevent soil loss.
- Culverts (24- to 36-inch) will be installed, as needed, along the new and upgraded access roads from the well pads to the arterial route. Culverts will be sized and installed in accordance with the BLM Gold Book standards (USDI/USDA 2007), BLM 9113-1 (Roads Design Handbook), and BLM 9113-2 (Roads National Inventory and Condition Assessment Guidance and Instructions Handbook).
- A closed-loop system will be used. Cuttings will be stored on site in aboveground storage tanks. Cuttings will be disposed of at an approved waste disposal facility.
- The closed-loop system storage tanks will be sized to ensure confinement of all fluids and will provide sufficient freeboard to prevent uncontrolled releases.

- A 20-millimeter-thick liner will be installed under tanks, pumps, ancillary facilities, and truck loading/unloading areas associated with the closed-loop system.
- Drilling fluids will be stored on site in aboveground storage tanks. Upon termination of drilling operations, the drilling fluids will be recycled and transferred to other permitted closed-loop systems or returned to the vendor for reuse, as practical. Residual fluids will be disposed of at an approved waste disposal facility.
- The water-based solution that flows back to the surface during and after completion operations will be placed in storage tanks on location. Flowback water will be confined to a storage tank not more than 90 days after initial production and will be disposed of at an approved waste disposal facility.
- Any spills of non-freshwater fluids will be cleaned up immediately and removed to an approved disposal site.
- Self-contained, chemical toilets will be provided for human waste disposal. The toilet holding tanks will be pumped, as needed, and the contents disposed of in an approved sewage disposal facility. Toilets will be on site during all operations.
- Garbage, trash, and other waste materials will be collected in a portable, self-contained, and fully-enclosed trash container during drilling and completion operations. Accumulated trash will be removed, as needed, and will be disposed of at an authorized sanitary landfill. No trash will be buried or burned on location.
- Immediately after removal of the drilling rig, all debris and other waste materials not contained in the trash container will be cleaned up and removed from the well location.
- No chemicals subject to reporting under SARA Title III in an amount equal to or greater than 10,000 pounds will be used, produced, stored, transported, or disposed of annually in association with the drilling, testing, or completion of this well.
- No extremely hazardous substances, as defined in 40 CFR 355, will be used, produced, stored, transported, or disposed of in threshold planning quantities in association with the drilling, testing, or completion of this well.
- The amount of open trench will be minimized ahead of pipe laying and backfilling. No more than ½ mile of trench or the amount of trench that can be worked in a day will be open at any given time. Backfilling operations will be performed within a reasonable amount of time of the lowering operation to ensure the trench is not left open for more than 24 hours. Trenches left open overnight will be fenced with a temporary fence or other methods approved by the Authorized Officer. The ends of the trench will be sloped (3:1) to allow animals to escape.
- Escape ramps/crossovers will be constructed every 1,320 feet. In areas where active grazing is taking place, escape ramps/crossovers will be placed every 500 feet. The ends of the open trench will be sloped each night with a 3:1 slope.
- Established livestock and wildlife trails will be left in place as crossovers. Escape ramps/crossovers will be constructed with a minimum 3:1 slope at each end of the crossover. Crossovers will be a minimum of 10 feet wide and not fenced.
- The end of the pipe will be plugged to prevent animals from entering.

- Before the trench is closed, it will be inspected for animals. Any trapped wildlife or livestock will be removed promptly and released at least 150 yards from the trench.
- All existing improvements (e.g., fences, gates, bar ditches, cattle guards) will be repaired to previous or better than pre-construction conditions. Cut fences will be tied to H-braces prior to cutting; openings will be protected during construction, as necessary, to prevent the escape of livestock. A temporary closure will be installed on the same day the fence is cut. Following reclamation, the fence will be reconstructed to BLM specifications.
- Cover from top-of-pipe to ground level will be a minimum of 36 inches through typical soil and rock, and a minimum of 48 inches at drainage of road crossings. Inspection will be conducted to verify that minimum cover is provided, the trench bottom is free of rocks and debris, external pipe coating is not damaged, and the pipe is properly fitted and installed into the ditch.
- Rocks and limbs removed during clearing will be scattered across the workspace in a random arrangement using rubber-tired equipment.
- Open pits will be netted and vent caps will be placed on all open pipes to prevent birds from entering and nesting.
- If construction is scheduled to begin within the typical migratory bird breeding season of May 15 to July 31, an FFO-approved bird nest survey will be conducted within the proposed disturbance area.
- Permanent erosion-control measures will be installed after the workspace has been re-contoured. Encana will construct waterbars on all disturbed areas to the spacing and cross sections specified by the Authorized Officer.
- The disturbed areas will be reseeded with a BLM/FFO approved seed mix (in this case, Badland and Sagebrush-Grass Community seed mixes). Refer to the site-specific Reclamation Plans prepared for each location and attached to the Surface Use Plan of Operations. Seeding will be accomplished within 120 days of construction completion, weather permitting. Upon evaluation after the second growing season, seeding will be repeated if a satisfactory stand is not obtained. Cut and fill slopes will be hand seeded with hydro-mulch excelsior netting and/or mulch with netting.
- It will be the operator's responsibility to monitor, control, and eradicate all invasive, non-native plant species within the proposed project area throughout the life of the proposed project. The operator will contact the BLM/FFO regarding acceptable weed-control methods. If the operator does not hold a current Pesticide Use Permit, a Pesticide Use Permit will be submitted prior to pesticide application. Only pesticides authorized for use on BLM lands will be used. Pesticides will be used in compliance with federal and state laws and only in accordance with their registered use and limitations. The operator will contact the BLM/FFO prior to using these chemicals.
- Production equipment will be placed on location in such a manner to minimize long-term disturbance and maximize interim reclamation. As practical, access will be provided by a teardrop-shaped road through the production area so that the center may be re-vegetated.
- A berm will be constructed completely around any production facilities that contain fluids (e.g., production tanks, produced water tanks). These berms will be constructed of compacted subsoil,

corrugated metal, or equivalent; be impervious; and hold 110 percent of the capacity of the largest tank.

- Production facilities will be painted Covert Green to blend with the natural color of the landscape and will be located, to the extent practical, to reasonably minimize visual impact. Equipment subject to safety considerations would not be painted.
- Engines will be equipped with mufflers; barriers or other sound-proofing measures will be implemented, if needed, to meet the requirements of BLM Notice to Lessees and Operators on Onshore Oil and Gas Leases within the jurisdiction of the FFO NTL 03-1 FFO.

Site-Specific Design Features for the Lybrook E33-2307

- Upon interim reclamation, water will be diverted around the pad and silt traps installed, as needed.
- A 24-inch culvert will be installed where the new well pad access road leaves the existing access road.
- Paleontological monitoring will be required during construction.
- Brack's hardwall cacti (*Sclerocactus cloveriae* ssp. *brackii*) along the access road will be fenced and individuals that would be impacted by project activities will be transplanted. This measure will be coordinated with the BLM/FFO Threatened and Endangered Species Biologist and implemented in accordance with BLM policy.
- Encana will notify the grazing allottee prior to construction.

Site-Specific Design Features for the Lybrook L33-2307

- Corner 3 of the well pad will be rounded to avoid paleontological resources and Brack's hardwall cactus.
- Water will be diverted around the pad and silt traps installed, as needed, upon interim reclamation.
- Prior to construction, Brack's hardwall cacti would be transplanted in accordance with BLM policy.
- Encana will notify the grazing allottee prior to construction.

Site-Specific Design Features for the Lybrook P32-2307

- The southern corners of the well pad (Corners 5 and 6) will be rounded to avoid an ephemeral drainage.
- Reroute existing fence during construction and drilling. The operator will work with the BLM Range Staff and the grazing allottee to determine the final fence placement (during interim reclamation).
- Water will be diverted around the pad and silt traps installed, as needed, upon interim reclamation.
- A 48-inch culvert will be installed where the new access road leaves the well pad.
- One low-water crossing will be installed where the proposed access road crosses a drainage.
- Where needed, 24-inch culverts will be installed on the upgraded access road.
- Paleontological monitoring will be required during construction.
- Encana will notify the grazing allottee prior to fence cutting and construction.

- Prior to construction, Brack's hardwall cacti would be transplanted in accordance with BLM policy.
- Prior to construction, Brack's hardwall cacti along the access road will be fenced, and 50 percent of the individuals that would be impacted by project activities will be transplanted in accordance with BLM policy.

2.2 No Action

According to the BLM NEPA Handbook (H-1790-1; USDI/BLM 2008), for EAs on externally initiated proposed actions, the no action alternative is generally to reject the proposal or deny the application. This option is provided in 43 CFR 3162.3-2 (h) (2). This alternative would deny the approval of the APDs and ROWs and the current land and resource uses would continue to occur in the proposed project area. The no action alternative provides a useful baseline for comparison of environmental effects (including cumulative effects) and demonstrates the consequences of not meeting the need for the action.

2.3 Alternatives Considered but Eliminated

Several configurations of the proposed well pads, pipelines, and roads were considered and evaluated by the applicant, BLM, and natural and cultural resources experts using desktop tools and in-field examination. These alternatives were considered but have been eliminated from further consideration as they would have resulted in greater environmental impacts:

- The site originally proposed for the Lybrook E33-2307 well pad is west of the currently proposed site. Approximately 45 Brack's hardwall cactus were identified on the proposed road/pipeline ROW. To avoid impacting the cacti, the well was moved east and twinned with the existing Federal 1 #4 well, and the road and pipeline were rerouted.
- The site originally proposed for the Lybrook L33-2307 well pad was rejected based on the presence of Brack's hardwall cactus and paleontological resources. Subsequently the site was moved 50 feet south and the pad was reduced in size by 50 feet on one side.
- The original configuration of the Lybrook P32-2307 well pad was changed (reduced in size and corners rounded) to minimize impacts to Brack's hardwall cactus.
- Twinning of the Lybrook L33-2307 and P32-2307 well pads was considered; however, the minimum size for a two-well pad is 400 by 430 feet with a 50-foot-wide construction zone to safely accommodate equipment required during the drilling and completion phases. The sizes of the L33-2307 and P32-2307 well pads were confined by topography and avoidance of paleontological resources and Brack's hardwall cactus. Both of these well pads as proposed were reduced in size to minimize environmental impacts. Therefore, neither of the well pads would be large enough to accommodate two wells.

No other alternatives were identified that would create less disturbance and still achieve the purpose and need of the proposed action.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the environment that would be affected by implementation of the alternatives described in Chapter 2. Aspects of the affected environment described in this section focus on the relevant major resources or issues.

Under the no action alternative, the proposed action would not be implemented. The no action alternative would result in the continuation of the current land and resource uses in the project area. This alternative will not be evaluated further in this EA.

Field resource investigations of the proposed action were conducted on July 23 and 29; August 6 and 27; and October 14, 2013 by Ecosphere Environmental Services (Ecosphere) biologists. Cultural resource surveys were conducted by La Plata Archaeological Consultants, LLC (LAC) between July 2012 and December 2013. On-sites were conducted on July 30 and November 14, 2013 and attended by representatives from Encana, Ecosphere, and the BLM/FFO.

The analysis area for this EA is defined as the project footprint of the proposed well pads, access roads, and pipelines.

3.1 Air Resources

3.1.1 Affected Environment

The proposed pipeline would be located in Sandoval and San Juan counties, New Mexico. Additional general information on air quality in the area is contained in Chapter 3 of the Farmington PRMP/FEIS. In addition, new information about greenhouse gases (GHGs) and their effects on national and global climate conditions has emerged since this document was prepared. Ongoing scientific research identified the potential impacts of GHG emissions such as carbon dioxide (CO_2), methane (CH_4), nitrous oxides, water vapor, and several trace gases on the global climate. Through complex interactions on a global scale, GHG emissions may cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), industrialization and burning of fossil carbon sources have caused GHG concentrations to increase measurably, and may contribute to overall climatic changes, typically referred to as global warming.

Much of the information referenced in this section is incorporated from the Air Resources Technical Report for BLM Oil and Gas Development in New Mexico, Kansas, Oklahoma, and Texas (herein referred to as the Air Quality Technical Report; USDI/BLM 2013). This document summarizes the technical information related to air resources and climate change associated with oil and gas development, and the methodology and assumptions used for analysis.

The U.S. Environmental Protection Agency (USEPA) has the primary responsibility for regulating air quality, including six nationally regulated ambient air pollutants (criteria pollutants): carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, particulate matter less than 10 and 2.5 microns in diameter (PM_{10}

and $PM_{2.5}$), sulfur dioxide (SO_2), and lead. The USEPA has established National Ambient Air Quality Standards (NAAQS) for criteria air pollutants to protect human health and the environment. The USEPA has approved the New Mexico's State Implementation Plan; New Mexico enforces state and federal air quality regulations on all public and private lands within the state, except for tribal lands within Bernalillo County. Air quality is determined by atmospheric pollutants and chemistry, dispersion meteorology, and terrain; included are applications of noise, smoke management, and visibility. Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. The USEPA has proposed or completed actions recently to implement Clean Air Act requirements for GHG emissions. Climate has the potential to influence renewable and non-renewable resource management.

Air Quality

Criteria Air Pollutants

The Air Quality Technical Report presents the types of data used for describing the existing conditions of criteria pollutants, how criteria pollutants are related to activities involved in oil and gas development, and providing a table of current national and state standards (USDI/BLM 2013). The USEPA Green Book web page reports that all counties in the analysis area—San Juan, McKinley, Rio Arriba, and Sandoval counties in New Mexico and La Plata County, Colorado—are in attainment of all NAAQS, as defined by the Clean Air Act. The area also does not violate any New Mexico Ambient Air Quality Standards (NMAAQS). The current criteria pollutant "design concentrations" in the analysis area are described below. Design concentrations are the concentrations of air pollution at a specific monitoring site that can be compared to the NAAQS. **Error! Reference source not found.** shows monitored design values for zone in recent years for each of the three San Juan County ozone monitoring stations.

Table 3-1. Reported ozone values for San Juan County ozone monitoring stations

State Air Monitoring Station	8-hour Ozone Design Value (parts per million)				NAAQS
	2007-2009	2008-2010	2009-2011	2010-2012	2008
Substation	0.067	0.063	0.063	0.067	0.075
Bloomfield	0.061	0.060	0.061	0.067	0.075
Navajo Lake	0.069	0.066	0.068	0.071	0.075

Note: NAAQS = National Ambient Air Quality Standards

Source: USEPA 2012

Table 3-2 summarizes monitored design values for other criteria pollutants in San Juan County.

Table 3-2. Criteria pollutant design value concentrations monitored in San Juan County

Pollutant	Design Value	Averaging Time	NAAQS	NMAAQS
NO_2	13 ppb	Annual	53 ppb	50 ppb
NO_2	39 ppb	1-hour	100 ppb[1]	0.10 ppm (24-hour)
PM_{10}	Data incomplete	24-hour	150 µg/m[3, 3]	150 µg/m[3, 4]
$PM_{2.5}$	4.5 µg/m^3	Annual	12 µg/m[3, 5]	60 µg/m[3, 4]
$PM_{2.5}$	14 µg/m^3	24-hour	35 µg/m[1, 3]	
SO_2	0.001 ppm	Annual	None	0.02 ppm
SO_2	20 ppb	1-hour	75 ppb[6]	None
SO_2	0.008 ppm	24-hour	None	0.10 ppm

Note: NAAQS = National Ambient Air Quality Standards; NMAAQS = New Mexico Ambient Air Quality Standards; NO_2 = nitrogen dioxide; ppb = parts per billion; µg/m^3 = micrograms per cubic meter; ppm = parts per million; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter

Source: USEPA 2012

[1] 98th percentile, averaged over 3 years.

[2] Not to be exceeded more than once per year.

[3] µg/m^3 refers to micrograms per cubic meter of air. Not to be exceeded more than once per year, on average over 3 years.

[4] The NMAAQS is a standard for total suspended particulate matter.

[5] Annual mean, averaged over 3 years.

[6] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

In 2005, the USEPA estimated that less than 0.01 ton of lead per square mile was emitted in the analysis area, which is less than 2 tons total (USDI/BLM 2013). Lead and CO are not monitored in northwestern New Mexico; however, concentrations of these pollutants are expected to be low in rural areas and, therefore, are not monitored.

Hazardous Air Pollutants

The Air Quality Technical Report discusses the relevance of hazardous air pollutants (HAPs) to oil and gas development and the particular HAPs that are regulated in relation to these activities (USDI/BLM 2013). The USEPA has identified 187 toxic air pollutants as HAPs. In March 2011, the USEPA published the fourth in a series of National Scale Air Toxics Assessments (NATA) that quantifies HAP emissions for 2005 by U.S. counties. The purpose of the NATA is to identify areas where HAP emissions result in high health risk. Computer models are used to develop estimates of risk of cancer or other health impacts. NATA presents risk hazard indices for cancer and neurological and respiratory problems for each county and census tract. Because techniques have changed over the years, the NATA are not comparable to those previously issued. USEPA also cautions that because data availability varies from state to state, the results are not necessarily comparable from one geographic area to another. The 2005 NATA estimated the total cancer risk for the analysis area as 25 to 50 per one million and the estimated tract level total respiratory hazard index was 0 to 1. The USEPA estimates the average national cancer risk for 2005 was 50 per one million, meaning 1 person out of every 20,000 had an increased likelihood of contracting cancer from breathing air toxics from outdoor sources if exposed to 2005 emission levels over their lifetime. A respiratory hazard index below 1 indicates that exposures in the area do not exceed reference levels that would have adverse effects on human health.

Climate

The analysis area is located in a semi-arid climate regime, typified by dry windy conditions and limited rainfall. Summer maximum temperatures generally are in the range of 80 or 90 degrees Fahrenheit (°F), and winter minimum temperatures generally are in the teens to 20s. Temperatures occasionally reach above 100°F in June and July, and have dipped below 0°F in December and January. Precipitation is divided between summer thunderstorms associated with the southwest monsoon and winter snowfall as Pacific weather systems drop south into New Mexico.

Table 3-3 shows climate normals for the 30-year period from 1981 to 2010 for the Farmington, New Mexico area.

Table 3-3. Climate normals for the Farmington area, 1981-2010

Month	Average Temperature[1]	Average Maximum Temperature[1]	Average Minimum Temperature[1]	Average Precipitation (inches)
January	30.5	40.8	20.3	0.53
February	35.8	46.8	24.8	0.59
March	43.2	56.1	30.3	0.78
April	50.4	64.7	36.2	0.65
May	60.4	74.8	46.1	0.54
June	69.8	85.1	54.5	0.21
July	75.4	89.6	61.2	0.90
August	73.2	86.5	59.8	1.26
September	65.4	79.1	51.7	1.04
October	53.3	66.4	40.1	0.91
November	40.5	52.2	28.8	0.68
December	31.0	41.2	20.7	0.50

Source: USDI/BLM 2013

[1] Degrees Fahrenheit

3.1.2 Impacts from the Proposed Action

Methodology and assumptions for calculating air pollutant and GHG emissions are described in the Air Resources Technical Report (USDI/BLM 2013). This document incorporates the sections discussing the modification of calculators developed by the BLM to address emissions for one horizontal oil well. The calculators give an approximation of criteria pollutant, HAP, and GHG emissions to be compared to regional and national emissions levels (USDI/BLM 2013). Also incorporated into this document are the sections describing the assumptions used in developing the inputs for the calculator (USDI/BLM 2013).

Direct and Indirect Impacts

Criteria Pollutants

Table 3-4 shows estimated emissions from one proposed horizontal oil well for criteria pollutants, volatile organic compounds (VOCs), and GHGs (USDI/BLM 2013). For comparison, Table 3-5 shows total

human-caused emissions for each of the counties in the FFO and La Plata County, Colorado, based on USEPA's 2008 emissions inventory (USEPA 2011).

Table 3-4. Criteria pollutant and volatile organic compound emissions estimated for construction of one horizontal oil well (average 25 days to drill and complete)

Activity	NO_X	CO	VOCs	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2
One-time operations (tons)								
Construction	5.5	1.5	0.5	2.5	0.25	0.1	0.007	598.85
Completion	0.5	0.1	0.03	0.025	0.025	-	-	55.00
Interim Reclamation	0.006	0.006	0.006	0.001	-	0.003	-	1.24
Final Reclamation	0.006	0.006	0.006	0.001	-	0.004	-	1.66
Ancillary Operations (tons)								
Workover	0.129	0.04	0.01	0.01	0.01	-	-	10.59
Road Maintenance	-	-	-	-	-	-	-	0.26
Road Traffic	-	-	-	-	-	-	-	0.06
Annual operations (tons/year)								
Oil Haul Truck and Small Truck (100 bbl/day)	0.009	0.006	0.0012	0.0009	0.0008	-	0.0001	3.88
Total	**6.13**	**1.64**	**0.55**	**2.54**	**0.29**	**0.11**	**0.01**	**671.54**

Note: NO_X = nitrous oxides; CO = carbon monoxide; VOCs = volatile organic compounds; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide; CH_4 = methane; CO_2 = carbon dioxide; bbl = barrels

Source: USDI/BLM 2013

Oil storage tanks at the well location may result in venting of VOCs. Oil well production generally is presented as barrels per day produced. The emissions calculator estimated that for every barrel per day produced there may be 0.12 ton of VOC vented per year.

The average horizontal oil well in the planning area produces approximately 100 barrels per day. One hundred barrels per day is estimated to result in 12 tons of VOC emissions per year. Oil storage tanks would be subject to current USEPA regulations regarding the capture or flaring of VOC emissions.

Table 3-5. Analysis area human-caused emissions in tons/year, 2008

County	NO_X	CO	VOCs	PM_{10}	$PM_{2.5}$	SO_2
McKinley	12,595.0	31,885.2	37,509.0	66,590.7	6,977.5	1,659.8
Rio Arriba	4,276.6	27,352.9	45,841.5	46,321.6	4,746.2	89.1
San Juan	35,651.7	54,549.5	46,994.9	69,655.7	8,108.3	11,471.0
Sandoval	4,780.1	33,290.5	31,733.6	36,232.3	4,056.3	123.4
Total	**57,303.4**	**147,078.1**	**160,079**	**218,800.3**	**23,897.3**	**13,343.3**

Note: NO_X = nitrous oxides; CO = carbon monoxide; VOCs = volatile organic compounds; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide

Source: USEPA 2008

Table 3-6 displays the percent increase in total emissions in the analysis area from the proposed action to construct and operate one horizontal oil well.

Table 3-6. Percent increase in analysis area emissions per well

	NO_X	CO	VOCs	PM_{10} (1)	$PM_{2.5}$ (1)	SO_2 (1)
Total Emissions tons/year	57,303.4	147,078.1	160,079.0	218,800.3	23,897.3	13,343.3
Horizontal Oil Well Emissions tons/year	6.13	1.64	12.55 (2)	2.54	0.29	0.11
Percent Increase	**0.011**	**0.0011**	**0.0078**	**0.0012**	**0.0012**	**0.00082**

Note: NO_X = nitrous oxides; CO = carbon monoxide; VOCs = volatile organic compounds; PM_{10} = particulate matter less than 10 microns in diameter; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; SO_2 = sulfur dioxide

[1] Values derived from average emissions for any well drilling in the analysis area. Calculated results available upon request.

[2] Current USEPA regulations require operators to reduce VOC emissions by 95 percent if their oil storage tanks emit over 6 tons of VOC emissions per year.

Hazardous Air Pollutants

The formulas used for calculating HAPs are very imprecise. For many processes it is assumed that HAP emissions will be equivalent to 10 percent of VOC emissions; therefore, the estimated HAP emissions of 1.25 tons/year should be considered a very gross estimate. Most of the VOC emissions estimated for one horizontal oil well result from venting from oil storage tanks. Current USEPA regulations require operators to reduce VOC emissions by 95 percent if their oil storage tanks emit over 6 tons of VOC emissions per year. A reduction of 95 percent of oil storage tank VOC emissions would reduce the estimated HAP emissions to 0.12 ton/year.

Total Greenhouse Gases

The available statewide GHG summary (NMED 2010) combines GHG emissions from CO_2 and CH_4. To compare the GHG emissions from the proposed action estimated by the calculator with statewide GHG emissions, CO_2e (carbon dioxide equivalent) emissions for both CH_4 and CO_2 were summed. The total statewide GHG emission estimate for 2007 was 76,200,000 metric tons CO_2e (76.2 million metric tons; NMED 2010). The estimated CO_2e metric tons emissions from one horizontal oil well (609.2 metric tons) would represent a 0.0008 percent increase in New Mexico's CO_2 emissions.

Cumulative Impacts

The FFO manages federal hydrocarbon resources in San Juan, Sandoval, Rio Arriba, and McKinley counties in New Mexico. There are approximately 23,522 wells in the San Juan Basin. About 16,435 of the wells in these counties are federal wells. Analysis of cumulative impacts for the reasonable development scenario of oil and gas wells on public lands in the FFO was presented in the 2003 RMP. This included modeling of impacts on air quality. A more detailed discussion of cumulative effects can be found in the Air Resources Technical Report (USDI/BLM 2013).

The primary activities that contribute to levels of air pollutant and GHG emissions in the Four Corners area are electricity generation stations, fossil fuel industries, and vehicle travel. The Air Quality Technical Report includes a description of the varied sources of national and regional emissions that are incorporated here to represent the past, present, and reasonably foreseeable impacts to air resources (USDI/BLM 2013). It includes a summary of emissions on the national and regional scale by industry source. Sources considered to have notable contributions to air quality impacts and GHG emissions include electrical generating units, fossil fuel production (nationally and regionally), and transportation.

The emissions calculator estimated there could be very small direct and indirect increases in several criteria pollutants, HAPs, and GHGs as a result of implementing the proposed alternative. The very small increase in emissions that could result would not be expected to result in exceeding the NAAQS for any criteria pollutants in the analysis area.

The very small increase in GHG emissions that could result from implementing the proposed alternative would not produce climate change impacts that differ from the no action alternative. This is because climate change is a global process that is impacted by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from the action alternatives cannot be translated into effects on climate change globally or in the area of this site-specific action. It is currently not feasible to predict with certainty the net impacts from the action alternatives on global or regional climate.

The Air Resources Technical Report (USDI/BLM 2013) discusses the relationship of past, present, and future predicted emissions to climate change and the limitations in predicting local and regional impacts related to emissions. It is currently not feasible to know with certainty the net impacts from particular emissions associated with activities on public lands.

3.2 Soils

3.2.1 Affected Environment

Surficial geology at all of the proposed well pads, access roads, and pipelines is composed of the Nacimiento Formation and soils are classified as Badland mapping unit (USDA/NRCS 1987). Soils in the TUAs associated with the proposed Lybrook Access Road #2 upgrade include the Badland mapping unit Blancot-Councelor-Tsosie association, 0 to 5 percent slopes, and the Doak-Sheppard-Shiprock association, rolling (USDA/NRCS 1987; USDA/SCS 1980). The existing access road would be upgraded within its current footprint and no new soil disturbance is anticipated.

The Nacimiento Formation consists of non-marine fluvial depositions created during the Paleocene in the San Juan Basin (Williamson and Lucas 1992, New Mexico Bureau of Geology and Mineral Resources

2003). The formation is comprised mostly of shale interbedded with medium to fine grained sandstone and conglomeratic sandstone (McLemore et al. 1986). The Nacimiento Formation is well-known for containing a significant early Paleocene vertebrate fossil record (Williamson and Lucas 1992).

The Badland mapping unit is classified as somewhat excessively drained and highly erodible. Badlands are steep or very steep, commonly non-stony, barren land dissected by many intermittent drainage channels. Runoff potential is very high and geologic erosion is active (USDA/NRCS 1987). The soils texture was found to be fine sandy loam to sandy clay loam.

The Blancot-Councelor-Tsosie association, 0 to 5 percent slopes, is very slightly saline and moderately sodic. This mapping unit is deep and well drained with a moderate permeability and moderately available water capacity. The maximum calcium carbonate concentration is approximately 15 percent. The limitations of this map unit for roads and buildings include low strength and salinity (USDA/NRCS 1987).

The Doak-Sheppard-Shiprock association, rolling, is found on mesas, plateaus, and terraces and is composed of approximately 40 percent Doak loam, 30 percent Sheppard loamy fine sand, and 20 percent Shiprock fine sandy loam. This mapping unit is deep and well to excessively drained. Effective rooting depth is 60 inches or greater. The major limitations of this mapping unit are blowing soil and water erosion (USDA/SCS 1980).

3.2.2 Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed action would affect approximately 24.03 acres of soils that have been classified as highly erodible. Construction would result in temporary displacement, compaction, and mixing of soils. The well pads and new access roads (approximately 5.1 acres) would remain as bare, compacted soil for the life of the project (approximately 30 years) and would be subject to an undetermined amount of wind and water erosion until the wells and roads are completely reclaimed. Compaction of the soils during construction and operation of the proposed project, coupled with implementation of design features described below, would limit soil impacts from erosion. Soils are most susceptible to erosion during construction, when strong winds or precipitation events during soil-disturbing activities could mobilize soils. The impact on soils would be localized and short to long term.

Industry-related vehicle and pedestrian traffic would be restricted to proposed disturbance areas and existing roads. Following construction activities, unused areas would be reseeded with the BLM-approved seed mixes to stabilize soils and prevent erosion. Following construction, vehicle traffic would be restricted to existing bladed roads to prevent erosion, soil mixing, and compaction in adjacent areas. Proper soil salvage, storage, and reclamation will allow adequate infiltration and permeability rates and maintain soil moisture, which is necessary for plant growth and vigor, and minimize surface runoff.

Cumulative Impacts

The proposed action falls within the development that was assessed in the 2003 RMP EIS cumulative impacts analysis. The PRMP/FEIS determined that “cumulative impacts on soils in the San Juan Basin would comprise the total amount of short-term and long-term surface disturbance due to all new oil and gas development and other activities” (USDI/BLM 2003a, page 4-123). The PRMP/FEIS projected that

264 acres of initial surface disturbance would occur in the Chaco sub-watershed (USDI/BLM 2003a, page 4-7). Past, present, and future developments are expected to result in a range of short- and long-term impacts to soils including disturbance, temporary or permanent increases in erosion prior to reclamation, and reduction of soil loss to erosion where reclamation and re-vegetation occurs. Given that about 24.03 acres of soil would be disturbed by the proposed action and the large extent that these soil types occur in the San Juan Basin, any impact from the proposed action is not expected to contribute appreciably to cumulative impacts to soils when added to past, present, and reasonably foreseeable actions.

3.3 Water Resources/Quality – Surface and Groundwater

3.3.1 Affected Environment

The analysis area is located in the Upper Colorado River Hydrologic Region and is within the Chaco sub-watershed. The analysis area is characterized by flat lowlands surrounded by badland hills, dissected by many intermittent drainage channels. Surface drainage generally flows to Escavada Wash and its unnamed tributaries. There are no perennial surface water resources such as rivers, lakes, ponds, or streams, nor any wetlands or springs within the analysis area.

The analysis area was surveyed for the presence of jurisdictional wetlands and other waters of the U.S. Where the proposed project would potentially impact "bluelines," as obtained from the USGS High-resolution National Hydrography Dataset (NHD), a field determination was made on whether the drainage feature supported a defined bed-and-bank feature (based on scour and deposition processes). If scour and deposition features were present, an assessment was made to determine which geomorphic features were representative of an ordinary high water mark. Waters of the U.S. and other wetlands are regulated by the U.S. Army Corps of Engineers. Table 3-7 provides a description of jurisdictional waters of the U.S. that were identified in the analysis area.

Table 3-7. Locations of drainages in Cluster 9 project area

Location	Description
Lybrook E33-2307 well pad	Shallow ephemeral drainage running east to west
Lybrook E33-2307 pipeline/access	Shallow ephemeral drainage running east to west across pipeline
Lybrook L33-2307 well pad and TUA	Shallow ephemeral drainage running south through the southeast portion of well pad
Lybrook P32-2307 well pad	Shallow, ephemeral drainage flowing southwest to northeast through entire length of well pad
	Shallow, ephemeral drainage flowing southeast to northwest in northeastern corner of well pad
Lybrook P32-2307 pipeline/access	Ephemeral drainage flowing west to east across pipeline and access road

Aquifers in the San Juan Basin generally are considered to be confined and artesian due to the overlying low hydraulic conductivity formations and the regional geologic structure. Groundwater recharge occurs

along the topographic high outcrops along the basin margins. Discharge from groundwater aquifers generally occurs in topographic low areas such as the San Juan River in the northwestern part of the basin and the Rio Grande in the southeast (Stone et al. 1983).

The primary aquifers in the BLM/FFO area are the sandstone based Uinta-Animas and the Mesaverde. Groundwater is readily available in most of the BLM/FFO area and is of fair to poor quality. A search was performed of the New Mexico State Engineers Office-Water Administration and Technical Engineering Resource System database for the proposed project area and vicinity (1-mile radius). There are no water wells located within a 1-mile radius of the proposed project area (NMOSE 2013).

3.3.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Potential impacts to surface water and shallow groundwater resources could occur from stormwater runoff and the accidental spill of chemicals, produced water, or flowback fluids. The potential for these impacts would be long term for the life of the proposed action.

The proposed action would temporarily expose an estimated 24.03 acres of soil as a sediment source entering area drainage ways in the short term; 5.1 acres would remain exposed at well pads and access roads in the long term after interim reclamation. Vegetation cover is low to moderate throughout the project area. Exposure of soils, particularly on slopes, would lead to an increase in an undetermined, but likely small, amount of sediment transport, particularly during and following storm events. Slight alterations in project area drainage patterns also may lead to an increase in sediment transport. These increases in sediment transport would persist for several years until the disturbed areas are stabilized. The potential for sediment transport into drainages would be minimized through implementation of best management practices and other preventive measures, such as re-establishment of vegetation and proper site hydrological diversions. The disturbance created by the proposed well pads, access roads, and well-tie pipelines within the ordinary high water mark of waters of the U.S., would be covered under the U.S. Army Corps of Engineers Nationwide Permits #12 (for Utility Line Activities), #14 (Linear Transportation Crossings), or Permit #39 (for Commercial and Institutional Developments). Encana would consult with the U.S. Army Corps of Engineers and provide pre-construction notifications, if required, prior to disturbance.

Water for drilling and completions would be sourced from a private water well that has been permitted by the state of New Mexico. The well has been assigned the POD Number SJ 01979-S4 by the New Mexico Office of the State Engineer. Approximately 1.3 million gallons of water would be used for drilling and completions per well.

Minimal amounts of hazardous materials (e.g., gas, diesel) would be used and stored on location. The potential exists for accidental spills or releases of these materials that could impact local water quality. The proposed wells would be drilled using a closed-loop system to contain drill cuttings and fluids. All chemicals stored on site would be properly contained. Containment structures sufficiently impervious to prevent a discharge to waters of the U.S., such as containment dikes, containment walls, drip pans, or equivalent protective structures, would be installed and maintained. Any spills of non-freshwater fluids would be cleaned up immediately and removed to an approved disposal site in accordance with federal and state regulations.

Stimulation (i.e., hydraulic fracturing or "fracking") is a process used to maximize the extraction of underground resources by allowing oil or natural gas to move more freely from the rock pores to production wells that bring the oil or gas to the surface. Fluids commonly made up of water (99 percent) and chemical additives (1 percent) are pumped into a geologic formation at high pressure during hydraulic fracturing (USEPA 2004). Chemicals added to stimulation fluids may include friction reducers, surfactants, gelling agents, scale inhibitors, acids, corrosion inhibitors, antibacterial agents, and clay stabilizers. When the fracking pressure exceeds the rock strength, the fluids open or enlarge fractures that typically extend several hundred feet away from the well bore, and may occasionally extend up to 1,000 feet from the well bore. After the fractures are created, a proppant (usually sand) is pumped into the fractures to keep them from closing when the pumping pressure is released. After fracturing is completed, a portion of the injected fracturing fluids returns to the wellbore and is recovered for future fracturing operations (USEPA 2004) or disposal. Stimulation techniques have been used in the U.S. since 1949 and in the San Juan Basin since the 1950s. Over the last 10 years, advances in multi-stage and multi-zone hydraulic fracturing have allowed development of gas fields that previously were uneconomic, including the San Juan Basin.

Hydraulic fracturing is a common process in the San Juan Basin and applied to nearly all wells drilled. The producing zone targeted by the proposed action is well below any underground sources of drinking water. The Mancos Shale formation also is overlain by a continuous confining layer. The geological confining layer is the Lewis Shale formation that is located above the Mancos Shale and Mesaverde formations and provides an impermeable layer that isolates the Mancos Shale and Mesaverde formations from both identified sources of drinking water and surface water. On average, total depth of the proposed well bore would be about 5,000 feet below the ground surface. Fracturing in the Basin Mancos formation is not expected to occur above depths of 4,000 feet below the ground surface. Fracturing could extend into the Mesaverde formation overlying the Basin Mancos; however, the formation has not been identified as an underground source of drinking water based on its depth and relative high levels of total dissolved solids. No impacts to surface water or freshwater-bearing groundwater aquifers are expected to occur from hydraulic fracturing of this proposed well.

Potential impacts to groundwater resources could occur from the proposed well bores. The potential for impacts to groundwater from the well bore would be long term for the life of the well. Adherence to the COA and design features, such as adequate casing, cementing, and other drilling and completion methods, would minimize effects to water quality.

Casing specifications would be designed by Encana and a casing program would be submitted to the New Mexico Oil Conservation Division. Surface casing would be set to 500 feet. The casing and cementing would stabilize the wellbore and provide protection to any overlying freshwater aquifers by isolating hydrocarbon zones from overlying freshwater aquifers. Prior to approving an APD, a BLM geologist would identify all potential subsurface formations that would be penetrated by the wellbore. This includes all groundwater aquifers and any zones presenting potential safety or health risks that may need special protection measures during drilling, or that may require specific protective well-construction measures.

Once the geologic analysis is completed, the BLM would review the company's proposed casing and cementing programs to ensure the well-construction design is adequate to protect the surface and

subsurface environment, including potential risks identified by the geologist and all known or anticipated zones with potential risks.

During drilling, the BLM would be on location during the setting of critical casing and cementing intervals. Before hydraulic fracturing takes place, all surface casings and some deeper, intermediate zones must be cemented from the bottom of the cased hole to the surface. The cemented well would be pressure tested to ensure there are no leaks and a cement bond log would be run on certain strings of casing to ensure the cement has bonded to the casing and the formation.

Cumulative Impacts

Reasonably foreseeable development within the Chaco sub-watershed may include an estimated additional 71 oil and gas wells and related facilities. Surface-disturbing activities associated with these actions may affect an estimated 264 acres (USDI/BLM 2003a, page 4-7). The PRMP/FEIS determined that the primary cumulative impacts on water quality would result from surface disturbance, which would generate increased sediment yields (USDI/BLM 2003a, pages 4-123 and 4-124). Cumulative effects to water resources from the proposed action would be maximized shortly after construction begins and would decrease over time as reclamation efforts progress.

The proposed action would cumulatively contribute approximately 5.1 acres of long-term disturbance in the watershed. Cumulative impacts to surface waters would be related to short-term sedimentation or flow changes. Surface-disturbing activities other than the proposed action that may cause accelerated erosion include (but are not limited to) construction of roads or other facilities, installation of trenches for utilities, road maintenance such as grading or ditch-cleaning, public recreational activities, vegetation manipulation and management, prescribed and natural fires, and livestock grazing.

3.4 Upland Vegetation and Noxious Weeds

3.4.1 Affected Environment

The proposed Lybrook E33-2307 well pad, access road, and pipeline ROW are dominated by the Great Basin desert scrub community. The majority of the project area is devoid of vegetation or supports a salt desert scrub community with greasewood (*Sarcobatus vermiculatus*), shadscale (*Atriplex confertifolia*), and four-wing saltbush (*Atriplex canescens*). Ground cover in the salt desert scrub community ranges from 0 to 15 percent. The proposed pipeline ROW would cross an approximately 500-foot section of sagebrush grassland dominated by big sagebrush (*Artemisia tridentata*). Cover in the sagebrush grassland was estimated at 30 percent. No trees are located in the project area and no noxious weeds were observed.

The proposed Lybrook L33-2307 well pad, access road, and pipeline ROW lie within the Great Basin desert scrub community. The dominant species in the project are big sagebrush, saltbush, blue grama (*Bouteloua gracilis*), and rubber rabbitbrush (*Ericameria nauseosa*). Large barren patches occur around the eastern, northern, and western perimeters of the proposed well pad. Ground cover was visually estimated at 0 to 25 percent. Two Utah juniper trees (*Juniperus osteosperma*) are located within the proposed project area. No noxious weeds were observed.

The proposed Lybrook P32-2307 well pad, access road, and pipeline ROW are located in the Great Basin desert scrub community. There are 17 piñon pine (*Pinus edulis*) and juniper trees located within the

project area. Dominant species in the project area include big sagebrush, greasewood, James' galleta, blue grama, Indian ricegrass (*Achnatherum hymenoides*), and needle and thread (*Hesperostipa comata*). Ground cover was visually estimated at 0 to 25 percent. No noxious weeds were observed.

3.4.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Direct impacts would include removal of vegetation during site-clearing activities. Construction of the proposed action would result in removal and modification of approximately 24.03 acres of vegetation, 1.62 of which are previously disturbed, and would remove estimated 19 piñon and juniper trees. Potential impacts pertain to changes in species composition and density, and an increased potential for invasive species to establish. Following reclamation, there would be long-term changes in the density and composition of project area vegetation communities. Trees may not re-establish in the area for several decades. Disturbed areas would be expected to re-vegetate in 2 or more years. There would be a long-term loss of approximately 5.1 acres of vegetation for project access and operation.

Invasive species generally are tolerant of disturbed conditions, and disturbed soils at project sites may provide an opportunity for the introduction and establishment of non-native invasive species. During construction and operation, noxious weed sources could be introduced to disturbed areas from vehicles, equipment, people, wind, water, or other mechanisms. There would be a long-term potential for non-native invasive weeds to establish in the area. Encana would be responsible for monitoring and controlling any non-native invasive weed species within the ROWs and well pads for the life of the project.

Re-vegetation of the well pad construction zones and the pipeline ROWs would be initiated by Encana within 120 days of well completion and pipeline construction. All vegetation removed during site clearing activities would be mowed and incorporated into stockpiled topsoil. Trees 3 inches or greater in diameter would be cut and de-limbed. The area would be reseeded the BLM Badland and Sagebrush-Grass vegetation community seed mixes.

Cumulative Impacts

Within the FFO planning area, there are approximately 435,500 acres of Great Basin desert scrub (USDI/BLM 2003a, page 3-31). Based on the acres of plant community types within the planning area and the estimated total disturbance of future activities, less than 1 percent of the Great Basin desert scrub community would be disturbed within the planning area over 20 years from reasonably foreseeable future actions (USDI/BLM 2003a, page 3-31 and 4-7). The proposed action would cumulatively contribute 5.1 acres of long-term vegetative disturbance in the planning area.

3.5 Wildlife

3.5.1 Affected Environment

The proposed action is not located within a BLM wildlife specially designated area (SDA) and there are no unique habitats within the analysis area. The project area is dominated by the Great Basin desert scrub community. Wildlife common to these habitats include mule deer (*Odocoileus hemionus*), fox (*Vulpes*

spp.), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), and reptiles (snakes and lizards). Sign (burrows, tracks, scat) from coyote (*Canis latrans*), mule deer, desert cottontail, kangaroo rat (*Dipodomys* spp.), and woodrat (*Neotoma* sp.) were observed during biological surveys. A chipmunk (*Sciuridae* spp.) and horned lizard (*Phrynosoma* spp.) also were observed during the biological surveys.

3.5.2 Impacts of the Proposed Action

Direct and Indirect Impacts

Two parameters are considered when evaluating habitat loss: direct habitat loss and effective habitat loss. Direct habitat loss occurs through the removal of vegetation, which reduces the extent or quality of habitat in terms of food and cover. Vegetation removal strips the affected area of its value to wildlife; therefore, direct habitat loss can be quantified by comparing the area of habitat lost to the amount retained. The amount of habitat available to wildlife is called effective habitat. The effectiveness of habitat is lost when a species reduces use of or avoids an area. Loss of effective habitat area can exceed direct habitat loss. Effective habitat loss can occur from habitat fragmentation, disturbance, and interference with wildlife movement. Impacts from habitat fragmentation are related to the loss of large contiguous areas of habitat and the relative increase in habitat “edge” in smaller areas. Construction of roads and other development, as well as human and vehicular traffic on existing roads, can cause habitat fragmentation. Such disturbance can cause animals to shift their activities to other locations or otherwise alter their behavior.

The proposed action would result in the removal and modification of approximately 24.03 acres of vegetation including an estimated 19 widely scattered piñon and juniper trees. Vegetation communities within the proposed project area provide forage and cover for big game and other wildlife species. Since the vegetation removed would not be replaced with the same species, and because removal of vegetation in this previously undisturbed area would result in habitat fragmentation, an alteration of available wildlife habitat and utilization is anticipated. Impacts to wildlife habitat would include short-term loss of natural vegetation and long-term changes in vegetation composition. The majority of direct habitat loss would be short term as areas reclaimed would recover their value as wildlife habitat. However, there would be a long-term loss of approximately 5.1 acres for well operation and access. Most species observed or expected to inhabit the area are generalists and would be minimally affected by the changes in vegetation composition.

Mule deer and elk (*Cervus canadensis*) have been shown to avoid natural gas wells, roads, and areas immediately surrounding them, resulting in a loss of effective habitat. Hebblewhite (2011) summarized that the average zone of influence reported in eight different studies extended about 1,000 meters (3,281 feet) from roads and wells. The nature and extent of this avoidance is dependent upon the type of vegetation, particularly the amount of cover present, topography, traffic volume and whether or not vehicles stop or continue moving; however, responses varied within seasons and among species. Disturbance is a primary factor in effective habitat loss as it can alter the ways wildlife use or move through an area and could push individual animals from preferred habitat into less suitable habitat. Such displacement likely would be localized around the source of the disturbance (e.g., equipment noise, human presence). Data collected by the BLM and New Mexico Department of Game and Fish in the Rosa

Wildlife SDA between 1994 and 2012 indicate a positive correlation between the increasing number of gas wells and accompanying roads, and the decline in mule deer fawn-to-doe ratios.

Since there is so much variability between studies, and no studies specific to the FFO have been completed, a conservative buffer of 400 meters (1,312 feet) was selected to quantify the potential effective habitat loss resulting from the proposed action. Based on a 400-meter buffer of the proposed action, indirect wildlife habitat loss would affect approximately 450 acres. Avoidance by wildlife would depend on the species, time of day, time of year, human activity level, topography, and cover type. It should also be noted that the zone of influence around roads and well pads does not imply 100 percent avoidance (Hebblewhite 2011). Impacts from effective habitat loss would be greatest during construction and drilling and would decrease over time in correlation to human and vehicular activity levels.

During construction, drilling, and completion, there would be short-term impacts to area wildlife because of human and vehicular activity and associated noise. Wildlife in the area would be displaced to adjacent habitat or may temporarily avoid the project area during construction activities. Once the project is complete, wildlife likely would return to the area. It is possible that small wildlife, particularly burrowing species, may be killed during construction, drilling, and completion. During operation, the level of human and vehicular activity in the analysis area would decrease substantially. However, one light-duty vehicle would continue to access the area on a near daily basis. Heavy-duty vehicles (semi-trucks) would access the well sites one or two times a day for approximately 6 months after which traffic trips would decrease to approximately one trip per month. Long-term impacts from vehicle traffic on roads could include incidental mortality to wildlife. Animal-vehicle collisions are variable depending on the time of day, speed and volume of traffic, local topography, structural features of the road, and the size and behavior of individual species. The proposed access roads also would facilitate entry to areas not previously open to vehicular travel, potentially resulting in increases in legal and illegal hunting.

Wildlife could come into contact with chemicals or fluids stored on site. Use of a closed-loop system would minimize potential impacts to wildlife from exposure to chemicals or fluids during drilling and completion. During operation, any open pits would be netted and vent caps placed on all open pipes to prevent birds from entering and nesting. Any spills would be cleaned up promptly; Encana maintains an emergency response plan. All chemicals or fluids stored on site would be properly contained and would have secondary containment.

Cumulative Impacts

Reasonably foreseeable development within the Chaco sub-watershed may include an estimated additional 71 oil and gas wells and related facilities, and 6 miles of new roads. Surface-disturbing activities associated with these actions may affect an estimated 264 acres of wildlife habitat (USDI/BLM 2003a, page 4-7 and 4-8). Other reasonably foreseeable actions such as continued livestock grazing, vegetation treatments, and community development would cumulatively impact wildlife through direct and effective habitat loss. The proposed action would cumulatively contribute approximately 5.1 acres of direct habitat loss and up to approximately 450 acres of indirect wildlife habitat loss in the planning area.

3.6 Special Management Species

3.6.1 Affected Environment

In accordance with BLM Manual 6840, the BLM manages certain sensitive species not federally listed as threatened or endangered in order to prevent or reduce the need to list the species as threatened or endangered in the future. There also are state-listed threatened or endangered species potentially occurring in Sandoval and San Juan counties, New Mexico. Table 3-8 lists the special management species that have the potential to occur in the analysis area. All of these species have the potential to occur throughout the project area. A Biological Survey Report for each proposed well pad project was prepared and is provided in Appendix D. The Biological Survey Reports provide the basis for the findings listed in Table 3-8.

Table 3-8. Species with special management status with potential to occur in the analysis area

Species	Conservation Status	Habitat Associations
Mammals		
Spotted bat (*Euderma maculatum*)	BLM Sensitive State Threatened	Meadows in subalpine coniferous forests are the preferred habitats for this species; rocky cliffs are important for roosting. Also recorded in a wide variety of habitats, from riparian and piñon-juniper woodlands to ponderosa pine and spruce-fir forests.
Townsend's big-eared bat (*Corynorhinus townsendii*)	BLM Sensitive	Roosts mostly in caves or mines; can roost in abandoned buildings at night. In summer, this species occurs widely across the state and can be found over desert scrub, desert-mountains, oak-woodland, piñon-juniper, and coniferous forests.
Birds		
American peregrine falcon (*Falco peregrinus anatum*)	BLM Sensitive State Threatened	Located in rugged terrain with rocky cliffs and canyons (30 to over 1,000 feet high), typically adjacent to rivers, lakes, or streams. Urban areas with towers and buildings also inhabited.
Chestnut-collared longspur (*Calcarius ornatus*)	BLM Sensitive	A native prairie specialist. Winters in grasslands, deserts, and plateaus dominated by low grasses and forbs, where most vegetation is less than 2 feet high.
Bendire's thrasher (*Toxostoma bendirei*)	BLM Sensitive	Typically inhabits sparse desert shrubland and open woodland with scattered shrubs.
Ferruginous hawk (*Buteo regalis*)	BLM Sensitive	Flat or rolling terrain in grasslands, shrub-steppes, deserts, and badlands; prefers elevated nest sites (e.g., buttes, utility poles, trees, and ledges).
Golden eagle (*Aquila chrysaetos*)	BLM Sensitive	In the western U.S., mostly open habitats in mountainous, canyon terrain. Nests primarily on cliffs and in trees.

Species	Conservation Status	Habitat Associations
Prairie falcon (*Falco mexicanus*)	BLM Sensitive	Arid, open regions of grassland or scrub vegetation with cliff formations that are at least 30 feet high. Breeding cliffs sometimes are in semi-open regions with scattered conifer trees and occasionally dense woodlands.
Plants		
Aztec gilia (*Aliciella formosa*)	BLM sensitive	Salt desert scrub communities in soils of the Nacimiento Formation (5,000 to 6,000 feet).
Brack's hardwall cactus (*Sclerocactus cloveriae* ssp. *brackii*)	BLM sensitive	Sandy clay of the Nacimiento Formation in sparse shadscale scrub (5,000 to 6,000 feet).

Sources: USDI/BLM 2008b, 2012; NHNM 2013; BISON-M 2013.

One special-status species was observed within the analysis area: Brack's hardwall cactus. Table 3-9 provides the number of individual Brack's hardwall cacti that were recorded during project-related biological surveys.

Table 3-9. Brack's hardwall cactus observations

	Number and Location of Cacti
Lybrook E33-2307	13 scattered along pipeline
Lybrook L33-2307	15 on north side and southeast corner of well pad
Lybrook P32-2307	10 in southwest corner of well pad

During the pre-planning process and the project design development, several planning measures or design features were implemented to minimize impacts to Brack's hardwall cactus.

- Lybrook E33-23-07: Location was moved to the east and twinned with the existing Federal 1 #4 well pad.
- Lybrook L33-2307: Pad moved 50 feet to the south and shortened by 50 feet on one side.
- Lybrook P32-2307: Corners to be rounded and the construction zone restricted.

3.6.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Impacts to special management species resulting from the proposed action may affect individuals, but are not expected to result in population-level impacts.

The project area provides potential foraging habitat for the spotted bat and Townsend's big-eared bat. No potential roosting habitat would be removed by the proposed action. Impacts to these bat species would be limited to avoidance of the area during nighttime drilling activities when bats may forage in the area. These impacts would be short term.

The project area provides suitable habitat for Bendire's thrasher and suitable wintering habitat for chestnut-collared longspur. The proposed action would result in the modification of approximately 24.03 acres, including 1.62 acres that have been previously disturbed, and the loss of an estimated 19 piñon and juniper trees of varying size. Long-term loss of these habitats would be approximately 5.1 acres.

The project area contains open desert scrub, providing potential foraging habitat for the golden eagle, ferruginous hawk, American peregrine falcon, and prairie falcon. No potential nesting habitat for these species would be removed or modified by the proposed action. It is possible that these raptor species could forage in the vicinity or fly through the analysis area. Direct impacts would include the modification of 24.03 acres of foraging habitat for these raptor species. Approximately 19 piñon and juniper trees of various ages and sizes would be removed by the proposed action, resulting in a long-term loss of potential perch sites. This loss of perch habitat is not expected to adversely affect the foraging abilities of these raptor species, given the abundance of suitable sites in the surrounding area and the large size of their home ranges. After reclamation, there would be a short-term change in vegetation density and composition which could affect the prey base for these raptors. Additional impacts may include avoidance of the project area by these raptor species during construction, drilling, and operation due to disturbance and activity from human and vehicle presence and associated noise. The loss of effective habitat would be localized around the proposed well pads and access roads, and would vary based upon the species habitat requirements and life histories. Impacts from the loss of 5.1 acres of suitable foraging habitat would be long term.

The exposed Nacimiento Formation soils in the proposed project area and surrounding hills provide potential habitat for the Aztec gilia. No Aztec gilia were observed during field surveys and no direct impacts to Aztec gilia are anticipated from the proposed action; however, approximately 22.41 acres of potential undisturbed unoccupied habitat would be impacted in the long term.

The proposed action would result in the long-term modification of approximately 22.41 acres of undisturbed potential habitat for the Brack's hardwall cactus, some of which is currently occupied. A total of 38 individual Brack's hardwall cacti were recorded during biological surveys. In coordination with the BLM/FFO biologist, Brack's hardwall cacti would be transplanted into suitable, adjacent habitat prior to construction activities in accordance with BLM policy. A biological consultant approved by BLM would be on site to monitor these activities. Temporary fencing would be erected around Brack's hardwall cacti along proposed ROWs and at the edge of disturbance around well pads to restrict vehicle traffic and avoid impacts to the cactus. All Brack's hardwall cacti that cannot be avoided by project-related activities at the Lybrook E33-2307 site would be transplanted in accordance with BLM requirements (Kendall 2014). Similar mitigations would be implemented at the Lybrook L33-2307 and Lybrook P32-2307 sites, in accordance with BLM policy.

Cumulative Impacts

The FFO would continue to manage non-federally listed species according to BLM policies and guidelines, with the goal of contributing to the conservation of these species to reduce the potential for being listed under the Endangered Species Act (ESA) of 1973, as amended (USDI/BLM 2003a, 4-111). For reasonably foreseeable actions on federal lands, direct impacts to nesting special status raptor species would be avoided through the BLM's siting criteria. Development on federal and private lands would

result in the removal or modification of potential foraging habitat. These effects would be related to availability of undisturbed habitat and the amount of disturbance that would occur within the project area.

The PRMP/FEIS determined that up to 5.5 percent (128,000 acres) of vegetation in the planning area could be impacted cumulatively by oil and gas development (USDI/BLM 2003a, page 4-125). Other reasonably foreseeable actions within the planning area that could impact special status species would include livestock grazing, agriculture, commercial and residential development, mining, and vegetation management. The proposed action would not contribute appreciably to a cumulative habitat loss for BLM special management species within the planning area.

3.7 Migratory Birds

3.7.1 Affected Environment

Under the Migratory Bird Treaty Act and Executive Order 13186, federal agencies are required to consider impacts to migratory birds from management activities. The BLM migratory bird conservation policy for the planning area is detailed in Instruction Memorandum No. NM-F00-2010-001 (USDI/BLM 2010). This management policy establishes a consistent approach for addressing migratory bird populations and habitats when by making project level implementation decisions. The management policy also outlines best management practices and design features to avoid or minimize impacts.

While all migratory songbirds are protected by law, certain species have been determined to be at greater risk than others. More than 350 avian species occur in San Juan County and the surrounding area administered by the BLM/FFO, which includes portions of Sandoval County. Data collected through breeding bird surveys coordinated by the USFWS and private sector efforts provided the basis for the New Mexico Partners in Flight (NMPIF) organization to develop bird “watch lists” and the USFWS list of Birds of Conservation Concern. The NMPIF also identified priority species of birds by habitat type for the state of New Mexico. The FFO area lies within the Colorado Plateau physiographic region, as identified by the NMPIF. The proposed project area contains one of the habitat types, the Great Basin desert shrub (sage-grass).

The Bird Conservation Plan developed for the state of New Mexico by the NMPIF lists the sage thrasher (*Oreoscoptes montanus*) and sage sparrow (*Amphispiza belli*) as a “highest priority” species for conservation in the Great Basin desert shrub habitat. Priority species in piñon-juniper woodland habitat include the gray vireo (*Vireo vicinior*), piñon jay, and juniper titmouse *(Baeolophus ridgwayi)*. Most of the priority bird species identified by the NMPIF also occur on the USFWS Division of Migratory Bird Management list of “Birds of Conservation Concern 2008” within the Bird Conservation Region 16-Southern Rockies/Colorado Plateau. Birds included on this list are those “species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the ESA of 1973” (USFWS 2008).

A variety of bird species may be found in the proposed project area such as Bendire’s thrasher, loggerhead shrike (*Lanius ludovicianus*), and vesper sparrow (*Pooecetes gramineus*).

3.7.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Executive Order 13186 calls for increased efforts to fully implement the Migratory Bird Treaty Act. In keeping with this mandate, the BLM consulted the NMPIF Bird Conservation Plan for the state of New Mexico and the USFWS list of Birds of Conservation Concern. A review of these documents, specifically as they pertain to the Colorado Plateau physiographic area, indicates there are three "priority" avian species with a known range of distribution in the FFO planning areas that utilize the piñon-juniper woodland habitat and eight priority species that utilize the sage-grass habitat within the Great Basin desert shrub habitat.

Various types of perturbations and/or anthropogenic activity may affect these species. These species and a brief assessment of the effects of the proposed action on their habitat are provided in Table 3-10.

Table 3-10. Migratory bird species of concern potentially occurring within the project area and effects from the proposed action

Species	Habitat Type	Effects
Grasshopper sparrow (*Ammodramus savannarum*)	Sage-grass	May be positively affected due conversion to grassland
Sage sparrow[1] (*Amphispiza belli*)	Sage-grass	May be positively affected due conversion to grassland
Burrowing owl (*Athene cunicularia*)	Sage-grass	No effect; nests in abandoned prairie dog burrows
Ferruginous hawk (*Buteo regalis*)	Sage-grass/piñon-juniper interface	Short- and long-term loss of foraging habitat
Mountain plover (*Charadrius montanus*)	Sage-grass	No effect; no suitable habitat in the project area
Long-billed curlew (*Numenius americanus*)	Sage-grass	May be positively affected due to conversion to grassland
Sage thrasher[1] (*Oreoscoptes montanus*)	Sage-grass	May be positively affected due to conversion to grassland
Bendire's thrasher (*Toxostoma bendirei*)	Sage-grass	May be positively affected due to conversion to grassland

[1] "High Priority" bird species that are on the NMPIF Priority Species List, but not on the USFWS Birds of Conservation Concern 2008 list. Source NMPIF 2007

Direct impacts to migratory birds would include the disturbance and modification of approximately 24.03 acres of undisturbed desert scrub vegetation. There would be a long-term loss of approximately 5.1 acres of habitat, which would be converted to an industrial use. Migratory birds would be impacted by disturbance during construction, drilling, and completion; these impacts would be short term. During production, impacts to migratory birds would be related to an increase in habitat fragmentation and disturbance from periodic traffic for maintenance and fluid removal.

Impacts to migratory birds would be greater should construction occur during the breeding season of May 15 through July 31. Construction, drilling, and completions during this period could result in nest destruction or may cause some nest abandonment in adjacent areas. Pre-construction surveys will be

conducted to identify any active nests within the proposed project area should construction occur between May 15 and July 31. Migratory birds could come into contact with chemicals or fluids stored on site. Open pits would be netted and vent caps placed on all open pipes to prevent birds from entering and nesting. Any spills would be cleaned up promptly. Although individual migratory birds could be impacted by the proposed action, no population level impacts are expected.

Cumulative Impacts

Other reasonably foreseeable actions within the planning area that could impact migratory birds include livestock grazing, agriculture, commercial and residential development, mining, wildfire, and vegetation management. Cumulative impacts to migratory birds from the proposed action would result from the long-term changes in density and composition of approximately 24.03 acres of Great Basin desert scrub habitat. The proposed action would contribute to cumulative habitat fragmentation within the planning area from construction of approximately 0.4 mile of new road. The proposed action would contribute negligible impacts to migratory birds when combined with past, present, and future actions.

3.8 Cultural Resources

3.8.1 Affected Environment

The proposed project area is located within the archaeologically rich San Juan Basin of northwestern New Mexico. In general, the prehistory of the San Juan Basin can be divided into five major periods: PaleoIndian (ca. 10000 B.C. to 5500 B.C.), Archaic (ca. 5500 B.C. to A.D. 400), Basketmaker II through III and Pueblo I through IV periods (A.D. 1 to 1540), and the historic (A.D. 1540 to present) that includes Native American as well as later Hispanic and Euro-American settlers. A detailed description of these periods and select phases within each period is provided in the Farmington PRMP/FEIS (USDI/BLM 2003a).

Cultural sites vary considerably, and can include but are not limited to simple artifact scatters, domiciles of various types with a myriad of associated features, rock art and inscriptions, ceremonial/religious features, and roads and trails.

Prior to all field surveys of the analysis area, a Class I investigation of records at the BLM/FFO and an online search of Archeological Records Management Services was conducted to determine if any sites have been recorded within 0.25 mile of the survey area.

The entire area of potential effect for the proposed action was archaeologically surveyed by La Plata Archaeological Consultants (LAC) at a BLM Class III level (100 percent). Four reports were prepared and submitted to the BLM in accordance with the *Procedures for Performing Cultural Resources Fieldwork on Public Lands in the Area of New Mexico BLM Responsibilities* (USDI/BLM 2005). The cultural resource survey results are included in four reports and are summarized as follows:

Lybrook E33-2307 (LAC 2013-6t; BLM 2014(I)038F): No previously recorded sites were identified within 0.25 mile of the proposed location and no cultural resources were identified during survey.

Lybrook L33-2307 (LAC 2012-1jjjj; BLM 2014(I)021F): No previously recorded sites were identified within 0.25 mile of the proposed location and no cultural resources were identified during survey.

Lybrook P32-2307 (LAC 2013-6s; BLM 2013(IV)029F): No previously recorded sites were identified within 0.25 mile of the proposed location and no cultural resources were identified during survey.

Lybrook Access Road 2 (LAC Report 2012-31a; BLM 2014(II)023F): There are eight previously recoded sites within 0.25 mile of the proposed Lybrook Access Road #2. During the survey, one of the previously recorded sites and four newly discovered sites were encountered. The previously recorded site is recommended as eligible for listing under criterion d. Three of the newly discovered sites need data before eligibility determinations can be made and the fourth was determined to be ineligible.

3.8.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Direct impacts normally include alterations to the physical integrity of a cultural site. If a cultural site is significant for other than its scientific information, direct impacts also may include introduction of audible, atmospheric, or visual elements that are out of character for the cultural site. A potential indirect impact from the proposed action is the increase in human activity or access to the area with the increased potential of unauthorized removal or other alteration to cultural sites in the area.

Significant cultural sites (e.g., National Register eligible/listed/undetermined) are being avoided with implementation of design features such as, but not limited to, reduction of construction areas, temporary barriers, and site monitoring. These design features are detailed in the BLM Cultural Resource Record of Review, attached to the COA in the APDs and ROW grants.

The proposed action is not known to physically threaten any Traditional Cultural Property, prevent access to sacred sites, prevent the possession of sacred objects, or interfere with or otherwise hinder the performance of traditional ceremonies/rituals. The Proposed Action would have no direct or indirect impact on significant cultural sites.

Cumulative Impacts

The proposed action would have no negative cumulative impact on cultural resources, as significant cultural sites would be avoided. A positive cumulative effect is the additional scientific information yielded by the archaeological surveys.

3.9 Paleontological Resources

3.9.1 Affected Environment

The proposed project is located within the paleontological rich area of the San Juan Basin of northwestern New Mexico. The BLM uses the Potential Fossil Yield Classification (PFYC) system to identify areas with a high potential to produce significant fossil resources (USDI/BLM 2007). The BLM's PFYC system is a predictive modeling tool developed to provide baseline guidance for assessing and mitigating paleontological resources. It is intended to be used at an intermediate point in analyses and to assist in determining the need for further mitigation assessment or actions. This system has ranked all lands within the BLM/FFO planning area with a Class 5 designation. Class 5 designations are described as being "Very High Potential" paleontological resource areas, thus requiring an assessment at the project level.

The BLM/FFO recognized eight paleontological specially designated areas in the RMP in order to preserve important paleontological resources for scientific study, protection, and other public benefits (USDI/BLM 2003b, page 4-117). The BLM determined that these areas require special management attention to protect and prevent irreparable damage to important paleontological resources. The proposed project is located in the Lybrook Fossil Area SDA. The Lybrook Fossil Area is one of the earliest paleontology study areas found in the San Juan Basin, with E.D. Cope working there in 1874 (USDI/BLM 2003a: Appendix C, p. C87). The Lybrook Fossil Area is managed by the BLM, which contains approximately 26,000 acres of land within its boundary. The explicit management goal for the area is to promote scientific study and protect fossil resources. Pursuant to the BLM RMP (USDI/BLM 2003a), ROWs in the SDA are granted on a case-by-case basis with stipulations that protect paleontological values.

3.9.2 Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed project was assessed individually based on analyses conducted for the BLM/FFO 2003 RMP using the BLM's PFYC system, geographic information system-based locality data, known paleontological locality information, existing paleontological reports for the area, aerial photos, soils maps, existing reports, and scientific publications for the area. BLM personnel took part in the siting of project components. The proposed Lybrook L33-2307 well pad was sited and designed to minimize potential impacts to paleontological resources. No other paleontological resources were identified in the analysis area.

Effects to fossil localities could result from ground-disturbing activities or disturbance of the stratigraphic context in which they are located. Alterations to the physical integrity of bedrock or potentially fossil-yielding alluvium may occur and would have a direct effect on unidentifiable or irretrievable fossil resources. The proposed action also could create indirect impacts to areas by changing erosion patterns. Additionally, an increase in human activity in the area could result in accessibility to remote areas and could lead to looting or vandalism of paleontological resources in the area.

A paleontological monitor would be on site during construction of the Lybrook P32-2307 well pad, pipeline and access road.

Cumulative Impacts

The proposed action is not expected to impact significant paleontological resources or contribute to cumulative impacts.

3.10 Livestock Grazing

3.10.1 Affected Environment

The BLM/FFO manages 167 grazing allotments with 351 grazing authorizations that permit cattle, sheep, and horse grazing within the planning area. Of the 351 grazing authorizations, 317 are permitted under Section 3 of the Taylor Grazing Act. Additional authorizations under Section 15 permit grazing on 30 allotments in the Lindrith, New Mexico area.

The proposed action would be located within the boundaries of three BLM/FFO grazing allotments—South Equus (5111), Escavada AMP (6014), and Counselor Community (6015). Table 3-11 lists details of these allotments.

Table 3-11. Details of grazing allotments in the analysis area

Allotment Number	Livestock Number	Livestock Type	Period Begin Date	Period End Date	AUM[1]
5111	30	Cattle	03/01	02/28	328
6014	300	Cattle	03/01	02/28	2880
6014	4	Horse	03/01	02/28	38
6015	324	Cattle	03/01	02/28	1431
6015	15	Horse	03/01	02/28	24
6015	1554	Sheep	03/01	02/28	4447

[1]animal unit month

3.10.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Surface disturbance associated with construction of the proposed action would remove approximately 24.03 acres of vegetation, resulting in a reduction in forage and a change to the vegetative species composition. Impacts to grazing resources would occur from the direct short-term loss of approximately 1 animal unit month (AUM) at an estimated 25 acres per AUM. Reclaimed areas would be expected to re-vegetate within 1 to 2 years following reclamation. There would be a long-term loss of approximately 0.25 AUM resulting from conversion of 5.1 acres to an industrial use for the well pads and access roads. Reseeding of disturbed areas with the approved seed mix composed of grasses and palatable shrubs may result in an increase in available forage within the affected allotments. This increase is not expected to be measurable.

Cattle, sheep, and the occasional horse may occur in or near the proposed analysis area, depending on the time of year. Livestock also could become trapped in the open trench and long sections of the open trench could present barriers to livestock movement. There would be a potential for livestock collisions with equipment and vehicles working in the area. However, livestock would be expected to avoid the area due to increased noise and activity. Gaps would be made in topsoil or subsoil stockpiles as needed to allow for livestock crossing. Pipeline trenches would be inspected for livestock prior to laying pipe and back filling; trenches would not be left open for more than 24 hours.

An existing fence line would be cut and braced for the proposed Lybrook P32-2307 access road and pipeline installation. A cattle guard and gate would be installed on the road. H-braces installed prior to cutting the fence would be constructed in accordance with the BLM Gold Book Standards (USDI/USDA 2007). Grazing permittees would be notified prior to construction.

Cumulative Impacts

Other reasonably foreseeable activities within the planning area that would impact forage resources include off-highway vehicle traffic, vegetation treatments, and grazing. The PRMP determined that total surface disturbance from oil and gas development in the planning area would affect about 1.6 percent of the San Juan Basin. Added to other surface disturbance from urban development, the overall effect of removing rangeland acreage from production would still be minimal when compared to the acreage of available forage (USDI/BLM 2003a, pages 4-126 to 4-127). When added to past, present, and reasonable foreseeable activities within the grazing allotments, the proposed action would not result in measurable changes to the allotment's carrying capacity or to available AUMs.

4. SUPPORTING INFORMATION

4.1 Tribes, Individuals, Organizations, or Agencies Consulted

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Appendix A– Maps and Photographs

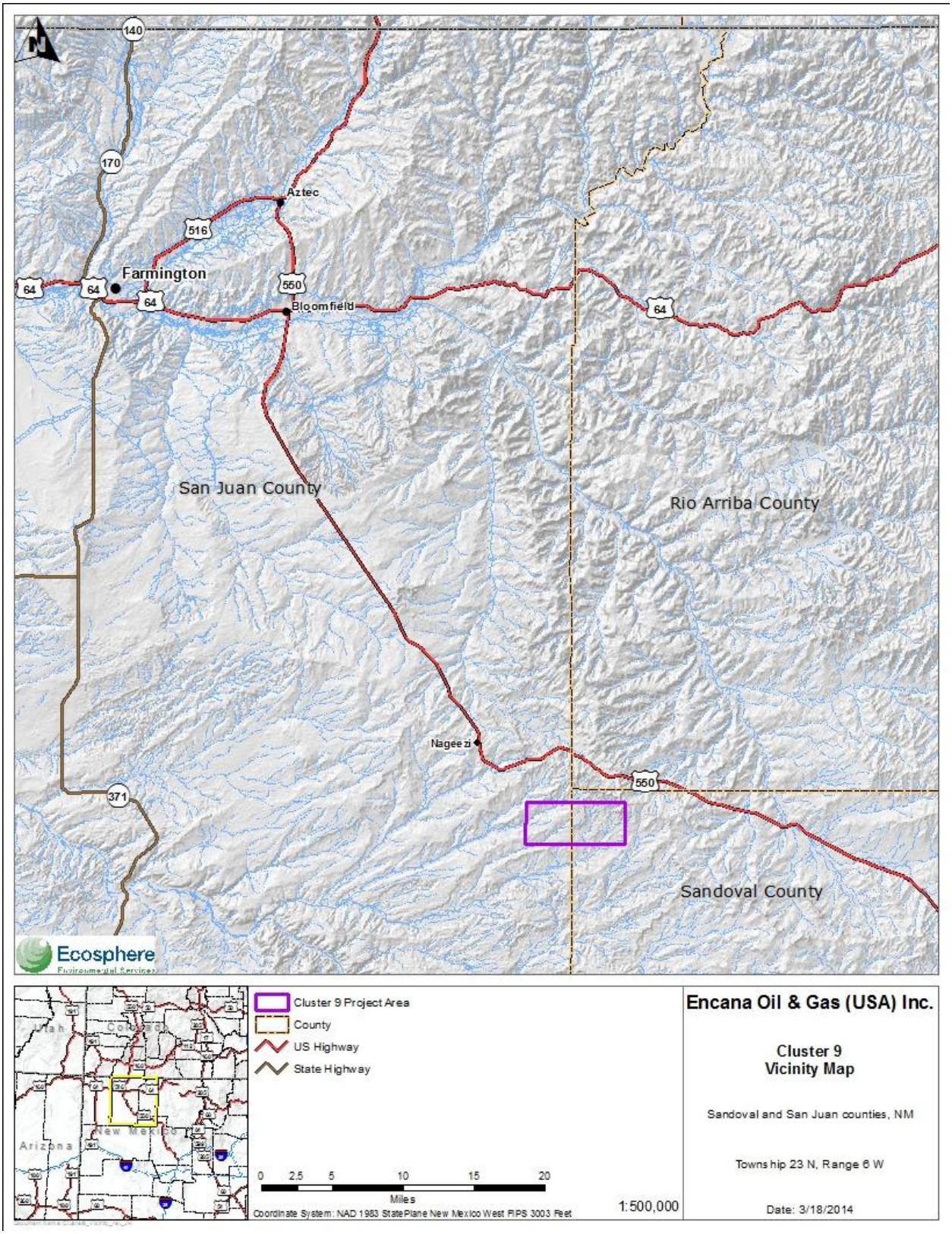


Figure 1. Proposed Lybrook Cluster 9 Vicinity Map

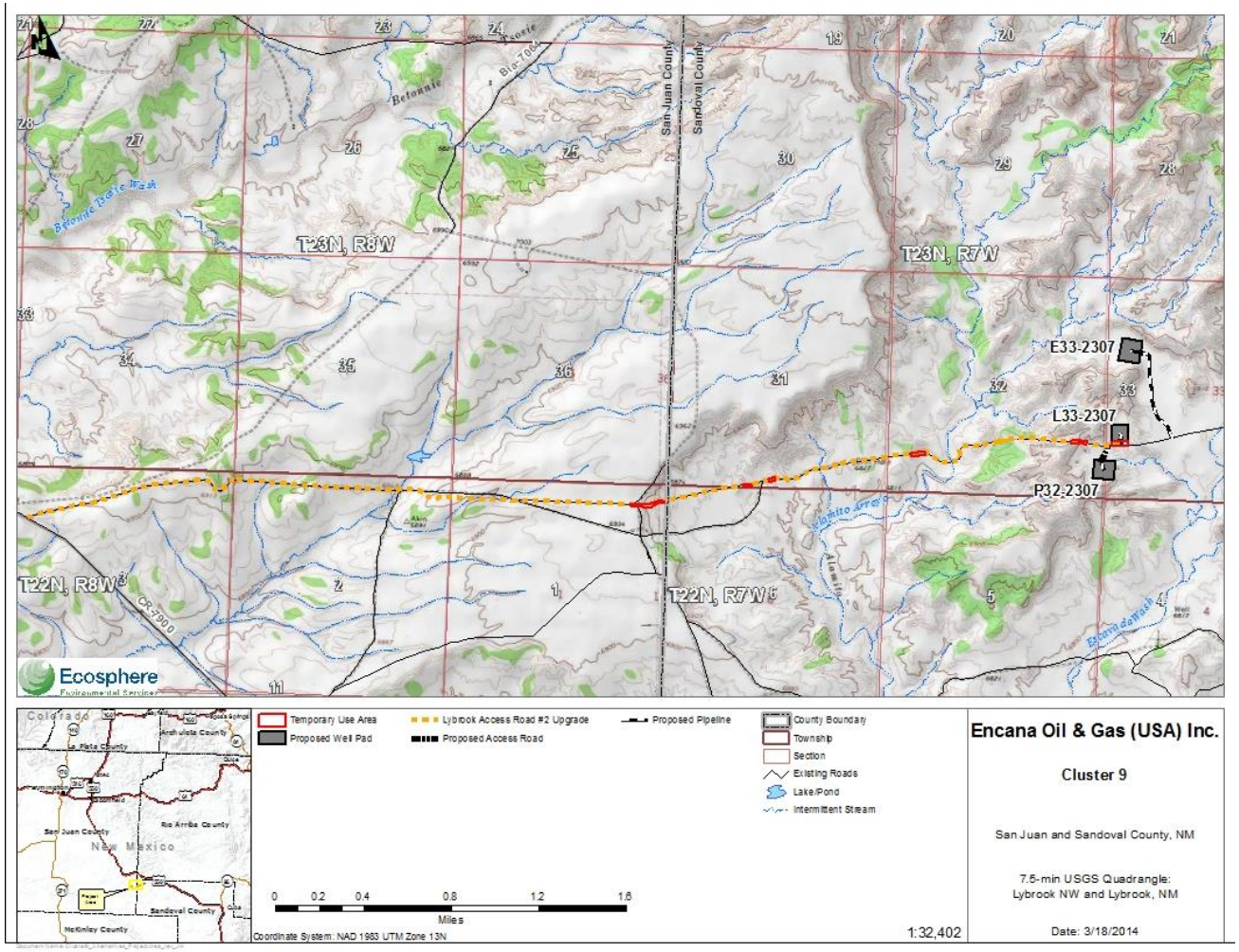


Figure 2: Proposed Lybrook Cluster 9 Project Area Map

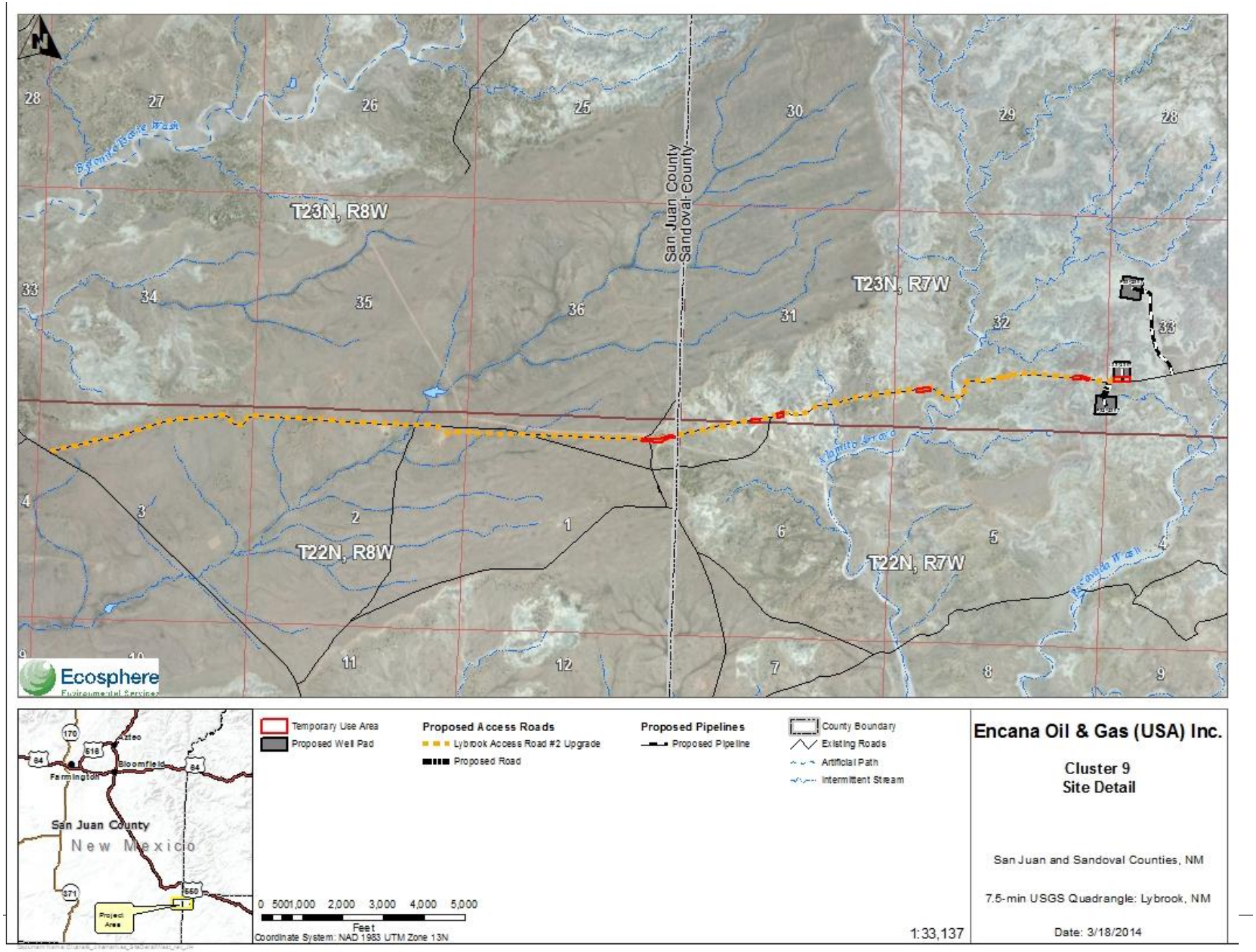
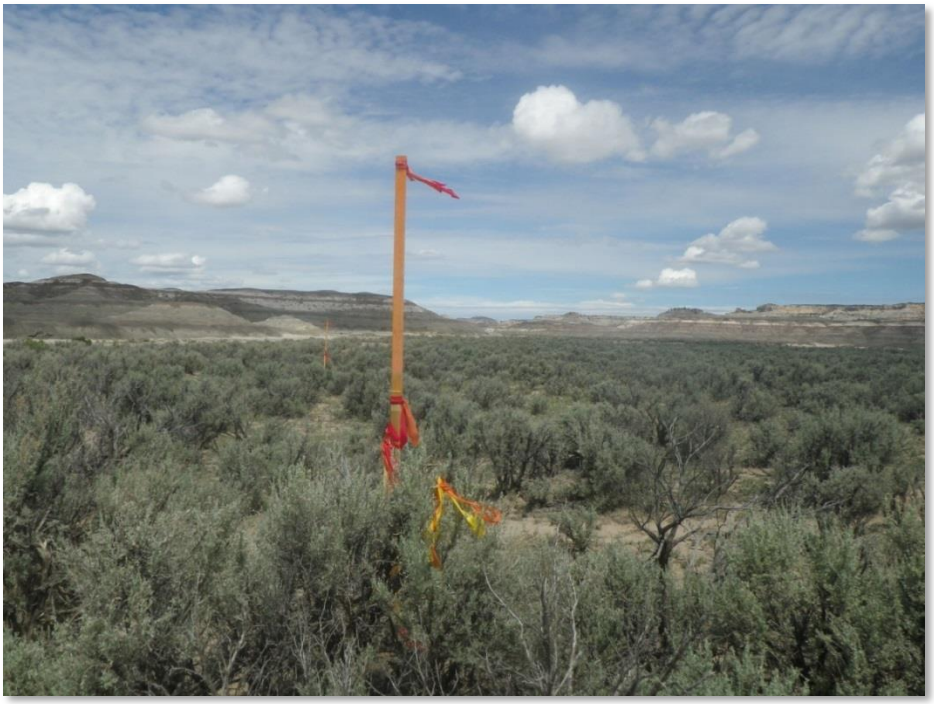

T23N, R8W
T23N, R7W
T22N, R8W
T22N, R7W
San Juan County
Sandoval County
Ecosphere
Temporary Use Area
Proposed Well Pad
Proposed Access Roads
Lybrook Access Road #2 Upgrade
Proposed Road
Proposed Pipelines
Proposed Pipeline
County Boundary
Existing Roads
Artificial Path
Intermittent Stream
Encana Oil & Gas (USA) Inc.
Cluster 9
Site Detail
San Juan and Sandoval Counties, NM
7.5-min USGS Quadrangle: Lybrook, NM
Date: 3/18/2014
San Juan County
New Mexico
Farmington
Bloomfield
Aztec
Project Area
0 500 1,000 2,000 3,000 4,000 5,000
Feet
Coordinate System: NAD 1983 UTM Zone 13N
1:33,137

Figure 3: Proposed Lybrook Cluster 9 Site Detail Map

Photograph 1: Lybrook E33-2307, well pad center stake (looking south)

Photograph 2: Lybrook E33-2307, start of access road (looking west)



Photograph 3: Lybrook E33-2307, end of pipeline (looking north)

Photograph 4: Lybrook L33-2307, well pad southwest corner 5 (looking northeast)

Photograph 5: Lybrook L33-2307, start of access road (looking north towards well pad)

Photograph 6: Lybrook P32-2307, well pad southeast corner 5 (looking northwest)

Photograph 7: Lybrook P32-2307, access road (looking south towards well pad)

Appendix B – Applications for Permit to Drill and Right-of-Way Grant Applications

Appendix C – Conditions of Approval and Stipulations

Appendix D – Biological Survey Reports