`United States Department of the Interior
Bureau of Land Management

BLM

Environmental Assessment

BLM-NM-F0102014-120

Cluster 18A

Lybrook G30-2307 01H, ATS-F010-14-59 02H, ATS-F010-14-60,

03H, ATS-F010-14-61 and 04H, ATS-F010-14-62

(Lease Number NM 36943 & NM NM 81638)

Lybrook G31-2307 01H, ATS F010-14-63, 02H, ATS F010-14-64 and

03H, ATS F010-14-65

(Lease Number NM 6681 & ST NM LG-9090)

Lybrook J31-2307 01H, ATS F010-14-76 and 02H, ATS-F010-14-77

(Lease Number NM 6681 & ST NM LG-3925)

Lybrook M35-2308 01H, ATS-F010-14-68 02H, ATS-F010-14-69,

03H, ATS-F010-70 and 04H, ATS-F010-14-71

(Lease Number NM 76842 and NM NM 48989A)

Lybrook O30-2307 01H, ATS-F010-14-78 02H, ATS-F010-14-79

and 03H, ATS-F010-14-80

(Lease Number NM 36943 & NM 6681)

Lybrook O35-2308 01H, ATS-F010-14-66 and 02H, ATS-F010-1467

(Lease Number NM 76842 & NM NM 48989A)

Chaco Trunk #2 Phase 1 Pipeline

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It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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ACRONYMS

°F	degrees Fahrenheit
$\mu g/m^3$	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
EIS	Environmental Impact Statement
Encana	Encana Oil & Gas (USA) Inc.
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
MLA	Mineral Leasing Act
NAAQS	National Ambient Air Quality Standard
NATA	National Scale Air Toxics Assessments
NEPA	National Environmental Policy Act
NMAAQS	New Mexico Ambient Air Quality Standards
NMPIF	New Mexico Partners in Flight
NMPM	New Mexico Principal Meridian
NO_2	nitrogen dioxide
NOx	nitrous oxides
PFYC	Potential Fossil Yield Classification
PL	Public Law
PM	particulate matter

PM_{10}	particulate matter with a diameter between 2.5 and 10 micrometers
$PM_{2.5}$	particulate matter with a diameter 2.5 micrometers or less
ppb	parts per billion
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
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
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 G30-2307, Lybrook G31-2307, Lybrook J31-2307, Lybrook M35-2308, Lybrook O30-2307, and Lybrook O35-2308 well pads and Chaco Trunk #2 Phase 1 Pipeline (Cluster 18A) 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 (FFO) and the State of New Mexico. Encana has filed Applications for Permit to Drill (APDs) with the BLM/FFO to drill four wells from the Lybrook G30-2307, three wells from the Lybrook G31-2307, and two wells from the Lybrook J31-2307 well pads. Encana has also applied for right-of-way (ROW) grants with the BLM/FFO to construct the three proposed well-tie pipelines for these wells. Encana has also applied with the New Mexico State Land Office for a New Mexico Off Lease Well Pad Business Lease Easement to construct a portion of the proposed Lybrook J31-2307 access road. Four wells would be drilled from the Lybrook M35-2308 well pad, three wells from the Lybrook 030-2307, and two wells from the Lybrook O35-2308 well pad. These three well pads would be located off lease and permitted through ROW grants issued by the BLM/FFO. Encana has also applied for ROW grants to construct the associated well-tie pipelines, the Chaco Trunk #2 Phase 1 gathering line, and the off-lease access roads.

Surface disturbance activities associated with drilling the wells would include construction of six well pads, access roads, and subsurface well-tie pipelines, a gathering line, and improving existing access roads. The analysis area is located approximately 3.25 miles southwest of Lybrook, New Mexico on an elevated mesa between Betonnie Tsosie Wash and Escavada Wash.

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 to construct the proposed well pads, access roads, and pipelines and to drill the proposed wells. These mineral leases are NM 36943 and NMNM 81638 (Lybrook G30-2307), NM6681 and ST NM LG-9090 (Lybrook G31-2307), NM 6681 and St NM LG-3925 (Lybrook J31-2307), NM 76842 and NMNM 48989A (Lybrook M35-2308), NM 36943 and NM 6681 (Lybrook 030-2307), and NM 76842 and NMNM 48989A (Lybrook 035-2308). 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 to permit the development of those leases. The need for the action is also established by the BLM's authority under the 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 APDs and 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 that warrant further analysis in an Environmental Impact Statement (EIS). The BLM/FFO Field Manager is the responsible officer who will decide one of the following:

- To approve the proposed APDs and ROW grants with design features as submitted
- To approve the proposed APDs and ROW grants with additional mitigations
- To analyze the effects of the proposal in an EIS
- To deny the APDs and 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 December 2003 and updated in December 2003 (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.nm.blm.gov/ffo/ffo_home.html. This project EA addresses site-specific resources and/or impacts that are not covered within the PRMP/FEIS, as required by the 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 managing agencies to expedite the production of the federal mineral estate for the development of reliable domestic sources of energy (USDI/BLM 2003b, pages 1 and 11). The proposed project would not be in conflict with any local, county, or state plans.

A reasonably foreseeable development scenario (RFDS) was developed for the 2003 RMP that estimated foreseeable oil and gas development in the New Mexico portion of the San Juan Basin, beginning in January 2002 and lasting for 20 years. The RFDS also contemplated technological advances that could alter development of the basin during the 20-year period. The Mancos Shale reservoir was analyzed in the RFDS as an emerging gas play over a large part of the basin, where it had not been previously developed (Engler et al. 2001). The PRMP/FEIS for the 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 that approved 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 as well as obtain the necessary permits for the proposed action. These laws and regulations include, but are not limited to the following:

- Antiquities Act of 1906, as amended (Public Law [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 2008, 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 BLM 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 the development of the proposed action through scoping.

The following issues 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 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?

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 that 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. Both well locations are in proximity to Sis Naateel, (Sisnathyel Mesa, Wide Belt Mesa) reported to be the home of several holy individuals important in Blessingway and to be the location of where the Navajo acquired sheep and horses. There is some ambiguity on the identification of this mesa. It is clearly described by Van Valkenburgh (1941:171) as a "large quasi-rectangular mesa standing isolated in the southwestern township of the Jicarilla Apache Indian reservation… 10 miles east of Counselors trading post." (See also Van Valkenburgh [1974:32-37].)

Brugge (1993:18) encountered the problems of Navajo toponymy and correlating names recorded on recent USGS maps. Brugge (1993:18) went on to state that "the work of Van Valkenburgh has been of value. His descriptions are usually "more detailed than those of other students of Navajo culture…" The mesa is shown on the current USGS map as "Sisnathyel Mesa does not seem to conform to Van Valkenburgh's description. Otherwise, there are currently no known remains in the proposed action area 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). 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 with the potential to occur in Sandoval or San Juan counties and or potential habitats for federally listed species were observed within the analysis area. Furthermore, no designated critical habitat for any federally listed species occurs within the analysis area. Water used for well drilling and completions would be sourced from a permitted private water well (Point of Diversion Number SJ 01979-S4). No new water depletions would result from the proposed action. 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). No further consultation with the U.S. Fish and Wildlife Service (USFWS) is required.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

Encana is proposing development of the Cluster 18A well pads, well-tie pipelines, access roads, and trunk pipeline to access the mineral estate administered by the BLM/FFO. The analysis area is located in the central portion of the San Juan Basin in the Lybrook area in Sandoval and San Juan counties. The analysis area is approximately 3.25 miles southwest of Lybrook, 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 United States Geological Survey 7.5-minute topographic maps. Figure 3 displays the proposed action on the Lybrook and Lybrook NW, New Mexico 2010 New Mexico digital photo orthoquads (see Appendix A). Photographs of the proposed action components are provided in Appendix A. The legal description of the proposed action components are listed in Table 2-1.

Table 2-1. Legal description of the surface location of proposed action components

Component		Legal Description
Lybrook G30-2307	Well Pad	NE ¼ of Section 30, Township 23 North, Range 7 West, New Mexico Principal Meridian (NMPM) in Sandoval County
	Access Road and Pipeline	SW ¼ NE ¼ of Section 30, Township 23 North, Range 7 West, NMPM in Sandoval County
Lybrook G31-2307	Well Pad	NE ¼ of Section 31, Township 23 North, Range 7 West, NMPM in Sandoval County
	Access Road and Pipeline	SW ¼ NE ¼ of Section 31, Township 23 North, Range 7 West, NMPM in Sandoval County
Lybrook J31-2307	Well Pad	SW ¼ of Section 31, Township 23 North, Range 7 West, NMPM in Sandoval County
	Access Road and Pipeline	Section 31, Township 23 North, Range 7 West, NMPM in Sandoval County Section 36, Township 23 North, Range 8 West, NMPM in San Juan County
Lybrook M35-2308	Well Pad	SW ¼ of Section 35, Township 23 North, Range 8 West, NMPM in San Juan County
	Access Road and Pipeline	S ½ SW ¼ of Section 35, Township 23 North, Range 8 West, NMPM in San Juan County
Lybrook O30-2307	Well Pad	SE ¼ Section 30, Township 23 North, Range 7 West, NMPM in Sandoval County
	Access Road and Pipeline	S ½ SE ¼ Section 30 and NE ¼ of Section 31 of Township 23 North, Range 7 West, NMPM in Sandoval County
Lybrook O35-2308	Well Pad	SE ¼ of Section 35, Township 23 North, Range 8 West, NMPM in San Juan County
	Access Road and Pipeline	SW ¼ SE ¼ of Section 35, Township 23 North, Range 8 West NW ¼ NE ¼ of Section 2, Township 22 North, Range 8 West NMPM in San Juan County
Chaco Trunk #2 Phase 1		Section 1, Township 22 North, Range 8 West Section 36, Township 23 North, Range 8 West, NMPM in San Juan County Section 30 and 31, Township 23 North, Range 7 West, NMPM in Sandoval County

Activities associated with the proposed project would include construction of access roads and well pads; drilling, stimulation, and completion of the proposed wells; installation of surface facilities necessary to produce the wells; and installation of pipelines to transport natural gas to markets. These activities are detailed in the following sections.

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 57.39 acres with 19.6 acres of disturbance remaining after interim reclamation for access and operation.

Table 2-2. Summary of proposed disturbance for the proposed action

Name	Pad Area (acres)	Pipeline/Road Length[1] (feet)	Pipeline/Road Area (acres)	Pipeline (feet)	Pipeline Area[2] (acres)	New Road Length[3] (feet)	Road Area (acres)	Total (acres)
Lybrook G30-2307	6.77	679	0.45			2,871	0.659	7.88
Lybrook G31-2307	6.77	515	0.34			870 [4]	0.20	7.31
Lybrook J31-2307	6.77	934	0.84			4,138 [4]	0.95	8.56
Lybrook M35-2308	6.77	452	0.14			270	0.19	7.09
Lybrook 030-2307	6.77	681	0.57			4,600 [4]	1.06	7.34
Lybrook 035-2308	6.08	475	0.54					6.62
Chaco Trunk #2 Phase 1 Pipeline				13,139	12.59			12.59
Total								**57.39**

[1] 50-foot-wide construction corridor where road and pipeline parallel.

[2] 40-foot-wide construction corridor for pipeline without access road.

[3] 30-foot-wide construction corridor for road without pipeline.

[4] Improve existing two-track road; disturbance acreage based on 10-foot-wide corridor, with the remaining 40 feet attributed to the Chaco Trunk #2 Phase 1 pipeline.

Drilling of the proposed Lybrook G30-2307 01H, 02H, 03H, and 04H wells would require constructing a pad measuring 490 feet by 400 feet, with a 50-foot-wide construction zone around the perimeter of the pad. Total disturbance from the proposed well pad would be 6.77 acres. The maximum cut would be approximately 8 feet at midpoint B and the maximum fill would be approximately 13 feet on the southwest corner (Corner 2). To access the site, Encana would construct an approximate 3,261-foot-long resource road within a 30-foot-wide corridor. The proposed well-tie pipeline would be approximately 679 feet in length and permitted with a 40-foot-wide ROW on BLM-managed lands. Approximately 289 feet of the proposed pipeline would be located within the proposed well pad disturbance. The proposed access road would parallel the proposed well-tie pipeline for approximately 390 feet and the proposed Chaco Trunk #2 Phase 1 pipeline for approximately 2,871 feet. Total construction width of the pipeline and

access road (where parallel) would be 50 feet and would be designated as 20 feet of disturbance adjacent to the road and 30 feet of disturbance on the road. The total disturbance from the access road and pipeline would be approximately 1.11 acres based on a 50-foot-wide construction corridor where the road and well-tie pipeline are parallel and a 10-foot-wide construction corridor for the road where it parallels the Chaco Trunk #2 Phase 1 pipeline (Table 2-2).

Drilling the proposed Lybrook G31-2307 01H, 02H, and 03H wells would require constructing a 490-foot by 400-foot pad with a 50-foot-wide construction zone around the perimeter, resulting in approximately 6.77 acres of disturbance. The maximum cut would be approximately 5 feet on the north side (corner 1) and the maximum fill would be approximately 8 feet on the south corner (Corner 3). To access the site, Encana would upgrade approximately 870 feet of existing two-track road and construct 299 feet of new road (total 1,169 feet). Encana would also construct and operate a proposed well-tie pipeline, which would be approximately 515 feet in length. The pipeline would be permitted with a 40-foot-wide ROW on BLM-managed lands. Approximately 216 feet of the proposed pipeline would be contained within the proposed well pad disturbance. The proposed access road would parallel the proposed Lybrook G31-2307 well-tie pipeline for approximately 299 feet and the proposed Chaco Trunk #2 Phase 1 pipeline for the remaining 870 feet. Total construction width of the new access road and well-tie pipeline would be 50 feet. The total disturbance from the access road and pipeline would be approximately 0.54 acre based on a 50-foot-wide construction corridor where the road and well-tie pipeline are parallel and a 10-foot-wide construction corridor for the road where it parallels the Chaco Trunk #2 Phase 1 pipeline (Table 2-2).

Drilling the proposed Lybrook J31-2307 01H and 02H wells would require constructing a 490-foot by 400-foot pad with a 50-foot-wide construction zone around the perimeter, resulting in approximately 6.77 acres of disturbance. The maximum cut would be approximately 4 feet on the east side (between Corners 5 and 6) and the maximum fill would be approximately 4 feet on the northwest corner (Corner 2). To access the site, Encana would upgrade approximately 4,138 feet of existing two-track and construct approximately 733 feet of new road. Encana would also construct and operate a 934-foot well-tie pipeline. The pipeline would be permitted within a 40-foot-wide ROW on BLM-managed. Approximately 201 feet of the proposed pipeline would be located within the proposed well pad disturbance and approximately 733 feet outside of the well pad. The proposed access road would parallel the proposed Lybrook J31-2307 well-tie pipeline for 733 feet and the proposed Chaco Trunk #2 Phase 1 pipeline for 4,138 feet. Total construction width of the new access road and well-tie pipeline would be 50 feet and would be designated as 30 feet of disturbance for the road and 20 feet of disturbance adjacent to the road for the pipeline. The total disturbance from the access road and pipeline would be approximately 1.79 acres, based on a 50-foot-wide construction corridor where the road and well-tie pipeline are parallel and a 10-foot-wide construction corridor for the road where it parallels the Chaco Trunk #2 Phase 1 pipeline (Table 2-2).

Drilling the proposed Lybrook M35-2308 01H, 02H, 03H, and 04H wells would require constructing a 490-foot by 400-foot pad with a 50-foot-wide construction zone around the perimeter, resulting in approximately 6.77 acres of disturbance. The maximum cut would be approximately 13 feet on the northeast corner (midline Corner 6) and the maximum fill would be approximately 10 feet on the southeast corner (Corner 2). The well-tie pipeline would be approximately 452 feet in length and the access road would be approximately 375 feet in length. The pipeline would be permitted within a 40-foot-

wide ROW on BLM-managed lands. Approximately 333 feet of the proposed pipeline would be located within the proposed well pad disturbance. The proposed access road would parallel the proposed Lybrook M35-2308 well-tie pipeline for approximately 105 feet and would parallel the proposed Chaco Trunk 1 pipeline for approximately 270 feet. The proposed road would be permitted within a 30-foot-wide ROW on BLM-managed lands. Total construction width of the pipeline and the access road where parallel would be 50 feet and would be designated as 20 feet of disturbance adjacent to the road and 30 feet of disturbance on the road (Table 2-2).

Drilling the proposed Lybrook O30-2307 01H, 02H and 03H wells would require constructing a 490-foot by 400-foot pad with a 50-foot-wide construction zone around the perimeter, resulting in approximately 6.77 acres of disturbance. The maximum cut would be approximately 4 feet on the north corner (Corner 3) and the maximum fill would be approximately 4 feet on the south corner (Corner 6). The well-tie pipeline would be approximately 778 feet in length. The pipeline would be permitted within a 40-foot-wide ROW on BLM-managed lands. Approximately 281 feet of the proposed pipeline would be contained within the proposed well pad disturbance and approximately 497 feet outside of the well pad disturbance. To access the site, Encana would upgrade approximately 4,600 feet of existing two-track road and construct 497 feet of new road (total 5,097 feet) within a permitted 30-foot wide ROW on BLM-managed lands. The access road would parallel the proposed Lybrook 030-2307 well-tie pipeline for approximately 497 feet and the proposed Chaco Trunk #2 Phase 1 pipeline for the remaining 4,600 feet. Total construction width of the well-tie pipeline and new access road would be 50 feet and would be designated as 20 feet of disturbance adjacent to the road and 30 feet of disturbance on the road. The total disturbance from the access road and pipeline would be approximately 1.63 acres, based on a 50-foot-wide construction corridor where the road and well-tie pipeline are parallel and a 10-foot-wide construction corridor for the road where it parallels the Chaco Trunk #2 Phase 1 pipeline (Table 2-2).

Drilling the proposed Lybrook O35-2308 01H and 02H wells would require constructing a 430-foot by 400-foot pad with a 50-foot-wide construction zone around the perimeter, resulting in approximately 6.08 acres of disturbance. The maximum cut would be approximately 15 feet on the northwest side (between Corners 3 and 5) and the maximum fill would be approximately 16 feet on the south corner (Corner 2). The well-tie pipeline would be approximately 681 feet in length and the access road would be approximately 449 feet in length. Approximately 206 feet of the proposed pipeline would be contained within the proposed well pad disturbance and approximately 475 feet of the proposed pipeline would be outside of the well pad disturbance. The proposed well-tie pipeline would be permitted within a 40-foot-wide ROW and the road within a 30-foot wide ROW on BLM-managed lands. The proposed access road would parallel the proposed pipeline. Total construction width of the pipeline and access road would be 50 feet and would be designated as 20 feet of disturbance adjacent to the road and 30 feet of disturbance on the road (Table 2-2).

The proposed Chaco Trunk #2 Phase 1 gathering pipeline would be approximately 13,931 feet (2.6 miles) in length. Approximately 884 feet (0.2 mile) would be constructed within a 30-foot wide ROW on New Mexico State lands and approximately 13,047.27 feet (2.4 mile) would be constructed within a 40-foot-wide ROW on BLM managed lands (Table 2-2).

Following interim reclamation, each well pad would need approximately 1.6 acres for well operation. Access roads also would contribute to long-term disturbance. The well-tie pipeline ROWs and gathering pipeline ROW would be reclaimed and would contribute to short-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	56.78	18.99
State of New Mexico	0.61	0.61
Total	**57.39**	**19.60**

[1] Based on 30-foot-wide access roads and 1.6 acres per well for operation; includes long-term disturbance for existing two-track road improvement

Drilling and Completions

After well pad construction is complete, Encana would mobilize a drilling rig to drill the 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 drill 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 per day.

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 oil wells targeting the Basin Mancos, Basin Mancos/Alamito Gallup, or Alamito Gallup pools of the Mancos Formation. The proposed Lybrook G30-2307 wells would be drilled to a total vertical depth ranging between approximately 4,867 and 5,341 feet and then horizontally drilled for approximately 4,590 to 4,675 feet.

Using a fresh water-based drilling mud system, surface casing would be set to an approximate measured depth of 500 feet. After the surface casing is installed, the casing 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. 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 into 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 into 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 completions 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 oil 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 oil 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/NE ¼ of Section 32, of 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 steel storage tanks (up to 15).

Drilling operations would take approximately 2 weeks per well. Completions activities are expected to take 1 to 3 weeks per well.

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 would be 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, which is anticipated to be 30 to 50 years.

Pipeline Installation

The proposed well-tie pipelines would be up to a 6-inch outside diameter buried steel pipelines with a maximum allowable operating pressure of 500 pounds per square inch gauge. The proposed Chaco Trunk #2 Phase 1 pipeline would be constructed using 8-inch outside diameter steel pipeline. Related aboveground appurtenances that would be installed within the pipeline workspace would include cathodic protection equipment, futures, and block valves with blowdowns. The Chaco Trunk #2 Phase 1 pipeline would also require an aboveground separator, tank with truck load out, and a meter run with associated equipment.

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 that 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 the pipe into the trench. Backfilling would begin after a section of the 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 pipeline ROWs would be seeded with the seed mix and rates provided in the Reclamation Plan attached to the APDs for the well pads and the ROW grant for the Chaco Trunk #2 Phase 1 pipeline.

Construction and pipeline installation activities would take 4 to 6 weeks per well-tie pipeline and reclamation activities would take 1 to 2 weeks per pipeline. Construction of the proposed Chaco Trunk #2 Phase 1 pipeline would take approximately 6 weeks. The pipelines and related aboveground appurtenances would be in place for the life of the wells, which are anticipated to be 30 to 50 years.

Interim Reclamation

After production facilities are installed at the pads, the size of 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 installed 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. Approximately 19.6 acres associated with well operation and access would not be reclaimed.

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 and 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 installed 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 through the implementation of 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:

- Because the proposed project would disturb more than 4.0 acres of vegetation, if construction activities would occur during the migratory bird breeding season (May 15 through July 31), a migratory bird nest survey would take place one to two days prior to construction. This survey would be conducted by a BLM-FFO-approved biologist following BLM-FFO protocol. If, during the nest survey or during construction, active nests are located within or adjacent to the proposed project area, the BLM-FFO biologist would be notified and project activities would not be permitted until fledging has occurred. If postponement is not an option, the operator would contact the USFWS's Migratory Bird Permit Office regarding permitting.
- Roads will be maintained in the same or better condition as what existed prior to the commencement of operations and road maintenance will continue until final abandonment and reclamation of the well location.
- Dust emissions will be controlled on the roads and locations, as necessary, with the application of dust suppressants (e.g., magnesium chloride) and/or water.
- The access roads will be designed and constructed as Resource Roads in accordance with the BLM Gold Book Standards (USDI/USDA 2007) and 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, 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. These stipulations may include, but are not limited to temporary or permanent fencing or other physical barriers, monitoring of earth-disturbing construction, area reduction and/or specific construction avoidance zones, and employee education. All employees, contractors, and sub-contractors of the

project will be informed by the project proponent that cultural sites are to be avoided by all personnel, personal vehicles, and company equipment. All employees, contractors, and sub-contractors of the project will also be informed 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. In the event of a discovery during construction, the project proponent will immediately stop all construction activities in the immediate vicinity of the discovery and then immediately notify the archaeological monitor, if present, or the BLM. The BLM will then evaluate or cause the site to be evaluated. Should a discovery be evaluated as significant (based on the National Register, Native American Graves Protection and Repatriation Act, and 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 and, 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 would be fenced or contained.
- All project activities would 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 will also be implemented along the construction workspace by either 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.
- Clearing, removal of topsoil, and grading will be limited to the minimum area required for safe and efficient construction.
- All trees will be mowed or cut and chipped and used in fill slopes or hauled to an approved disposal site. 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.
- 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 or water to wet the topsoil stockpile to create a crust across the exposed soil to prevent soil loss.
- Culverts (24 to 36 inches) 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 BLM Gold Book standards (USDI/USDA 2007) and 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 above-ground storage tanks. Cuttings will be disposed 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 above-ground 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 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 the location. Flowback water will be confined to a storage tank for a period not to exceed 90 days after initial production and will be disposed at an approved waste disposal facility.
- Any spills of non-freshwater fluids will be immediately cleaned up 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 thereof disposed 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. The accumulated trash will be removed, as needed, and will be disposed 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 completing of these wells.
- No extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities will be used, produced, stored, transported, or disposed of annually in association with the drilling, testing, or completing of these wells.
- 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 a crossover. 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 crawling in.
- Before the trench is closed, it will be inspected for animals. Any trapped wildlife or livestock will be promptly removed and released at least 150 yards from the trench.
- All existing improvements (such as fences, gates, and bar ditches) will be repaired to previous or better than pre-construction conditions. Cut fences will be tied to H-braces prior to cutting and openings will be protected as necessary during construction to prevent the escape of livestock. A temporary closure will be installed on the same day as 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 the 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 placed on all open pipes to prevent bird entry 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 must be conducted within the proposed action 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 then be reseeded with a BLM/FFO approved seed mix. The proposed Lybrook G30-2307, Lybrook G31-2307, Lybrook J31-2307, Lybrook M35-2308, Lybrook O30-2307, Lybrook O35-2308, and the Chaco Trunk #2 Phase 1 pipeline would be reseeded with a Sagebrush-Grass seed mix as described in the respective reclamation plans. 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 permitted 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. The use of pesticides will comply with federal and state laws. Pesticides will be used 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 (i.e., production tanks, produced water tanks, etc.). These berms will be constructed of compacted subsoil, corrugated metal, or the equivalent; be impervious; and hold 110 percent of the capacity of the largest tank.
- Production facilities would be painted Covert Green to blend with the natural color of the landscape and would be located, to the extent practical, to reasonably minimize visual impact. Equipment subject to safety considerations would not be painted.
- Engines would be equipped with mufflers and barriers or other sound-proofing measures would 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 G30-2307

- Well pad will be dropped to the grade of the drainage that runs along the pad. Excavated material will be used for road construction.
- Water will be diverted around the pad and silt traps installed as needed upon interim reclamation.
- A single Brack's hardwall cactus (*Sclerocactus cloveriae* ssp. *brackii*) located in area will be transplanted outside the construction zone in compliance with BLM/FFO policy.

Site Specific Design Features for the Lybrook G31-2307

- Water will be diverted around the pad from midpoint 1, around Corner 6, and silt traps installed as needed upon interim reclamation.

Site-Specific Design Features for the Lybrook J31-2307

- The construction zone will be restricted on the southeastern side of well pad from Midpoint B to Corner 5.
- Water will be diverted around the pad from midpoint B to Corner 6 and midpoint B to Corner 5.
- Silt traps installed as needed upon interim reclamation.
- Culverts will be installed as needed on access road.

Site-Specific Design Features for the Lybrook M35-2308

- Corner 5 will be rounded.
- A silt trap will be installed at midpoint B.
- Water will be diverted around the pad from midpoint B around Corner 5.

Site-Specific Design Features for the Lybrook O30-2307

- Water will be diverted from Corner 3 to Corner 2.
- Silt traps will installed as needed upon interim reclamation.

- If construction is scheduled during the burrowing owl (*Athene cunicularia*) nesting period between April 1 and July 31, surveys for active burrowing owl nesting will be required. Should active nests be identified, no disturbance within a 50-meter radius would be allowed from April 1 to August 15.

Site-Specific Design Features for the Lybrook O35-2308

- Pond east of well pad will be cleaned out and rebuilt.
- Water will be diverted on the high side of the pad, near Corner 6, to drain into pond to the east.
- Silt traps will be installed as needed upon interim reclamation.
- Access road will be raised approximately 4 feet, crowned, and ditched. Two 30-inch culverts will be installed on access road.

Site-Specific Design Features for the Chaco Trunk #2 (Phase 1) Pipeline

- A cattle guard will be installed at the gate where state and BLM lands meet. A gate will be installed next to the cattle guard for the movement of authorized livestock.

2.2 No Action

The BLM NEPA Handbook (H-1790-1; USDI/BLM 2008) states that 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 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

Another configuration of the proposed Chaco Trunk #2 Phase 1 pipeline was considered and evaluated by the applicant, BLM, and natural and cultural resources experts using desktop tools and in-field examination.

The original alignment proposed for the Chaco Trunk #2 Phase 1 pipeline was located west of the currently proposed alignment. It would have been located on undisturbed land for approximately 11,033 feet (2.1 miles). The alignment was rerouted adjacent to an existing two-track road for approximately 10,593 feet (2 miles) reducing the length of the ROW located on undisturbed land to approximately 3,338 feet (0.6 mile). The original alignment was considered but was eliminated from further consideration as it would have resulted in greater new disturbance.

Additionally, minor modifications of new access roads and well-tie pipelines were developed during the planning and siting processes.

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 area. This alternative will not be evaluated further in this EA.

Field resource investigations of the proposed action were conducted between September 18 and December 2, 2013 by natural resources specialists from Ecosphere Environmental Services (Ecosphere). Cultural resource surveys were conducted by La Plata Archaeological Consultants, LLC (LAC) between September 2012 and January 2014. On-sites for the Chaco Trunk #2 Phase 1 pipeline were conducted on October 30 and November 7, 2013. The on-sites for the well pad locations were conducted on January 7 and 8, 2014. The on-sites were attended by representatives from Encana, Ecosphere, LAC, Adobe Construction, NCE Surveys, Inc., Scorpion Survey & Consulting, LLC, and the BLM/FFO.

The analysis area for this EA is defined as the project footprint of the proposed Lybrook G30-2307, Lybrook G31-2307, Lybrook J31-2307, Lybrook M35-2308, Lybrook O30-2307, and Lybrook O35-2308 well pads, access roads, and pipelines, and the proposed Chaco Trunk #2 Phase 1 pipeline.

3.1 Air Resources

3.1.1 Affected Environment

The proposed action would be located in Sandoval County and San Juan County, 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 has identified the potential impacts of GHG emissions such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NOx), water vapor, and several trace gases on 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 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). These criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, particulate matter (PM), particulate matter with a diameter between 2.5 and 10 micrometers (PM_{10}) and particulate matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$), sulfur dioxide (SO_2), and lead. The USEPA has established National Ambient Air Quality Standards (NAAQS) for criteria air pollutants. The NAAQS are protective of human health and the environment. The USEPA has approved the New Mexico's State Implementation Plan and 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 greenhouse gas emissions. Climate has the potential to influence renewable and non-renewable resource management.

Air Quality

Criteria Air Pollutants

The Air Quality Technical Report describes the types of data used for describing the existing conditions of criteria pollutants, how criteria pollutants are related to the 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. Table 3-1 shows monitored design values for ozone 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 Standard 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 parts per billion (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}, [(2)]	150 µg/m^{3}, [(3)]
$PM_{2.5}$	4.5 µg/m^{3}	Annual	12 µg/m^{3}, [(4)]	60 µg/m^{3}, [(3)]
$PM_{2.5}$	14 µg/m^{3}	24-hour	35 µg/m^{3}, [(1)]	
SO_2	0.001 ppm	Annual	None	0.02 ppm
SO_2	20 ppb	1-hour	75 ppb [(5)]	None
SO_2	0.008 ppm	24-hour	None	0.10 ppm

Note: NAAQS = National Ambient Air Quality Standard Standards; NMAAQS = New Mexico Ambient Air Quality Standards; NO_2 = nitrogen dioxide; ppb = parts per billion; µg/m3 = micrograms per cubic meter; ppm = parts per million; PM_{10} = particulate matter with an diameter between 2.5 and 10 micrometers; $PM_{2.5}$ = particulate matter with a diameter of 2.5 micrometers or less; SO_2 = sulfur dioxide

Source: USEPA 2012

[(1)] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb.

[(2)] µg/m3 refers to micrograms per cubic meter of air; not to be exceeded more than once per year, on average over 3 years.

[(3)] The NMAAQS is a standard for total suspended particulate matter.

[(4)] Annual mean, averaged over 3 years.

[(5)] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

In 2005, the USEPA estimated that there was less than 0.01 ton of lead per square mile emitted in the analysis area, which is less than 2 tons total (USDI/BLM 2013). There is no monitoring conducted for lead and CO in northwestern New Mexico. However, concentrations of these pollutants are expected to be low in rural areas; therefore, 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 (NATAs) 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 indexes for cancer, neurological, and respiratory problems for each county and census tract. Because techniques have changed over the years, the NATA is not comparable to those previously issued. The 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 one 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 for 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 are generally in the range of 80 or 90 degrees Fahrenheit (°F), and winter minimum temperatures are generally 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, HAPs, and GHGs 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 calculators (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	NOx	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	**6.15**	**1.66**	**0.55**	**2.54**	**0.29**	**0.11**	**0.01**	**671.54**

Note: NOx = nitrous oxides; CO = carbon monoxide; VOCs = volatile organic compounds; PM_{10} = particulate matter with an diameter between 2.5 and 10 micrometers; $PM_{2.5}$ = particulate matter with a diameter of 2.5 micrometers or less; SO_2 = sulfur dioxide; CH_4 = methane; CO_2 = carbon dioxide; bbl = barrels

Source: USDI/BLM 2013

Oil storage tanks on the well locations may result in venting VOCs. Oil well production is generally presented as produced barrels per day. The emissions calculator estimated that for every barrel per day produced there may be 0.12 tons of VOCs 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	NOx	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

County	NOx	CO	VOCs	PM_{10}	$PM_{2.5}$	SO_2
Total	**57,303.4**	**147,078.1**	**162,079**	**218,800.3**	**23,888.3**	**13,343.3**

Note: NOx = nitrous oxides; CO = carbon monoxide; VOCs = volatile organic compounds; PM_{10} = particulate matter with an diameter between 2.5 and 10 micrometers; $PM_{2.5}$ = particulate matter with a diameter of 2.5 micrometers or less; 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

	NOx	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: NOx = nitrous oxides; CO = carbon monoxide; VOCs = volatile organic compounds; PM_{10} = particulate matter with a diameter between 2.5 and 10 micrometers; $PM_{2.5}$ = particulate matter with a diameter of 2.5 micrometers or less; 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 in the emissions calculator are very imprecise. For many processes, it is assumed that emission of HAPs will be equivalent to 10 percent of VOC emissions. Therefore, the estimated HAP emissions of 1.25 tons per 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 tons per 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 (i.e., 609.2 metric tons) would represent a 0.0008 percent increase in New Mexico 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 that are 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 that 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 Water Resources/Quality – Surface and Groundwater

3.2.1 Affected Environment

The analysis area is located in the Upper Colorado River Hydrologic Region and is within of the Chaco sub-watershed. The analysis area is located on a narrow mesa that trends southwest to northeast and is bisected by a dendritic system of shallow ephemeral drainages. The surface drainage of the analysis area generally flows southwest into an unnamed tributary of Escavada Wash. There are no perennial surface water resources such as rivers, lakes, ponds, or streams in the analysis area. There is a seasonal pond located approximately 50 feet east of the Lybrook 035-2308 well pad.

The analysis area was surveyed for the presence of jurisdictional wetlands and other waters of the U.S. Waters of the U.S. and other wetlands are regulated by the U.S. Army Corps of Engineers. Three intermittent "blue-lines," as shown on the USGS National Hydrography Dataset, are located within the analysis area. These drainages were determined to be non-jurisdictional, as no existing evidence of defined bed and bank features, scour, or deposition processes were observed.

Aquifers in the San Juan Basin are generally 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. Vertical leakage across fine-grained formations is also a source of recharge and discharge due to variations in hydraulic head. Regionally vertical leakage is assumed to be low. However, fracturing in particular around structural features in the basin could result in higher rates of vertical permeability (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 of the New Mexico State Engineers Office—Water Administration and Technical Engineering Resource System database for the analysis area and vicinity (1-mile radius) was performed. There are no records of any water wells located within a 1-mile radius of the analysis area (NMOSE 2013)

3.2.2 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 57.39 acres of soil as a sediment source entering area drainage ways. Vegetation cover is moderate throughout the analysis area. Exposure of soils, particularly on slopes, would lead to an increase in an undetermined but likely small amount of sediment transport, especially during and following storm events. Slight alterations in analysis area drainage patterns may also 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 the implementation of best management practices and other preventive measures, such as re-establishment of vegetation and proper site hydrological diversions.

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 (i.e., gas, diesel, etc.) would be used and stored on location. There would be the potential 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. On-site containment structures such as containment dikes, containment walls, and drip pans would be impervious and would be maintained to prevent a discharge to waters of the U.S. Any spills of non-freshwater fluids would be immediately cleaned up 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 propping agent (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 United States 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 is also 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 it provides an impermeable layer that isolates the Mancos Shale and Mesaverde formations from identified sources of drinking water and surface water. On average, total depth of the proposed well bores would be about 4865 to 5,340 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 possibly 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 Conditions of Approval and design features such as adequate casing, cementing, and other drilling and completion methods are intended to 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 District. 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 that would present 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 the 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 are required to 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 is run on certain strings of casing to ensure the cement has bonded to the casing and the formation.

During operation, the proposed pipelines could potentially leak or rupture, possibly impacting groundwater quality. The proposed pipelines would be tested to ensure integrity prior to operation. Cathodic protection systems would be installed to protect the pipelines from corrosion, which could affect the integrity of the pipe. Potential impacts to groundwater quality from leaks or ruptures during pipeline operation would be long term.

Cumulative Impacts

Reasonably foreseeable development within the Chaco sub-watershed may include an estimated additional 1,811 oil and gas wells and related facilities. Surface-disturbing activities that would be associated with these actions may affect an estimated 6,756 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 57.39 acres of disturbance within 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, other facilities, and installation of trenches for utilities; road maintenance such as grading or ditch cleaning; public recreational activities; vegetation manipulation and management activities; prescribed and natural fires; and livestock grazing.

3.3 Upland Vegetation and Noxious Weeds

3.3.1 Affected Environment

The analysis area is located in a monotypic vegetation community dominated by big sagebrush (*Artemisia tridentata*), James' galleta (*Pleuraphis jamesii*), blue grama (*Bouteloua gracilis*), and broom snakeweed (*Gutierrezia sarothrae*). The occasional Utah Juniper (*Juniperus osteosperma*) and piñon pine (*Pinus edulis*) tree is scattered within the analysis area. Ground cover was visually estimated to range between 20 and 50 percent in the analysis area. Generally, vegetation cover was moderate in most areas at an estimated 40 percent. There are approximately 15 piñon and juniper trees located in the proposed project footprint.

No noxious weeds listed by the BLM/FFO or the State of New Mexico were observed in the analysis area.

3.3.2 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 the removal and modification of approximately 57.39 acres of vegetation including removal of approximately 15 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 vegetation communities. Disturbed areas would be expected to re-vegetate in 2 or more years. There would be a long-term loss of approximately 19.6 acres of vegetation for well access and operation.

Invasive species are generally 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 well pads and pipeline ROWs for the life of the project.

Re-vegetation of 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. The Cluster 18A well pads, associated pipelines, and Chaco Trunk #2 Phase 1 pipeline would be reseeded with a sagebrush-grass community seed mix.

Cumulative Impacts

Within the FFO planning area, there are approximately 633,400 acres of sagebrush-grassland habitat type (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 sagebrush-grassland 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 approximately 19.6 acres of long-term vegetative disturbance in the planning area.

3.4 Wildlife

3.4.1 Affected Environment

The proposed action is not located within a BLM wildlife specially designated area (SDA). There are no unique habitats within the analysis area. The analysis area on a low, narrow mesa vegetated by sagebrush grassland. Wildlife common to this habitat includes mule deer (*Odocoileus hemionus*), fox (*Vulpes* sp.), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), and reptiles (snakes

and lizards) , and to a lesser extent elk (*Cervus elaphus*), black bear (*Ursus americanus*), and mountain lion (*Felis concolor*). Wildlife or signs observed in the analysis area included elk, mule deer, desert cottontail, ringtail (*Bassariscus astutus*), Gunnison's prairie dog (*Cynomys gunnisoni*), and kangaroo rat (*Dipodomys* sp.).

3.4.2 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 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 movement. The impacts of 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 activity or alter their behavior.

The proposed action would result in the removal and modification of approximately 57.39 acres of sagebrush grassland. This vegetation community provides forage for big game and provides forage and cover for other wildlife species. Since the vegetation removed would not be replaced with the same species and because the removal of vegetation in this generally 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 composition of vegetation. The majority of direct habitat loss would be short term, as reclaimed areas would recover their value as wildlife habitat. However, there would be a long-term loss of approximately 19.6 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 have been shown to avoid natural gas wells, roads, and the 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, volume of traffic) and whether vehicles stop or continue moving; however, responses varied within seasons and between 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 would likely be localized around the source of the disturbance (i.e., equipment noise, human presence, etc.). 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 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 could affect up to approximately 1,400 acres. Avoidance by wildlife would depend on the species, time of day, time of year, human activity level, topography, and cover type. It should 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 might temporarily avoid the area during construction activities. Once the project is completed, wildlife would likely 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 nearly daily basis. Heavy-duty vehicles (semi-trucks) would access the well sites one to 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 the individual species. The proposed access roads would also 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 bird entry and nesting. All chemicals or fluids stored on-site would be properly contained and would have secondary containment. Any spills would be promptly cleaned up; furthermore, Encana maintains an emergency response plan.

Construction activities would be confined to the permitted area to avoid further disruption to wildlife. Re-vegetation would be initiated within 120 days of completion or at the direction of the BLM/FFO. Gaps would be made, as needed, in topsoil or subsoil stockpiles to allow for wildlife crossings and to avoid ponding or excessive diversion of natural runoff during storm events. Trenches would be inspected for wildlife prior to laying pipe and back filling; trenches would not be left open more than 24 hours. Adherence to BLM reclamation and sanitation measures would also minimize potential impacts to wildlife.

Cumulative Impacts

Reasonably foreseeable development within the Chaco sub-watershed may include an estimated additional 1,811 oil and gas wells and related facilities, and 147 miles of new roads. Surface-disturbing activities that would be associated with these actions may affect an estimated 6,756 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 57.39 acres of direct wildlife habitat loss and up to 1,400 acres of indirect wildlife habitat loss in the planning area.

3.5 Special Management Species

3.5.1 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 are also 28 New Mexico State threatened or endangered species with potential to occur in Sandoval County and San Juan counties. Table 3-7 lists the special management species that have the potential to occur in the analysis area. A Biological Survey Report for each proposed well pad project and the gathering pipeline was prepared and is provided in Appendix C. The Biological Survey Reports provide the basis for the findings listed in Table 3-7.

Table 3-7. Species with special management status with potential to occur in the analysis area

Species	Habitat Associations
Gunnison's prairie dog (*Cynomys gunnisoni*)	Primarily inhabits grass/forb/shrub habitats on abandoned land, valley floors, stream valleys, mountain meadows, high-elevation plateaus and benches, and intermountain valleys.
Spotted bat (*Euderma maculatum*)	The preferred habitat is meadows in subalpine coniferous forest; 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*)	Roosts mostly in caves or mines; at night can roost in abandoned buildings. In summer species occurs widely across the state and can be found over desert-scrub, desert-mountains, oak-woodland, piñon-juniper, and coniferous forests.
American peregrine falcon (*Falco peregrinus anatum*)	The breeding territories of peregrine falcons in New Mexico center on cliffs in wooded/forested habitats, with large "gulfs" of air nearby in which these predators can forage.
Bendire's thrasher (*Toxostoma bendirei*)	Typically inhabits sparse desert shrubland and open woodland with scattered shrubs.
Burrowing owl (*Athene cunicularia*)	Rarely digs its own burrows and is typically associated with prairie dog colonies. Found in dry, open, short-grass, treeless plains. Uses areas that include shrubs, such as four-wing saltbush and rabbit-brush.
Chestnut-collared longspur (*Calcarius ornatus*)	A native prairie specialist that winters in grasslands, deserts, and plateaus dominated by low grasses and forbs, where most vegetation is less than 1.5 feet high.

Species	Habitat Associations
Ferruginous hawk (*Buteo regalis*)	Flat or rolling terrain in grasslands, shrub-steppes, deserts, and badlands. Prefers elevated nest sites (e.g., buttes, utility poles, trees, and on the ground.)
Golden eagle (*Aquila chrysaetos*)	In the West, mostly open habitats in mountainous, canyon terrain. Nests primarily on cliffs and in trees.
Prairie falcon (*Falco mexicanus*)	Arid, open regions of grassland or scrub vegetation with cliff formations that are high and inaccessible. Breeding cliffs are sometimes in semi-open regions with scattered conifer trees and occasionally in dense woodlands.
Brack's hardwall cactus (*Sclerocactus cloveriae* ssp. *brackii*)	Sandy clay of the Nacimiento Formation in sparse shadscale scrub (5,000 to-6,000 feet).

Two special status species were observed in the analysis area during the biological surveys—Gunnison's prairie dog (*Cynomys gunnisoni*), a BLM sensitive species, and Brack's hardwall cactus, a BLM sensitive and state endangered species. An approximately 60-acre prairie dog town is located within the analysis area and immediate vicinity. One Brack's hardwall cactus was recorded within the proposed Lybrook G30-2307 well pad.

3.5.2 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.

An approximate 60-acre Gunnison's prairie dog town occurs within the northern portion of the proposed Lybrook O30-2307 well pad and access road and within the proposed Lybrook G30-2307 access road and Chaco Trunk #2 Phase 1 pipeline alignment (which are parallel) between Station 97+05 to 126+47. The town appeared active during the fall 2013 biological surveys. Impacts to prairie dogs would include the potential for mortality during construction of the proposed action. However, prairie dogs would be expected to disperse temporarily from the area for the duration of construction and reclamation. Prairie dogs would be expected to return to the area following reclamation. There would be a long-term loss of 2.7 acres of suitable, occupied habitat for access and operation of the Lybrook G30-2307 and Lybrook 030-2307 wells.

The entire analysis area offers suitable foraging habitat for spotted bat (*Euderma maculatum*) and Townsend's big-eared bat (*Corynorhinus townsendii*). No suitable roosting habitat would be removed by the proposed action. Impacts to these bat species would be limited to avoidance of the area during spring, summer, and fall nighttime drilling activities when they may incidentally forage in the area. These bat species migrate from the area during winter months. Avoidance impacts would be short term.

Prairie dog burrows provide potential nesting habitat for burrowing owl (*Athene cunicularia*). No sign of burrowing owl occupancy was observed at the entrance of burrows in the analysis area during the biological surveys. However, the surveys were conducted during a time of year when this species would not be present. The potential for disturbance and nest destruction would be greatest between the months

of March and August. If construction of the Lybrook O30-2307 well pad project, Lybrook G-30-2307 access road, or Chaco Trunk #2 Phase 1 pipeline is scheduled during the nesting period between April 1 and July 31, surveys for active burrowing owl burrows would be required. Should active nests be identified, no disturbance within a 50-meter radius would be allowed from April 1 to August 15. The proposed action would result in the long-term loss of approximately 2.7 acres of potential nesting habitat.

The analysis area provides potential nesting and foraging habitat for the Bendire's thrasher (*Toxostoma bendirei*) and wintering habitat for chestnut-collared longspur (*Calcarius ornatus*). These species were not observed and no nests were recorded in the analysis area during the biological surveys. Direct impacts would include the modification of approximately 57.39 acres of foraging and nesting habitat for Bendire's thrasher and wintering habitat for chestnut-collared longspur. Following reclamation, approximately 38 acres of habitat would be returned to shrub-grassland. There would be a long-term reduction of approximately 19.6 acres of suitable habitat for these species for well access and operation. Pre-construction surveys would be conducted to identify any active nests within the proposed project footprint should construction of any project component occur between May 15 and July 31. Impacts to Bendire's thrasher and chestnut-collared longspur could include avoidance of the area, depending what time of year construction and drilling occur.

The analysis area provides potential foraging habitat for American peregrine falcon (*Falco peregrinus anatum*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), and prairie falcon (*Falco mexicanus)*. It is possible that these raptor species could forage in the vicinity or fly through the proposed action area. No potential nesting habitat for these species would be removed or modified by the proposed action. Direct impacts would include the modification of about 57.39 acres of foraging habitat. Approximately 19.6 acres of suitable foraging habitat would be converted to an industrial use for access and operation. Impacts from loss or modification of habitat would be long term. After reclamation, there would be a short-term change in vegetation density and composition and this change could affect the prey base for raptor species. Additional impacts may include avoidance of the area during construction, drilling, and operation due to disturbance and activity from human and vehicle presence and associated noise.

One Brack's hardwall cactus was found in on the northeast side of the proposed B30-2307 well pad during the biological surveys. In general, the habitat in the well pad is atypical and this plant appears to be an outlier, most likely from more suitable habitat to the east. There would be a long-term loss of approximately 0.5 acre of previously undisturbed potential Brack's hardwall cactus habitat. The remainder of the proposed analysis area is not considered suitable habitat, given its vegetation composition and soils characteristics.

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 analysis 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. There would be a cumulative loss of approximately 2.7 acres of Gunnison's prairie dog habitat and suitable nesting habitat for burrowing owl. There would also be a cumulative loss of approximately 19.6 acres of foraging and nesting habitat for Bendire's thrasher, wintering habitat for chestnut-collared longspur, and foraging habitat for American peregrine falcon, ferruginous hawk, golden eagle, and prairie falcon. There would also be a cumulative loss of approximately 0.5 acre of potential Brack's hardwall cactus habitat.

Because much of the analysis area is undisturbed, the construction of the proposed action would result in habitat fragmentation and an increase in edge habitat. An existing two-track would be used as a main access with the proposed new access roads spurring from it. Approximately 1 mile of new road would be added to the travel network in the planning area.

3.6 Migratory Birds

3.6.1 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 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 that includes portions of Sandoval County. Data collected through breeding bird surveys coordinated by the USFWS and private sector efforts have 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 has 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 analysis area contains the habitat type 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. 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 analysis area such as American kestrel (*Falco sparverius*), ash-throated flycatcher (*Myiarchus cinerascens*), Bendire's thrasher, loggerhead shrike (*Lanius ludovicianus*), and vesper sparrow (*Pooecetes gramineus*) (NMPIF 2007).

3.6.2 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 eight "priority" avian species with a known range of distribution in the FFO planning areas 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 3-8.

Table 3-8. Migratory bird species of concern potentially occurring within the analysis area and effects from the proposed action

Species	Habitat Type	Effects
Grasshopper sparrow (*Ammodramus savannarum*)	Sage-grass	Long-term loss of 19.6 acres of habitat. Increase in edge habitat.
Sage sparrow[1] (*Amphispiza belli*)	Sage-grass	Long-term loss of 19.6 acres of habitat. Increase in edge habitat.
Burrowing owl (*Athene cunicularia*)	Sage-grass	Long-term loss of approximately 2.7 acres of suitable habitat
Ferruginous hawk (*Buteo regalis*)	Sage-grass/ piñon-juniper interface	Long-term loss of 19.6 acres of foraging habitat.
Mountain plover (*Charadrius montanus*)	Sage-grass	No effect; no suitable habitat in the analysis area.
Long-billed curlew (*Numenius americanus*)	Sage-grass	Long-term loss of 19.6 acres of habitat. Increase in edge habitat.
Sage thrasher[1] (*Oreoscoptes montanus*)	Sage-grass	Long term loss of 19.6 acres of habitat. Increase in edge habitat.
Bendire's thrasher (*Toxostoma bendirei*)	Sage-grass	Long-term loss of 19.6 acres of habitat. Increase in edge habitat.

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

Direct impacts to migratory birds would include the disturbance and modification of approximately 57.39 acres of undisturbed desert scrub vegetation. There would be a long-term loss of approximately 19.6 acres

of habitat, which would be converted to an industrial use. Migratory birds could be impacted by disturbance during construction, drilling, and completion, depending on the time of year the action is implemented; these impacts would be short term. Long-term 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 would be conducted to identify any active nests within the proposed analysis 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 will be netted and vent caps placed on all open pipes to prevent bird entry and nesting. Any spills would be promptly cleaned up. 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 would 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 19.6 acres, including the removal of approximately 15 piñon and juniper trees. The proposed action would contribute to cumulative habitat fragmentation within the planning area from the construction of approximately 1.06 miles of new road. The proposed action would contribute negligible impacts to migratory birds when combined with past, present, and future actions.

3.7 Cultural Resources

3.7.1 Affected Environment

The analysis 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-III and Pueblo I-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 various 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.

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) and 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 three reports. The LAC Report 2013-14a (BLM 2014(II)049F) covers the well pads, access roads, and pipelines for Lybrook G30-2307, Lybrook G31-2307, Lybrook J31-2307, and Lybrook O30-2307, and for the Chaco Trunk #2 Phase 1 pipeline. The LAC Report 2012-1ooo (BLM 2014(II)032F) covers the well pad, access road, and pipeline for the Lybrook M35-2308. The LAC Report 2013-6u (BLM 2014(II)042F) covers the well pad, access road, and pipeline for the Lybrook O35-2308.

During the surveys of the Lybrook G30-2307, Lybrook G31-2307, Lybrook J31-2307, Lybrook O30-2307, and Chaco Trunk #2 Phase 1 pipeline, five new archaeological sites (LA 178234, LA 178235, LA 178236, LA 178237, LA 178238) and two previously recorded sites (LA 82880 and LA 82881) were encountered and recorded or re-recorded. Of these sites, three are recommended as being eligible for nomination to the National Register of Historic Places (National Register), one is recommended as being ineligible for nomination to the National Register, and three are recommended as needing data before a National Register assessment can be made. Eight isolated occurrences were also recorded.

During the survey of the Lybrook M35-2308 project area, two isolated occurrences were recorded during the fieldwork.

During the survey of the Lybrook O35-2308 project area, one new site (LA 178151) was recorded during the fieldwork. This site is recommended as eligible for inclusion in the National Register. Three isolated occurrences were also recorded.

3.7.2 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 may also include the 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) are being avoided with the 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 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.

3.8 Paleontological Resources

3.8.1 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. The BLM's PFYC system is a predictive modeling tool that was 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 as 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 has determined that these areas require special management attention in order 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 and it 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.

3.8.2 Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed project was assessed individually based on analyses conducted for the 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. No paleontological resources were identified in the analysis area.

Effects to fossil localities could result from the ground disturbing activities or the 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 could also 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

Cumulative Impacts

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

3.9 Livestock Grazing

3.9.1 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 the Escavada AMP (6014) and the South Equus (5111) BLM/FFO grazing allotments. Table 3-9- lists details of these allotments.

Table 3-9. 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	2,880
6014	4	Horse	03/01	02/28	38

[1] AUM = animal unit month

3.9.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Surface disturbance associated with construction of the proposed action would remove approximately 57.39 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 less than 1 animal unit month (AUM) at an estimated 20 acres per AUM. Reclaimed areas would be expected to re-vegetate within 2 years or more following reclamation. There would be short-term loss of approximately 2.9 AUMs and a long-term loss of approximately 1 AUM, resulting from the conversion of 19.6 acres to an industrial use for the well pads and access roads. The proposed action would result in 15 acres of disturbance in allotment 5111 and 4.5 acres in allotment 6014. Reseeding of disturbed areas with the approved seed mix, which is 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 and the occasional horse may occur in or near the proposed analysis area, depending on the time of year. Livestock could also 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 as needed in topsoil or subsoil stockpiles 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. A cattle guard with a gate would be installed at the boundary of state and BLM lands in the analysis area.

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 allotments' carrying capacity or to available AUMs.

4. SUPPORTING INFORMATION

4.1 Tribes, Individuals, Organizations, or Agencies Consulted

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Scott Parker, Encana

Matthew Fenton, Encana

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Craig Spradly, Grazing Allottee

4.2 List of Preparers

This EA was prepared by Ecosphere in conformance with the standards of, and under the direction of, the BLM/FFO.

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Steven Fuller, La Plata Archaeological Consultants

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Appendix A – Maps and Photographs

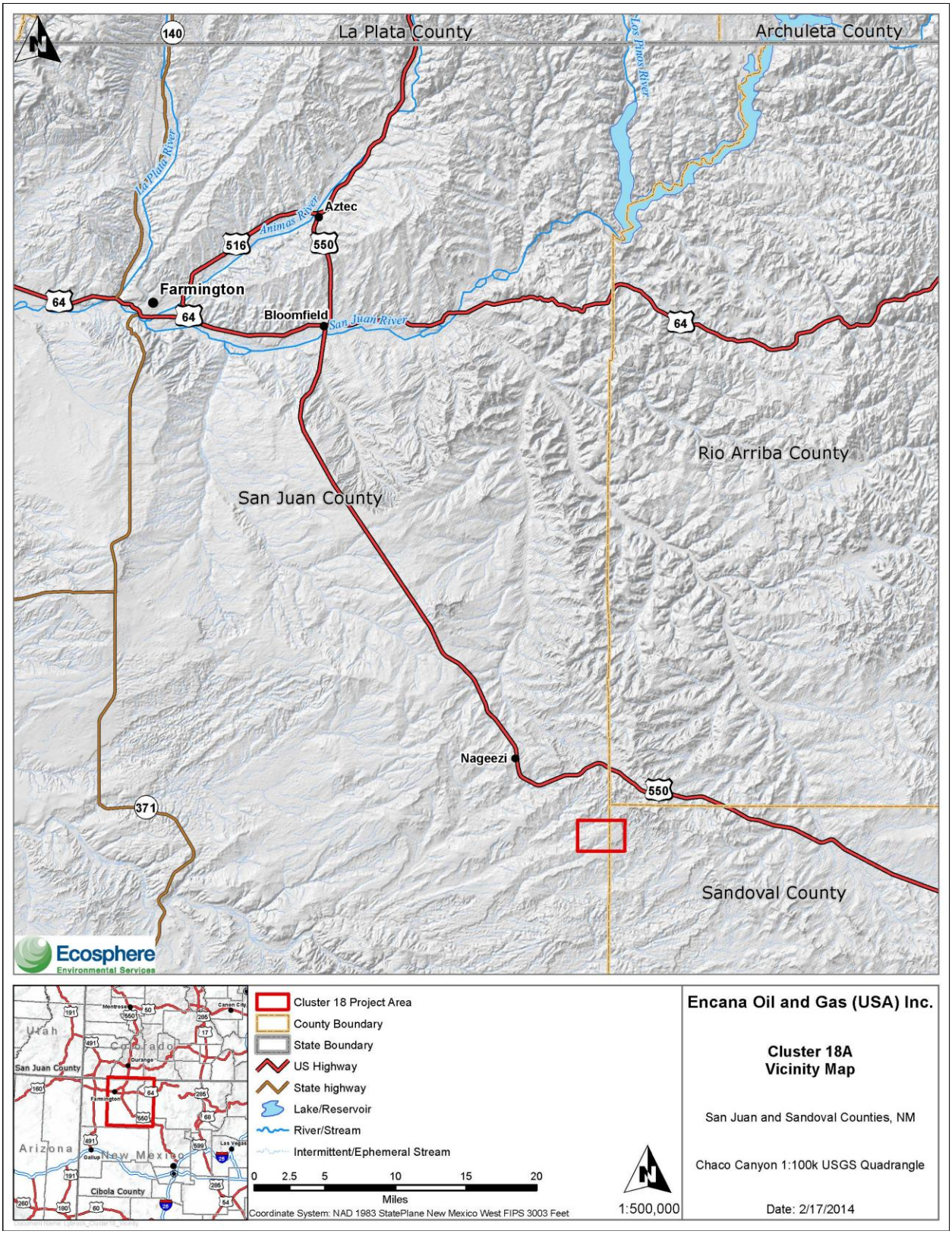


Figure 1. Proposed Cluster 18A and vicinity

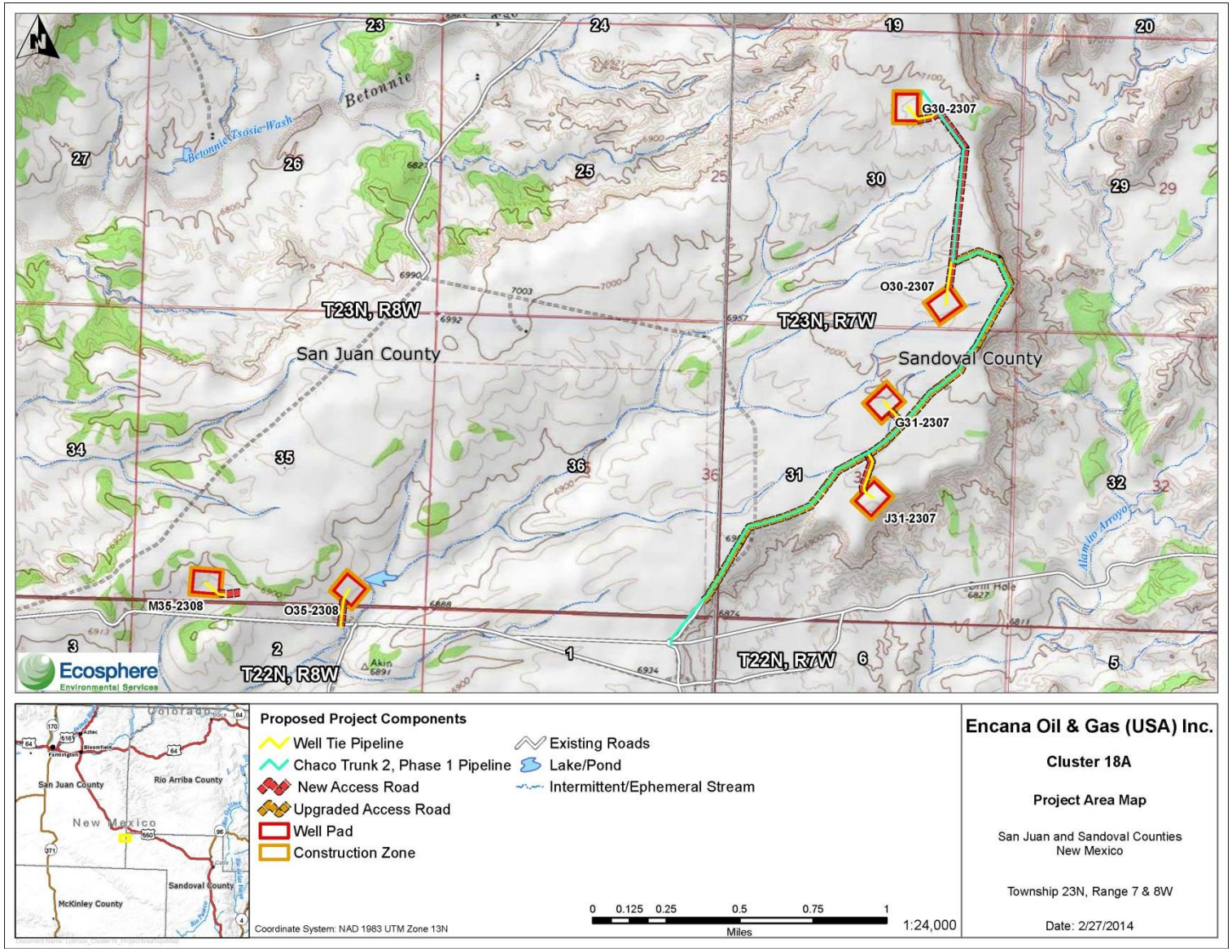


Figure 2: Proposed Cluster 18A project area

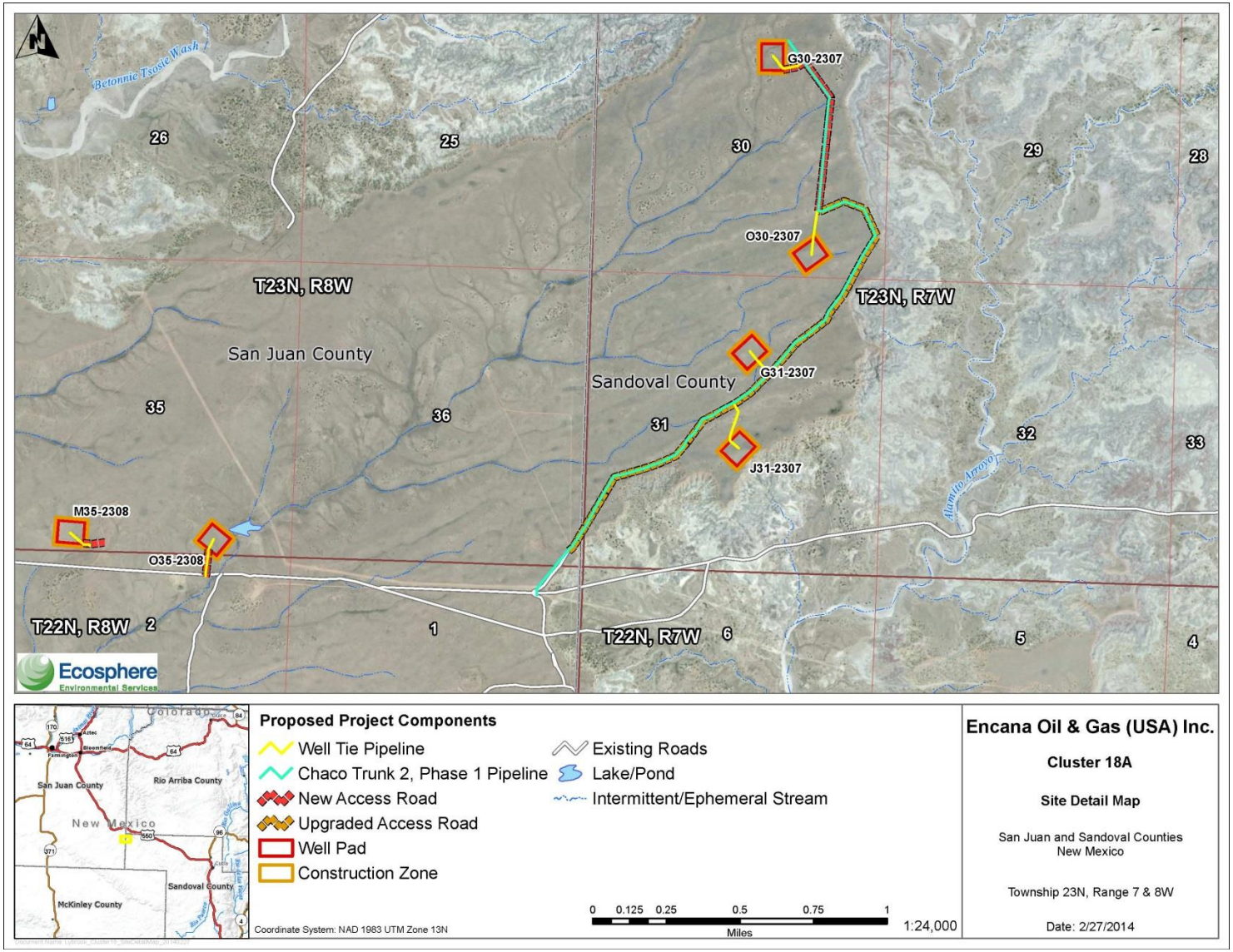
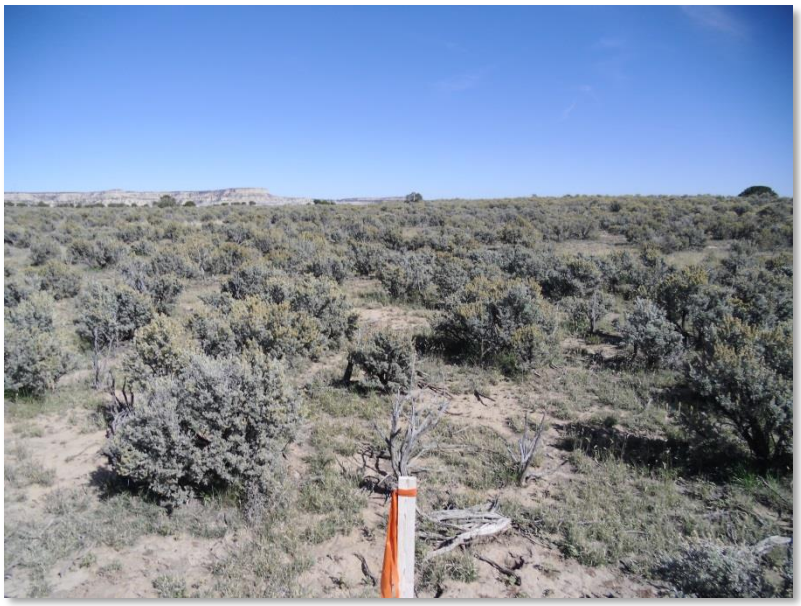


Figure 3: Proposed Cluster 18A site detail

Photograph 1. Lybrook G30-2307, looking southeast from Corner 6

Photograph 2. Lybrook G31-2307, looking east from Corner 5.



Photograph 3. Lybrook J31-2307, looking east from Corner 2

Photograph 4. Lybrook M35-2308, looking south from the center stake

Photograph 5. Lybrook 030-2307, looking west from the center stake

Photograph 6. Lybrook 035-2308, looking west from Corner 6

Photograph 7. Chaco Trunk #2 Phase 1, looking north down the ROW at Station 62+00

Photograph 8. Chaco Trunk #2 Phase 1, looking southeast from the end of the line

Appendix B – Application for Permit to Drill

Appendix C – Conditions of Approval

Appendix D – Biological Survey Reports