

**UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT**

Farmington District
Farmington Field Office
6251 N College Blvd., Ste. A
Farmington, NM 87402

DECISION RECORD
for the
Encana Oil & Gas (USA) Company
Cluster 48 B

Lybrook D34 2307 No 1H, 2H, 3H &4H
Lybrook L34 2307 No. 1H, 2H, 3H &4H
Oil Wells

NEPA No. DOI-BLM-NM-F010-2016-0020

ATS No.'s F010-15-210, 211, 212, 213
F010-15-214, 215, 216, 217

I. Decision

I have decided to select Alternative B for implementation as described in the Environmental Assessment (EA) for Encana Oil & Gas (USA) Company, Cluster 48 B, to include Lybrook D34 2307 No 1H, 2H, 3H, 4H and Lybrook L34 2307 No 1H, 2H, 3H, 4H oil wells, access roads and pipeline ties. Based on my review of the Environmental Assessment (EA) and project record, I have concluded that Alternative B was analyzed in sufficient detail to allow me to make an informed decision. I have selected this alternative because the proposed project would allow Encana Oil & Gas (USA) Company access to their proposed drilling sites in order to horizontally drill for oil and gas within their valid existing lease.

II. Conformance and Compliance

The proposed action is in conformance with the 2003 BLM-FFO Resource Management Plan (RMP). Pursuant to 40 CFR 1508.28 and 1502.21, this site-specific Environmental Assessment (EA) tiers into and incorporates by reference the information and analysis contained in the BLM-FFO Proposed Resource Management Plan/Final Environmental Impact Statement (PRMP/FEIS) (BLM 2003a). The RMP was approved by the September 29, 2003 Record of Decision (ROD) (BLM 2003b), and updated in December 2003.

It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices. At the same time, the BLM strives to ensure that mineral development is carried out in a manner that minimizes environmental damage and provides for the rehabilitation of affected lands. (BLM 2003b, 2-2 – 2-3)

III. Finding of No Significant Impact

I have reviewed the direct, indirect and cumulative effects of the proposed activities documented in the EA for the Encana Oil & Gas (USA) Company. I have also reviewed the project record for this analysis. The effects of the proposed action and alternatives are disclosed in the Alternatives and Environmental Consequences sections of the EA. I have determined that construction of the well pads, access roads and on lease pipelines to allow Encana Oil & Gas (USA) Company reasonable access to the mineral lease in order to develop the existing lease as described in the EA will not significantly affect the quality of the human environment. Accordingly, I have determined that the preparation of an Environmental Impact Statement is not necessary.

IV. Other Alternatives Considered

No other alternatives were analyzed that would result in less disturbance.

V. Rationale for the Decision

Pursuant to 40 Code of Federal Regulations (CFR) 1508.28 and 1502.21, this site-specific environmental assessment (EA) tiers to and incorporates by reference the information and analysis contained in the Farmington Proposed Resource Management Plan/Final Environmental Impact Statement [(PRMP/FEIS) BLM 2003a]. This EA is in conformance with the management goals set forth in the Resource Management Plan (RMP) for the Farmington Field Office (FFO) of the BLM, which was approved by the Record of Decision (ROD) signed September 29, 2003 (BLM 2003b). Specifically, this action is in conformance with the following: It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices. At the same time, the BLM strives to ensure that mineral development is carried out in a manner that minimizes environmental damage and provides for the rehabilitation of affected lands (2003b, 2-2). The PRMP/FEIS, RMP, and ROD are available for review at the BLM Farmington Field Office, 6251 College Blvd., Farmington, NM, or electronically at:

[The proposed action is in conformance with the 2003 BLM-FFO Resource Management Plan (RMP). Pursuant to 40 CFR 1508.28 and 1502.21, this site-specific Environmental Assessment (EA) tiers into and incorporates by reference the information and analysis contained in the BLM-FFO Proposed Resource Management Plan/Final Environmental Impact Statement (PRMP/FEIS) (BLM 2003a). The RMP was approved by the September 29, 2003 Record of Decision (ROD) (BLM 2003b), and updated in December 2003.

Specifically, the proposed project supports the following BLM policy:

It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices. At the same time, the BLM strives to ensure that mineral development is carried out in a manner that minimizes environmental damage and provides for the rehabilitation of affected lands. (BLM 2003b, 2-2 – 2-3)

Regulations under 43 CFR 1610.5 requires the proposed action to be in conformance with the terms and the conditions of the RMP as approved by the ROD signed September 29, 2003 (BLM 2003b) and updated in December 2003.

I have determined that the activities described in the proposed action will not adversely affect or cause loss or destruction of scientific, cultural, or historical resources, including those listed in or eligible for listing in the National Register of Historic Places (40 CFR 1508.27(b)(8)). Cultural resources were not identified in the project areas.

Note: If there are questions about these stipulations, contact Janet Clawson (BLM) at 505.564.7662 or jmclawson@blm.gov

The proposed activities are not likely to adversely affect any endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act (40 CFR 1508.27(b)(9)). The project area is within a Sensitive Species (Bracks hardwall cacti) habitat but not within any Threaten and Endangered habitat.

VI. Public Involvement

The Notice of Staking was made available for the public to review at the Farmington Field Office. No comments were received. The project was posted on the Farmington Field Office NEPA log. No comments were received.

VII. Administrative Review and Appeal

Under BLM regulations, this Decision Record (DR) is subject to administrative review in accordance with 43 CFR 3165. Any request for administrative review of this DR, with or without oral presentation, must include information required under 43 CFR 3165.3(b) (State Director Review), including all supporting documentation. Such a request must be filed in writing with the State Director, Bureau of Land Management, 301 Dinosaur Trail, Santa Fe, NM 87508, no later than 20 business days after this DR is received or considered to have been received.

Any party who is adversely affected by the State Director's decision may appeal that decision to the Interior Board of Land Appeals, as provided in 43 CFR 3165.4.

This decision to authorize a right-of-way may be appealed to the Interior Board of Land Appeals (IBLA), Office of the Secretary, in accordance with the regulations contained in 43 CFR Part 4. Any appeal must be filed within 30 days of this decision. Any notice of appeal must be filed with Richard A Fields, Field Manager, Bureau of Land Management, Farmington Field Office, 6251 College Boulevard, Suite A, Farmington, NM 87402. The appellant shall serve a copy of the notice of appeal and any statement of reasons, written arguments, or briefs on each adverse party named in the decision, not later than 15 days after filing such document (see 43 CFR 4.413(a)). Failure to serve within the time required will subject the appeal to summary dismissal (see 43 CFR 4.413(b)). If a statement of reasons for the appeal is not included with the notice, it must be filed with the IBLA, Office of Hearings and Appeals, U. S. Department of the Interior, 801 North Quincy St., Suite 300, Arlington, VA 22203 within 30 days after the notice of appeal is filed with Garry Torres, Farmington Field Office Manager.

Notwithstanding the provisions of 43 CFR 4.21(a)(1), filing a notice of appeal under 43 CFR Part 4 does not automatically suspend the effect of the decision. If you wish to file a petition for a stay of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal.

A petition for a stay is required to show sufficient justification based on the following standards:

- (1) The relative harm to the parties if the stay is granted or denied;
- (2) The likelihood of the appellant's success on the merits;
- (3) The likelihood of immediate and irreparable harm if the stay is not granted; and
- (4) Whether the public interest favors granting the stay.

In the event a request for stay or an appeal is filed, the person/party requesting the stay or filing the appeal must serve a copy of the appeal on the Office of the Field Solicitor: United States Dept. of the Interior, Office of the Solicitor, Southwest Regional Office, 505 Marquette Avenue NW, Suite 1800, Albuquerque, NM 87102.

/s/Richard A. Fields
Richard A. Fields
Field Manager
BLM, Farmington Field Office

5/16/16
Date

**UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT**

Farmington District
Farmington Field Office
6251 N. College Blvd., Ste. A
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Finding of No Significant Impact

**Encana Oil & Gas (USA) Company
Cluster 48 B**

NEPA No. DOI-BLM-NM-FO10-2016-0020

**Lybrook D34 2307 01H, 02H, 03H & 04H
Lybrook L34 2307 01H, 02H, 03H & 04H**

**ATS No.'s F010-15-210, 211, 212, 213
ATS No.'s F010-15-214, 215,216, 217**

FINDING OF NO SIGNIFICANT IMPACT

I have determined that the proposed action, as described in Environmental Assessment (EA) **NM-FO10-2016-0020** will not have any significant impact, individually or cumulatively, on the quality of the human environment. Because there would not be any significant impact, an Environmental Impact Statement is not required.

In making this determination, I considered the following factors:

Context

The Farmington Field Office (FFO) is located in northwestern New Mexico. The field office boundaries include approximately 7,800,000 acres; 1.4 million surface acres and an additional 1 million acres of mineral estate are managed by the BLM. The distribution of BLM-managed lands is fairly well consolidated in the north and becomes increasingly mingled with Tribal lands to the south. BLM-managed lands abut the Navajo Reservation to the west and south, Jicarilla Apache Nation Reservation to the east, and the Ute Mountain Reservation and Southern Ute Indian Reservation to the north. Aztec Ruins National Monument and Chaco Culture National Historical Park, managed by the National Park Service, lie within the field office boundaries. The BLM manages approximately 18% of lands within a 10 mile radius of Chaco Culture National Historical Park.

The FFO encompasses the New Mexico portion of the San Juan Basin. The San Juan Basin and surrounding areas have been occupied by varied cultures since the Paleo Indian period (circa 10,000 BC). The San Juan Basin and Four Corners area have one of the most extensive prehistoric and protohistoric occupations in the United States. The most commonly known archaeological resources are the Anasazi structures at Chaco Culture National Historical Park, Mesa Verde National Park, and other National Park Service sites. Scattered across BLM-managed lands are similar, but smaller structures, which were probably related to these larger sites. Twenty-three Chacoan outliers are known to exist within the FFO. Each contains at least one Chacoan structure and most have associated communities, prehistoric roads, and great kivas along with features such as herraduras and special use areas. The FFO contains an extensive system of finely engineered roads radiating out from Chaco Canyon and extending a considerable distance to outlying sites through the San Juan Basin and beyond. These roads are

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remarkably straight and carefully constructed. The most notable is the Great North Road, which starts at Chaco Canyon and run north to the Aztec Ruins.

Located within the boundary of the FFO is much of Dinétah, the ancestral homeland to the Navajo. Here the Navajo constructed forked-stick hogans, shades, sweat lodges, and other structures over a several hundred year span. During a short period between 1680 and the mid-1700s, pueblitos were constructed, often associated with other structures. Although not firmly dated, extensive Navajo pictograph and petroglyph sites were painted, etched, pecked, or ground onto the sandstone cliffs of the canyons of Dinétah. Most are believed to be ceremonial art which is no longer traditionally executed in a permanent form.

Native American Traditional and Sacred Areas are known to exist across the FFO. Many are associated with narrative accounts of origin or other traditional stories. Most of the identified sacred areas are associated with the Navajo culture. These places are still important in Navajo ceremonies and daily activities.

Historic Hispanic or Spanish and Anglo sites within the San Juan Basin primarily date from the late 1800s to the present. Although there are some early Spanish land grants in the southern portion of the FFO, most historic sites located on public lands are either Hispanic or Anglo homesteads with associated structures from the late 1800s and early 1900s. Associated with many clusters of homesteads were a school house and often a church which was visited every few months by a priest.

Cultural resource inventories have been conducted throughout the FFO for project undertakings, management studies, and scientific inquiries. As of April 2014, approximately 760,000 acres of the 7,800,000 acres in the FFO boundaries have been inventoried. Over 46,000 sites have been identified ranging from small artifacts to the 800-room structures in Chaco Canyon. Many of these sites are listed on the National Register of Historic Places and Chaco Culture National Historical Park along with several of the Chacoan sites which have been placed on the World Heritage List. The FFO manages 79 Areas of Critical Environmental Concern (ACECs) for relevant and important cultural values, including five World Heritage Sites.

The San Juan Basin is an important area for mammalian and reptilian fossils. A variety of paleontological resources exist in the FFO including animal fossils, fossil leaves, palynomorphs, petrified wood, and trace fossils occurring in the Triassic, Jurassic, Cretaceous, and Tertiary rocks. Dinosaur and other fossils have made significant contribution to the scientific record have been found and excavated in the FFO. Paleontological resources are present in the Bisti De-Na-Zin Wilderness Area, Ah-Shi-Sle-Pa Wilderness Study Area, Fossil Forrest Research Natural Area, and seven fossil areas identified in the 2003 Farmington Resource Management Plan.

The San Juan Basin is one of the largest natural gas fields in the nation and has been under development for more than 60 years. Oil was discovered by accident in the Seven Lakes area of McKinley County in 1911. Natural gas was discovered near Aztec, New Mexico, in 1920-1921 with oil of commercial quantity discovered near the Hogback in 1922 (Barnes 1951). Several small pipelines were built to carry the oil and gas from these discoveries to Aztec and Farmington, respectively. Development began in earnest in the late 1940s and early 1950s as the demand for natural gas increased. The FFO manages 2,765 active oil and gas leases in the San Juan Basin consisting of 2.1 million acres. Leasing began in the mid-1930s and accelerated in the late 1940s. By 1950, over 1 million acres were under lease.

In 1951, El Paso Natural Gas completed the first interstate pipeline out of the San Juan Basin to California. That same year, oil was discovered in the Mancos Shale in Dogie Canyon (Barnes 1951). Since that time, over 30,000 oil and gas wells have been drilled in the San Juan Basin with approximately 16,000 associated rights-of-way. Approximately 23,000 wells are currently producing. Since Stanolind Oil introduced hydraulic fracturing in 1949, nearly every well in the San Juan Basin has been fracture stimulated.

Intensity

1. The activities described in the proposed action do not include any significant beneficial or adverse impacts (40 CFR 1508.27(b)(1)). Per 40 CFR 1500.1(b), the EA concentrated on issues that are truly significant to the action in question, rather than amassing needless detail. Issues have a cause and effect relationship with the proposed action or alternatives; are within the scope of the analysis; have not been decided by law, regulation, or previous decision; and are amendable to scientific analysis rather than conjecture (BLM 2008, page 40). The following issues were identified related to the proposed action.

- How would dust and equipment emissions associated with the project impact air resources?
- How would vegetation-clearing, project activities, and final reclamation impact soils?
- Would drilling the proposed well impact groundwater?
- How would vegetation-clearing, project activities, and final reclamation associated with the project impact upland vegetation?
- How would vegetation-clearing, project activities, and final reclamation impact wildlife, including migratory birds?
- How would vegetation-clearing, project activities, and final reclamation impact the following BLM Special Status Species: American peregrine falcon (*Falco peregrinus anatum*), Aztec gilia (*Aliciella formosa*), Bendire's thrasher (*Toxostoma bendirei*), Brack's fishhook cactus (*Sclerocactus cloveriae* var. *brackii*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), pinyon jay (*Gymnorhinus cyanocephalus*), Townsend' big-eared bat (*Corinorhinus townsendii*), and spotted bat (*Euderma maculatum*)?
- How would vegetation-clearing, project activities, and final reclamation impact the following Federally-listed threatened and endangered species: Bracks cactus (*Sclerocactus cloverae* ssp. *brackii*)?
- How would surface disturbing activities associated with the proposed project have on paleontological resources.
- How would surface-disturbing activities associated with the proposed project impact cultural resources?
- How would the project affect human health and safety?
- Would the project have disproportionate effects on minority or low income populations?

The EA includes a description of the expected environmental consequences of the proposed activities for those issues in Chapter 3.

2. The activities included in the proposed action would not significantly affect public health or safety (40 CFR 1508.27(b)(2)). The following design features have been included in the proposed action to address any impacts to public health and safety: The project area is within a sparsely populated, rural area approximately 6 to 7 miles southeast of Counselor, NM.

Public health and safety concerns are related to vehicle travel on area roads and public and worker safety around natural gas/oil wells, pipelines, or other production facilities. Worker safety concerns include working near loud equipment, heavy equipment and moving parts, and flammable and/or explosive material. Other health and safety concerns identified include the risk of pipeline rupture, leaks, or explosion. There is a risk of accidental spills and illegal dumping of non-hazardous and hazardous materials. Contamination of surface waters, near-surface drinking water aquifers, and soil resources caused by surface degradation due to accidental spills and leaks of chemicals and waste products are also of concern. Potential impacts to surface water and shallow groundwater resources are addressed in detail in Section 3.2–Surface Water Resources.

The proposed wells would be located near other wells, pipeline ROWs, other oil and gas facilities, and a network of dirt surface access roads. Public risk associated with well drilling includes increased traffic on public roads, wildfire, pipeline leakage, rupture, fire, and explosion. Additional public health and safety risks include spills of wastes, chemicals, or hazardous materials. Roads in the area are generally unimproved

dirt surface and are used to access natural gas facilities. These roads may become hazardous or impassable during periods of inclement weather.

Air quality may effect health and safety. Air quality for San Juan County and for the State of New Mexico is described earlier in the Air Resources section 3.1. of the Environmental Assessment.

Traffic along US 550 would be most heavy during the construction phase of each well pad (a duration of 7 to 15 days per well pad), as well as during interim reclamation approximately 120 days after the start of the project (for a duration of 7 to 15 days per well pad). Approximately 5 to 40 vehicle trips would be needed during the project duration (about 4 to 5 months total per well). Construction crews are required to comply with all traffic laws; however, additional traffic could increase the risk of traffic accidents. Additional personnel residing in the project area could contribute to crime. About 10 to 40 construction personnel would be onsite during the project, depending on the stage of project completion. Personnel likely would find lodging and other requirements (fuel, food, etc.) in Bloomfield, New Mexico, about 37 miles north of the project area. The potential for increased crime, particularly given trends in the Bloomfield crime statistics, are speculative.

Changes to air quality from the proposed action are expected to be relatively minor, as discussed in Section 3.1. of the EA. It is unclear whether these air pollutants would affect the health of nearby residents or workers closest to the well. Workers in closest proximity to the drilling activity use engineering controls and protective gear to minimize risk of effects.

Cumulative impacts: None would be expected due to the relatively small scale and short duration of the project, as well as local traffic and crime trends.

3. The proposed activities would not significantly affect any unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas (40 CFR 1508.27(b)(3)). Unique characteristics are generally limited to those that have been identified through the land use planning process or other legislative, regulatory or planning processes (BLM 2008, page 71). The FFO does not contain any prime and unique farmlands, suitable or designated wild and scenic rivers, or designated caves. Table 1 discloses the distance of the proposed activities to wetlands delineated by the Army Corps of Engineers. Table 2 discloses the distance of the proposed activities to National Park Service units and Congressionally designated areas. ***The proposed action and alternatives are not located within an Area of Critical Environmental Concern.*** Impacts to historic or cultural resources are described in the Cultural Resources section of the EA and discussed further under item 8.

Table 1. Distance of the Proposed Activities from Wetlands

Delineated Wetlands	Distance from Proposed Activities
Bancos	64 – 65 miles
Blanco	48 – 49 miles
Bloomfield	52 – 53 miles
Cutter Canyon	43 – 44 miles
Carrizo Oxbow	40 – 41 miles
Desert Hills	55 - 56 miles
Valdez	51 – 52 miles

Table 2. Distance of the Proposed Activities from Park Lands and Ecologically Critical Areas

Park Land or Ecologically Critical Area	Distance from Proposed Activities
Ah-Shi-Sle-Pah Wilderness Study Area	20 – 21 miles
Aztec Ruins National Monument	63 – 64 miles
Bisti De-Na-Zin Wilderness Area	32 – 33 miles

Chaco Culture National Historical Park	23 – 24 miles
Fossil Forest Research Natural Area	34 – 35 miles

4. The activities described in the proposed action do not involve effects on the human environment that are likely to be highly controversial (40 CFR 1508.27(b)(4)). Controversy in this context means disagreement about the nature of the effects, not expressions of opposition to the proposed action or preference among the alternatives (BLM 2008, page 71). Oil and gas development has occurred in the San Juan Basin for more than 60 years. While there may be controversy over the appropriateness of oil and gas development, there is not a high level of controversy or substantial scientific dispute over the impacts of that activity. The impacts of the proposed activities are described in Chapter 3 of the EA.

5. The activities described in the proposed action do not involve effects that are highly uncertain or involve unique or unknown risks (40 CFR 1508.27(b)(5)). As described under Context, oil and gas development has occurred in the San Juan Basin since the late 1940s and early 1950s. The field office has permitted over 30,000 wells and 16,000 rights-of-way. Hydraulic fracturing has occurred on nearly every well in the San Juan Basin since the 1950s. As such, the FFO has decades of experience and is knowledgeable about the impacts and risks associated with the proposed activities.

6. My decision to implement these activities does not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration (40 CFR 1508.27(b)(6)). Approval of these activities in no way assures approval of any future activities.

7. The effects of the proposed activities would not be significant, individually or cumulatively, when considered with the effects of other actions (40 CFR 1508.27(b)(7)). Direct, indirect, and cumulative impacts are described in Chapter 3 of the EA.

8. I have determined that the activities described in the proposed action will not adversely affect or cause loss or destruction of scientific, cultural, or historical resources, including those listed in or eligible for listing in the National Register of Historic Places (40 CFR 1508.27(b)(8)). The proposed activities are not located in an ACEC containing relevant and important cultural values. Cultural resource surveys). Cultural resource surveys were completed (**BLM Report Numbers 2015 (IV) 040 F and 2015 (IV) 041 F**). No archaeological resources or site were located. No monitoring or site protection fencing will be required during construction, drilling and reclamation as discussed in EA in the Cultural Resources section 3.7.

The BLM fulfills its responsibilities under the National Historic Preservation Act (NHPA) through a number of agreements. The National Programmatic Agreement (NPA; 2012) between the BLM, Advisory Council on Historic Preservation (ACHP), and the National Council of State Historic Preservation Officers (NCSHPO) allows the agency to fulfill its NHPA responsibilities according to the provisions of the NPA in lieu of 36 CFR 800.3 through 800.7 regulations. The NPA, which applies to all BLM activities below specified thresholds, provides among other things, regulatory relief in many instances from the requirement for case-by-case review by State Historic Preservation Officers (SHPOs) and the ACHP, in exchange for managers' maintenance of appropriate staff capability and observance of internal BLM standards as set out in the 8100 Manual series.

The New Mexico BLM has a two-party protocol with the New Mexico SHPO (2014) specifically encouraged by the NPA. This protocol details how the New Mexico BLM and SHPO will regulate their relationship and consult. Specifically, this document outlines among other things, how and when consultation will be conducted between the BLM, SHPO, Tribes, and the public. The protocol also outlines when case-by-case SHPO consultation is or is not required for specific undertakings and the procedures for evaluating the effects of common types of undertakings and resolving adverse effects to historic properties. These common types of undertakings regularly include the common actions undertaken in the BLM FFO.

9. The proposed activities are not likely to adversely affect any endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act (40 CFR 1508.27(b)(9)).

The proposed action area provides potential foraging habitat for American peregrine falcon, prairie falcon, golden eagle, and to a lesser degree ferruginous hawk. The proposed project and action area were visually scanned for raptors, raptor nests, and whitewash. One unknown stick nest was observed near, but outside the proposed project areas. Ravens, but no other raptors or their sign were observed during the on-site field survey.

The project area does not contain suitable habitat for mountain plover, yellow-billed cuckoo, burrowing owl, or bald eagle.

The proposed projects would result in the disturbance of up to 15.4 acres, or <.01% of Brack's fishhook cactus habitat of the approximate 77,000 acres of potential habitat within the Escavada Wash watershed. Of this, approximately 11.6 acres would be reseeded. The remainder, 3.8 acres, would remain disturbed throughout the life of the proposed projects. It is possible that Brack's fishhook cacti could grow within reclaimed portions of the proposed project areas, although the likelihood of these species populating disturbed areas is unlikely.

A total of approximately 290 individual Brack's hardwall cacti were recorded during biological surveys in the proposed Lybrook D34-2307 and Lybrook L34-2307 project areas. To minimize impacts to Brack's cactus, Encana conducted spatial analyses and determined there was no alternative to develop the minerals in Sections 34 and 33 and also avoid Brack's cactus habitat due to the extent of the habitat and operational issues with wellbore reach, and artificial lift constraints. Rough topography and drainages limit the options for locating the proposed well pads. Refer to Section 2.3 for further details on Alternatives Considered but Eliminated. All individual Brack's cactus will be transplanted using protocol established in IM NMF000-2014-010.

The proposed projects would result in the disturbance of up to 15.4 acres, or <.01% of Brack's fishhook cactus habitat of the approximate 77,000 acres of potential habitat within the Escavada Wash watershed. Of this, approximately 11.6 acres would be reseeded. The remainder, 3.8 acres, would remain disturbed throughout the life of the proposed projects. It is possible that Brack's fishhook cacti could grow within reclaimed portions of the proposed project areas, although the likelihood of these species populating disturbed areas is unlikely.

Approximately 15.4 acres of potential and occupied Brack's cactus habitat would be removed for the long term (< 0.001% habitat loss within the Escavada Wash watershed).

10. The proposed activities will not threaten any violation of Federal, State, or local law or requirements imposed for the protection of the environment (40 CFR 1508.27(b)(10)). Sections 1.4 and 1.5 of the EA describe the relationship of the proposed activities to relevant laws, policies, regulations, and plans.

REFERENCES

Barnes, Frank C., 1951. History of development and production of oil and gas in the San Juan Basin. In *The south and west sides of the San Juan Basin, New Mexico and Arizona*, Smith, C.T.; Silver, C. ed(s), New Mexico Geological Society, Guidebook, 2nd Field Conference, pp. 155-160.

BLM. 2008. *National Environmental Policy Handbook. H-1790-1*. Bureau of Land Management. National Environmental Policy Act Program.

APPROVED:

/s/Richard A. Fields
Richard A. Fields
Farmington Field Manger
BLM, Farmington Field Office

5/16/16
Date

**United States Department of the Interior
Bureau of Land Management**

Environmental Assessment DOI-BLM-NM-F010-2016-0020

Cluster 48B

Lybrook D34-2307 01H, 02H, 03H & 04H

Lease Number NMNM 16586

Lybrook L34-2307 01H, 02H, 03H & 04H

Lease Number NMNM 16586

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February 2016

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New Mexico • Farmington Field Office



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 AND ABBREVIATIONS

°F	degrees Fahrenheit
AADT	Average Annual Daily Traffic
ACHP	Advisory Council on Historic Preservation
APD	Application for Permit to Drill
APE	area of potential effect
AQI	Air Quality Index
AUM	animal unit month
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice
BOP	blowout preventer
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH ₄	Methane
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
COA	Conditions of Approval
EA	Environmental Assessment
Ecosphere	Ecosphere Environmental Services, Inc.
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 gases
GIS	geographic information system
HAP	hazardous air pollutants
LAC	La Plata Archaeological Consultants
MBTA	Migratory Bird Treaty Act
MLA	Mineral Leasing Act
NAAQS	National Ambient Air Quality Standard
NATA	National Scale Air Toxics Assessments
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMAAQs	New Mexico Ambient Air Quality Standards

NMDOT	New Mexico Department of Transportation
NMOSE	New Mexico Office of the State Engineer
NMPIF	New Mexico Partners in Flight
NMPM	New Mexico Principal Meridian
NMSDA	New Mexico State Department of Agriculture
NO ₂	nitrogen dioxide
NO _x	nitrous oxides
NPA	National Programmatic Agreement
NRHP	National Register of Historic Properties
O ₃	ozone
ONGARD	Oil and Natural Gas Administration and Revenue Database
Pb	lead
PFYC	Potential Fossil Yield Classification
PL	Public Law
PM ₁₀	particulate matter between 2.5 and 10 micrometers in diameter
PM _{2.5}	particulate matter less than 2.5 micrometers in diameter
PRMP	Proposed Resource Management Plan
POD	Point of Diversion
RMP	Resource Management Plan
RFD	reasonable foreseeable development
ROD	Record of Decision
ROW	right-of-way
RPFO	Rio Puerco Field Office
SDA	Specially Designated Area
SHPO	State Historic Preservation Officer
SO ₂	sulfur dioxide
TCP	traditional cultural property
TUA	temporary use area
USC	United States Code
USDI	United States Department of Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compounds

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1. PURPOSE AND NEED FOR ACTION

1.1 Background

Encana Oil & Gas (USA) Inc. (Encana) is proposing to develop the Lybrook D34-2307 and the Lybrook L34-2307 well pads and associated access roads and well-tie pipelines (Cluster 48B) in Sandoval County, New Mexico. Encana has filed Applications for Permit to Drill (APDs) with the United States Department of the Interior (USDI) Bureau of Land Management (BLM) Farmington Field Office (FFO) to drill four wells each on the Lybrook D34-2307 and the Lybrook L34-2307 well pads.

Encana has applied for right-of-way (ROW) grants with the BLM/FFO to construct the proposed off-lease Lybrook D34-2307 and the Lybrook L34-2307 well pads and associated access roads and well-tie pipelines.

Surface disturbance activities associated with drilling the wells would include construction of two well pads, new and upgraded access roads, and subsurface well-tie pipelines. The proposed action would be located on BLM-managed lands and would access federal minerals administered by the BLM/FFO. The proposed action would be located approximately 3.2 miles to 3.7 miles south of Lybrook, New Mexico.

1.2 Purpose and Need for Action

The purpose of the proposed action is to provide Encana with reasonable access to BLM-managed lands to develop their federal mineral lease (Lease Number NMNM 16586) to construct the two proposed well pads, access roads, well-tie pipelines, and drill the eight proposed wells.

The need for the action is BLM's responsibility under the Mineral Leasing Act (MLA) of 1920, as amended (30 United States Code [USC] 181 et seq.), to respond to the ROW applications. The MLA authorizes the BLM to issue oil and gas leases for the exploration of mineral resources and permit the development of those leases. The need for the action 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 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 BLM/FFO must determine if there are any significant environmental impacts associated with the proposed action warranting further analysis in an Environmental Impact Statement (EIS). The BLM/FFO Field Manager is the responsible officer who will decide one of the following:

- To approve the proposed ROW grants with design features as submitted
- To approve the proposed ROW grants with additional mitigations
- To analyze the effects of the proposal in an EIS.
- To deny the ROW grants

1.4 Conformance with Applicable Land Use Plan(s)

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

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 installation and operation of the wells, access roads, and pipelines. These laws and regulations include, but are not limited to:

- Antiquities Act of 1906, as amended (PL 52-209; 16 USC 431-433)
- American Indian Religious Freedom Act of 1978 (PL 95-431; 92 Stat. 469; 42 USC 1996)
- Archaeological Resources Protection Act of 1979 (PL 96-95; 93 Stat. 721; 16 USC § 470aa et seq.), as amended (PL 100-555; PL 100-588)
- Bald and Golden Eagle Protection Act of 1940, as amended (PL 86-70, PL 87-884, PL 92-535, PL 95-616; USC 668-668d)
- Clean Air Act, as amended (PL 88-206; 42 USC § 7401 et seq.)
- Clean Water Act, as amended (PL 107-303; 33 USC § 1251, et seq.)
- Colorado River Salinity Control Act, as amended (PL 93-320; 7 CFR Part 702)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (PL 96-510; 42 USC § 9601; 40 CFR Part 307)
- Endangered Species Act (ESA) 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 (MBTA) 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 (1978 § 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 (NHPA) 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)

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.

1.6.1 Issues to be Analyzed

The following issues were identified as potential issues of concern by the Interdisciplinary Team during internal scoping meeting on Monday July 6, 2015:

- How would the proposed action affect air resources?
- How would the proposed action affect soil resources?
- How would the proposed action affect surface water resources?
- How would the proposed action affect upland vegetation?
- How would the proposed action affect the establishment and distribution of noxious weeds and invasive species?
- How would the proposed action affect migratory birds?
- How would the proposed action affect BLM special management species?

- How would the proposed action affect wildlife?
- How would the proposed action affect cultural resources?
- How would the proposed action affect paleontological resources?
- How would the proposed action affect traffic and transportation?
- How would the proposed action affect livestock grazing?
- Would the proposed action have environmental justice impacts?
- How would the proposed action affect public health and safety?

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). External scoping was conducted through posting this project on the BLM/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.

1.6.2 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 Interdisciplinary Team identified the following during internal scoping as potential issues of concern that would not be significantly impacted.

Threatened and Endangered Species

No federally listed species with the potential to occur in Sandoval County or potential habitats for federally listed species were observed within the proposed analysis area. Furthermore, no designated critical habitat for any federally listed species occurs within the proposed analysis area. Water used for well drilling and completions would be sourced from one or more permitted private water wells. One source would be Point of Diversion (POD) Number SJ 2105; the second source has been assigned the Permit Number RG-82771 through RG-82771-S-2 by the New Mexico Office of the State Engineer (NMOSE); and a third source has been assigned the Permit Number SJ-00960-S-2 by the NMOSE. No new water depletions would result from the proposed action. The BLM/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.

Traditional Cultural Properties

For the proposed action, identification of Native American Religious Concerns was limited to reviewing existing, published, and unpublished literature (Brugge 1993; Kelly et al. 2006; Van Valkenburgh 1941, 1974); 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. There are currently no known remains that fall within the purview of the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) or the Archaeological Resources Protection Act (16 USC 470) within the analysis area. The proposed action would not impact any known traditional cultural properties, prevent access to sacred sites, prevent the possession of sacred objects, or interfere with or hinder the performance of traditional ceremonies and rituals pursuant to the American Indian Religious Freedom Act of 1978 (42 USC 1996) or Executive Order 13007.

Hydrologic Fracturing

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 or disposal (USEPA 2004). 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 both the Mancos Shale and Mesaverde formations and provides an impermeable layer that isolates the Mancos Shale and Mesaverde formations from both identified sources of drinking water and surface water. On average, total depth of the proposed well bore would be about 5,000 feet below the ground surface. Fracturing in the Basin Mancos formation is not expected to occur above depths of 4,000 feet below the ground surface. Fracturing could 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 the proposed wells.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Alternative A: 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 ROW grants, and the current land and resource uses would continue in the area.

2.2 Alternative B: Proposed Action

Encana is proposing development of the Cluster 48B well pads, well-tie pipelines, and roads to access the mineral estate administered by the BLM/FFO. The proposed action would be located in Sandoval County, New Mexico, south of Lybrook and U.S. Highway 550. A vicinity map is provided as Figure 1 in Appendix A.

The proposed Lybrook D34-2307 would be co-located with the existing Federal B #5 while the proposed Lybrook L34-2307 would be co-located with the plugged and abandoned Federal B #4 well pad.

Figure 2 shows the proposed action on the Lybrook, New Mexico U.S. Geological Survey 7.5-minute topographic map. Figure 3 displays the proposed action on the Lybrook, New Mexico, 2010 aerial photograph (see Appendix A). Photographs of the proposed action components are also provided in Appendix A. Legal descriptions of the proposed action components are listed in Table 2-1.

Table 2-1. Legal description for the proposed action components surface locations

Component		Legal Description
Lybrook D34-2307	Well pad	NW ¼ of Section 34, Township 23 North, Range 7 West
	Access road and pipeline	NW ¼ and SW ¼ of Section 34, Township 23 North, Range 7 West
Lybrook L34-2307	Well pad	SW ¼ of Section 34, Township 23 North, Range 7 West
	Access road and pipeline	SW ¼ of Section 34, Township 23 North, Range 7 West

Note: NW = northwest; SW = southwest

Construction of the proposed action would require two temporary use areas (TUAs). Table 2-2 lists the TUA locations, purpose, and size.

Table 2-2. Temporary use area locations, purpose, and size

Component	Station	Purpose	Size (acres)
Lybrook D34-2307	Access road 0+00 to 2+00	Truck staging	0.46
Lybrook L34-2307	P&A well pad	Truck staging	1.24

Table 2-3 lists the well-tie pipeline and access road lengths and the dimensions of the well pads that are part of the proposed action. The proposed action would be permitted by ROW grants from the BLM/FFO. The table includes land status for each project component.

Table 2-3. Permitted rights-of-way for the proposed action

Name	Type of Right-of-Way	Bureau of Land Management (feet)
Lybrook D34-2307	Well pad	490 x 400
	Access road	2,067.7
	Pipeline	1,489.4
	Temporary Use Area	200 x 100
Lybrook L34-2307	Well pad	490 x 400
	Access road	1,272.60
	Pipeline	930.9
	Temporary Use Area	215 x 250

Activities associated with the proposed project would include construction of the access roads and well pads; upgrading existing roads; 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 below.

Construction

Construction for the access roads and well pads would take approximately 1 to 2 weeks per location. Table 2-4 provides a summary of proposed disturbance that would occur under the proposed action. Detailed descriptions are provided in the following paragraphs.

Table 2-4. Summary of surface disturbance for the proposed action

Name	Total Disturbance (acres)				New Disturbance (acres)	Long-term Disturbance (acres)		
	Well Pad	Pipeline/Road ¹	TUA ²	Total	Total	Well Pad	Pipeline/Road ¹	Total
Lybrook D34-2307	6.77	1.44	0.46	8.69	7.5	1.6	0	1.6
Lybrook L34-2307	6.77	1.37	1.24	9.38	7.9	1.6	0.6	2.2
Total				18.07	15.39			3.8

¹ Where pipeline and roads parallel, the construction corridor is 50 feet wide; for access roads, the construction corridor is 30 feet wide; for pipelines the construction corridor is 40 feet wide.

² TUA = Temporary Use Area

Drilling of the proposed Lybrook D34-2307 wells would require constructing a 490-foot by 400-foot well pad with a 50-foot-wide construction zone around the perimeter for a disturbance of approximately 6.77 acres. Maximum cut would be approximately 4.5 feet at corner 6, and the maximum fill would be approximately 6.4 feet at corner 3. To access the well pad, Encana would upgrade approximately 2,068 feet of an existing road. To ensure safe traffic flow, one pullout would be constructed along the proposed access road. The pullout would be designed in accordance with BLM standards and would be up to 20

feet wide and approximately 150 feet long tapering back into the roadway. Encana would also construct and operate a proposed well-tie pipeline approximately 1,489 feet in length. The proposed well-tie pipeline would parallel the proposed upgraded access road and would be constructed within a 40-foot-wide ROW. Construction of the proposed Lybrook D34-2307 project would require one TUA approximately 0.46 acre in size. Total surface disturbance for the proposed Lybrook D34-2307 project would be 8.69 acres. After interim reclamation, approximately 1.6 acres would remain long-term disturbance.

Drilling of the proposed Lybrook L34-2037 well would require constructing a 490-foot by 400-foot well pad with a 50-foot-wide construction zone around the perimeter for a disturbance of approximately 6.77 acres. Maximum cut would be approximately 10.7 feet at laydown, and the maximum fill would be approximately 7.4 feet at corner 3. To access the site, Encana would construct a new road approximately 1,273 feet in length. The proposed well-tie pipeline would be approximately 931 feet in length and would parallel the proposed access road for approximately 776 feet. Where the pipeline and access road are parallel, the construction width would be 50 feet (including the road width). The remaining 494 feet of the road would be constructed in a 30-foot-wide ROW, and the remaining 155 feet of pipeline would be constructed in a 40-foot-wide ROW. The proposed project would require a TUA for truck staging. Approximately 1.24 acres of a plugged and abandoned well pad immediately north of the proposed well pad would be used as a TUA. Total surface disturbance for the proposed project would be approximately 9.38 acres. After interim reclamation, approximately 2.2 acres would remain long-term disturbance.

Drilling and Completions

After access road and 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 fluids
- Mud shakers to separate the cuttings from the fluids
- Generators to provide power to the drill rig
- Office trailers equipped with sleeping quarters for essential personnel

Drilling operations would be conducted in compliance with all Federal Onshore Oil and Gas Orders, all applicable Federal and State of New Mexico rules and regulations, and BLM Notice to Lessees. The proposed wells would be horizontal wells targeting the Alamito Gallup/Basin Mancos. The proposed wells would be drilled to a vertical depth greater than 5,000 feet and then horizontally drilled.

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

BOP, a string of intermediate casing would be installed. 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 wells 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 gas or 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 one or more existing private water wells or private water hole. One source is located in the SW/NE ¼ of Section 32, of Township 25 North, Range 9 West, New Mexico Principal Meridian (NMPM). This well is permitted by the State of New Mexico. The well has been assigned the POD Number SJ 2105 by the NMOSE. The second source is located in the NE/NE ¼ of Section 9, Township 21 North, Range 2 West, NMPM. The well has been assigned the Permit Number RG-82771 through RG-82771-S-2 by the NMOSE. A third source is located in the NE/SW ¼ of Section 36, Township 24 North, Range 8 West, NMPM. The water hole has been assigned the Permit Number SJ-00960-S-2 by the NMOSE. Water would be stored on-site in steel storage tanks (up to 15).

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

Production

Production facilities on 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 are 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. Related aboveground appurtenances that would be installed within the pipeline workspace would include cathodic protection equipment, futures, and block valves with blowdowns.

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

The trenching operation would be followed by pipe installation that would include stringing, bending for horizontal or vertical angles in the alignment, welding pipe segments together, inspection, coating joints to prevent corrosion, and lowering 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 pipelines would be seeded with the seed mix and rates provided in the Reclamation Plan attached to the APDs for the wells.

Construction and well-tie pipeline installation activities would take 4 to 6 weeks per pipeline, and reclamation activities would take 1 to 2 weeks per pipeline. The pipelines and related aboveground appurtenances would be in place for the life of the wells, 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 procedure would follow the BLM/FFO Bare Soil Reclamation Procedure and the reclamation plan submitted with the APD and ROW Applications. 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 re-establish vegetation. Seed mixtures and rates would be in accordance with the Reclamation Plan for each proposed location. 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 3.8 acres associated with well operation and access would not be reclaimed.

Interim reclamation activities would be initiated within 90 days after completion of the well or 120 days of the spud date 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, covered with salvaged topsoil material, and seeded to re-establish vegetation. Sediment and erosion control measures would be installed as necessary. Final reclamation procedure would follow the Bare Soil Reclamation Procedure and the reclamation plan submitted with the APD and ROW Applications.

2.2.1 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. A detailed description of the design and construction practices associated with the proposed action is contained in the APDs, ROW Grants, and submitted plats. For the proposed action, standard and project-specific design features include but are not limited to the following:

- Roads will be maintained in the same or better condition as what existed prior to the commencement of operations. Road maintenance will continue until final abandonment and reclamation of the well locations.
- 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 well pad 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, and installing pullouts, as necessary, to provide a well-constructed and safe road.
- A migratory bird nest survey will be conducted if any vegetation-disturbing activities occur between May 15 and July 31. The survey must be conducted by a BLM-approved biologist using a survey protocol developed and provided by the BLM/FFO. If active nests are located within the proposed permitted area, project activities will not be permitted without written approval by a BLM/FFO biologist.
- All BLM/FFO cultural resources stipulations will be followed as indicated in the Cultural Resource Records of Review, attached to the Conditions of Approval (COA) in the APD/ROW as the case may be. These stipulations may include, but are not limited to temporary or permanent

fencing or other physical barriers, monitoring of earth-disturbing construction, 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 (e.g., National Register of Historic Places, Native American Graves Protection and Repatriation Act, Archaeological Resources Protection Act), it will be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM.

- Prior to construction, pipeline and road ROWs will be staked at 100- to 200-foot intervals.
- Grazing permittees will be notified when construction is scheduled to begin. All hazards to livestock will be fenced or contained.
- All project activities will be confined to permitted areas only.
- Where pipeline construction parallels or crosses public roads, warning signs will be placed to alert motorists of construction. Safety measures 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.
- Woody plant material will be chipped, shredded, or mulched and will then be incorporated into the topsoil for later use in interim reclamation. No trees 3 inches in diameter and greater suitable for fuel wood were found within the proposed action area.
- 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 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 for each location. Cuttings will be stored on-site in aboveground 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 aboveground storage tanks. Upon termination of drilling operations, the drilling fluids will be recycled and transferred to other permitted closed-loop systems or returned to the vendor for reuse, as practical. Residual fluids will be disposed of at an approved waste disposal facility.
- The water-based solution that flows back to the surface during and after completion operations will be placed in storage tanks on 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 of 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 of in an approved sewage disposal facility. Toilets will be on-site during all operations.
- Garbage, trash, and other waste materials will be collected in a portable, self-contained, and fully-enclosed trash container during drilling and completion operations. The accumulated trash will be removed, as needed, and will be disposed of at an authorized sanitary landfill. No trash will be buried or burned on location.
- Immediately after removal of the drilling rig, all debris and other waste materials not contained in the trash container will be cleaned up and removed from the well location.
- No chemicals subject to reporting under the Superfund Amendments and Reauthorization Act 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 this well.
- No extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities, will be used, produced, stored, transported, or disposed of in association with the drilling, testing, or completing of this well.
- The amount of open trench will be minimized ahead of pipe laying and backfilling. No more than ½ mile of trench or the amount of trench that can be worked in a day will be open at any given time. Backfilling operations will be performed within a reasonable amount of time of the lowering operation to ensure the trench is not left open for more than 24 hours. Trenches left open overnight will be fenced with a temporary fence or other methods approved by the Authorized Officer.
- Escape ramps/crossovers will be constructed every 1,320 feet. In areas where active grazing is taking place, escape ramps/crossovers will be placed every 500 feet. The ends of the open trench will be sloped each night with a 3:1 slope.
- Established livestock and wildlife trails will be left in place as crossovers. Escape ramps/crossovers will be constructed with a minimum 3:1 slope at each end of the crossover. Crossovers will be a minimum of 10 feet wide and not fenced.
- The end of the pipe will be plugged to prevent animals from 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 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.
- Permanent erosion control measures will be installed after the workspace has been re-contoured. Encana will construct waterbars on all disturbed areas to the spacing and cross sections specified by the Authorized Officer.
- The disturbed areas will be reseeded with a BLM/FFO Badland community seed mix, as determined during the project onsite. 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 noxious weed species within the 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 Proposal a Pesticide Use Proposal 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, impervious corrugated metal or equivalent and will hold 110 percent of the capacity of the largest tank.
- Production facilities will be painted Carlsbad Canyon or Covert Green, as determined during the project onsite to blend with the natural color of the landscape and will be located, to the extent practical, to reasonably minimize visual impact. Equipment subject to safety considerations would not be painted.

- Engines will be equipped with mufflers and barriers or other soundproofing 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 D34-2307

- Mitigation for impacts to Brack's cactus (*Sclerocactus cloveriae* ssp. *brackii*) found within the proposed action area will be determined by the BLM/FFO.
- Water will be diverted around the pad toward corner 5 on the northwest of the pad.
- Silt traps will be constructed on the north side of the pad between corners 5 and 6, on the west side of the pad between corners 3 and 5, and at corner 5.

Site-Specific Design Features for the Lybrook L34-2307

- Mitigation for impacts to Brack's cactus found within the proposed action area will be determined by the BLM/FFO.
- Brack's cactus mitigation measures will be implemented prior to treatment of halogeton (*Halogeton glomeratus*) found within the proposed project area.
- Water will be diverted to the southwest around the pad from a silt trap at corner 5 toward corner 3.

2.3 Alternatives Considered but Eliminated

The applicant analyzed several scenarios to determine how to best develop Sections 33, 34, and 35, Township 23 North, Range 7 West. Using desktop tools and in-field examination, several configurations of the proposed well pads, pipelines, and roads were considered and evaluated by the applicant, the BLM, and natural and cultural resources experts. These alternatives were considered, but have been eliminated from further consideration as they would have resulted in greater environmental impacts or would not have met the proposed action's purpose and need. The proposed Lybrook D34-2307 would be co-located with the existing Federal B #5 while the proposed Lybrook L34-2307 would be co-located with the plugged and abandoned Federal B #4 well pad.

An alternative to the Lybrook D34-2307 was originally proposed in the SW ¼ of Section 28 to develop the west half of Section 33 with north-south wells. This alternative was eliminated due to drainages and topography. The proposed Lybrook D34-2307 would develop the north half of Sections 33 and 34 with east-west wells.

An alternative to the Lybrook L34-2307 was originally proposed in the SW ¼ of Section 28 to develop the east half of Section 33 with north-south wells. This alternative was eliminated due to drainages and topography. The proposed Lybrook L34-2307 would develop the south half of Sections 33 and 34 with east-west wells.

The applicant originally proposed a well pad location in the NW ¼ of Section 26 to develop the north half of Section 27. This alternative was eliminated because the applicant was unable to determine a viable option to develop the south half of Section 27. The applicant then proposed north-south wells in the southeast quarter of Section 22 or south-north wells in the northeast quarter of Section 34. These alternatives were eliminated due to topography.

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.

3.1 Methodology

3.1.1 Direct and Indirect Impacts

Ecosphere Environmental Services (Ecosphere) biologists conducted field resource investigations of the proposed action on various dates between May 2014 and June 2015. Cultural resource surveys were conducted by La Plata Archaeological Consultants, LLC (LAC) on various dates between April 2014 and June 2015. On-site evaluations were conducted on June 16, 2015, and attended by representatives from Encana, Ecosphere, LAC, and the BLM/FFO.

The information about the existing condition of the environment is used as a baseline by which to measure and identify potential impacts from the proposed action and alternative. The analysis considered and incorporated design features, where appropriate, before arriving at the impacts described in the following section. Impacts in this section are analyzed by quantitatively estimating impacts based on the project components of the proposed action and alternatives. When necessary, impacts are analyzed qualitatively. This analysis was developed using the best available science. The primary data sources used for the analysis were the data collected from the site investigations and existing geographic information system (GIS) data and information from the BLM/FFO.

3.1.2 Cumulative Impacts

A Reasonably Foreseeable Development scenario (RFD) was prepared for the FFO in October 2014 (Engler et al. 2014). The RFD identified high, moderate, and low potential regions for oil development of the Mancos-Gallup Formation. Within the high potential region, full development would include five wells per Section, resulting in 1,600 completions. Within the moderate potential region, full development would include one well per Section, resulting in 330 completions. Within the low potential region, full development would include one well per Township, resulting in 30 well completions. Additionally, the RFD predicted 2,000 gas wells could be developed in the northeastern corner of the FFO.

The following methods and assumptions were used to predict the potential impact of the development predicted in the RFD.

Past Oil and Gas Development

Past oil and gas wells were identified using the State of New Mexico Oil and Natural Gas Administration and Revenue Database (ONGARD). Following interim reclamation, the average well pad size for past development is 0.75 acre per well pad.

Present and Future Oil Development

Based on previous development, it was assumed that development of the high potential region would involve the twinning of well pads. This is the placement of two or more wells on one well pad. The assumption for the analysis is that the development of a Section would include two twinned well pads and one single well pad, resulting in three well pads for five wells. In the moderate and low potential regions, it was assumed that development would involve single well pads. The proposed action is located in the high potential region.

The average well pad size for a twinned well pad was assumed to be 500 feet by 530 feet, or 6.08 acres. An additional 0.6 acre was added to account for any associated road or pipeline development, resulting in 6.68 acres of short-term disturbance. Following completion of the well, interim reclamation of the well pad and reclamation of any pipelines would occur, resulting in 1.5 acres of long-term disturbance.

The average well pad size for a single well pad was assumed to be 500 feet by 500 feet, or 5.74 acres. Again, an additional 0.6 acre was added to account for associated road or pipeline development, resulting in 6.34 acres of long-term disturbance. Following completion of the well, interim reclamation of the well pad and reclamation of any pipelines would occur, resulting in 1.5 acres of long-term disturbance.

The Random Point Tool in ArcMap was used to randomly assign points representing well pads and associated disturbance based on the RFD assumptions: five wells per section in the high potential region, one well per section in the moderate potential region, and one well per township in the low potential region. The allowed both long-term and short-term disturbance from oil development of the Mancos-Gallup Formation to be calculated for the analysis areas used in this EA.

Present and Future Gas Development

The RFD predicted 2,000 wells could be developed in the gas prone area. The average well pad size was assumed to be 555 feet by 410 feet, or 5.22 acres. An additional 0.6 acre of disturbance was added to account for associated roads and pipelines, resulting in total disturbance of 5.82 acres. Following completion of the well, interim reclamation of the well pad and reclamation of any pipelines would occur, resulting in 1.5 acres of long-term disturbance.

The Random Point Tool in ArcMap was used to randomly assign points representing one well pad and associated disturbance. The allowed both long-term and short-term disturbance from gas development in the northeastern corner of the FFO to be calculated for the analysis areas used in this EA. No gas wells were predicted for any of the analysis areas used in the EA.

3.2 Air Resources

3.2.1 Affected Environment

The proposed action would be located in Sandoval 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), including their effects on national and global climate conditions, has emerged since this document was prepared. On-going scientific research has identified the potential impacts of GHG emissions such as carbon dioxide (CO₂), methane (CH₄), nitrous oxide (NO_x),

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 back 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 Resources Technical Report) (USDI/BLM 2014). 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 (NO₂), ozone (O₃), particulate matter (PM₁₀ and PM_{2.5}), sulfur dioxide (SO₂) and lead (Pb). USEPA has established National Ambient Air Quality Standards (NAAQS) for criteria air pollutants. The NAAQS are protective of human health and the environment. USEPA has approved New Mexico’s State Implementation Plan, and the state enforces state and federal air quality regulations on all public and private lands within the state, except for tribal lands and within Bernalillo County. Air quality is determined by atmospheric pollutants and chemistry, dispersion meteorology and terrain, and also includes 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

The Air Resources Technical Report describes the types of data used for description of the existing conditions of criteria pollutants, how the criteria pollutants are related to the activities involved in oil and gas development, and provides a table of current National and state standards. USEPA’s Green Book web page (USEPA 2013a) reports that all counties in the Farmington Field Office area are in attainment of all NAAQS as defined by the Clean Air Act. The area is also in attainment of all state air quality standards (NMAAQS). The current status of criteria pollutant levels in the Farmington Field Office are described below.

“Design Values” are the concentrations of air pollution at a specific monitoring site that can be compared to the NAAQS. The 2012 design values for criteria pollutants are listed below in Table 3-1. There is no monitoring for CO and Pb in San Juan County, but because the county is relatively rural, it is likely that these pollutants are not elevated. PM₁₀ design concentrations are not available for San Juan County.

Table 3-1. 2012 Criteria Pollutant Monitored Design Concentrations in San Juan County

Pollutant	2012 Design Concentrations	Averaging Time	NAAQS	NMAAQS
O ₃	0.071 ppm	8-hour	0.075	

			ppm ⁽¹⁾	
NO ₂	13 ppb	Annual	53 ppb ⁽²⁾	50 ppb
NO ₂	38 ppb	1-hour	100 ppb ⁽³⁾	
PM _{2.5}	4.7 µg/m ³	Annual	12 µg/m ³ ⁽⁴⁾	60 µg/m ³ ⁽⁶⁾
PM _{2.5}	14 µg/m ³	24 hour	35 µg/m ³ ⁽³⁾	150 µg/m ³ ⁽⁶⁾
SO ₂	19 ppb	1-hour	75 ppb ⁽⁵⁾	

Source: U.S. Environmental Protection Agency 2014

Note: NAAQS = National Ambient Air Quality Standard Standards; NMAAQs = New Mexico Ambient Air Quality Standards; O₃ = ozone; NO₂ = nitrogen dioxide; PM_{2.5} = particulate matter with a diameter of 2.5 micrometers or less; ppb = parts per billion; ppm = parts per million; SO₂ – sulfur dioxide; µg/m³ = micrograms per cubic meter.

⁽¹⁾ Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years

⁽²⁾ Not to be exceeded during the year

⁽³⁾ 98th percentile, averaged over 3 years

⁽⁴⁾ Annual mean, averaged over 3 years

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

⁽⁶⁾ The NMAAQs is for Total Suspended Particulate (TSP)

In 2005, the USEPA estimated that there was less than 0.01 ton per square mile of Pb emitted in FFO counties, which is less than 2 tons total (USEPA 2012). Lead emissions are not an issue in this area and will not be discussed further.

Air quality in a given region can be measured by its Air Quality Index (AQI) value. The AQI is reported according to a 500-point scale for each of the major criteria air pollutants, with the worst denominator determining the ranking. For example, if an area has a CO value of 132 on a given day and all other pollutants are below 50, the AQI for that day would be 132. The AQI scale breaks down into six categories: good (AQI<50), moderate (50-100), unhealthy for sensitive groups (101-150), unhealthy (151 to 200), very unhealthy (201 to 300) and hazardous (301 to 500). The AQI is a national index; the air quality rating and the associated level of health concern is the same everywhere in the country. The AQI is an important indicator for populations sensitive to air quality changes.

Mean AQI values for San Juan County were generally in the good range (AQI<50) in 2013 with 80 percent of the days in that range. The median AQI in 2013 was 42, which indicates “good” air quality. The maximum AQI in 2013 was 156, which is “unhealthy.”

Although the AQI in the region has reached the level considered unhealthy for sensitive groups on several days almost every year in the last decade, there are no patterns or trends to the occurrences (Table 3-2). On 8 days in the past decade, air quality has reached the level of “unhealthy” and on two days, air quality reached the level of “very unhealthy”. In 2009 and 2012, there were no days that were “unhealthy for sensitive groups” or worse in air quality. In 2005 and 2013, there was one day that was “unhealthy” during each year. In 2010, there were five “unhealthy” days and two “very unhealthy days.”

Table 3-2. Number of days classified as “unhealthy for sensitive groups” (AQI 101-150) or worse

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Days	3	6	9	18	1	0	12	9	0	1

Source: USEPA 2013b

Hazardous Air Pollutants

The Air Resources 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 2014). The USEPA conducts a periodic National Air Toxics Assessment (NATA) that quantifies HAP emissions by county in the U.S. The purpose of the NATA is to identify areas where HAP emissions result in high health risks and further emissions reduction strategies are necessary. A review of the results of the 2005 NATA shows that cancer, neurological, and respiratory risks in San Juan County are generally lower than statewide and national levels, as well as those for Bernalillo County, where urban sources are concentrated in the Albuquerque area (USEPA 2012).

Climate

The analysis area is located in a semi-arid climate region, 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 2014

⁽¹⁾ Degrees Fahrenheit

Very recently, pioneering research using space-borne (satellite and aircraft) determination of methane concentrations have indicated anomalously large methane concentrations may occur in the Four Corners region (Kort et al. 2014). A subsequent study (Schneising et al. 2014) indicated larger anomalies over other oil and gas basins in the U.S. Methane is 34 times more potent at trapping greenhouse gas emissions than CO₂ when considering a time horizon of 100 years (Intergovernmental Panel on Climate Change 2013). While space-borne studies can determine the pollutant concentration in a column of air, these studies cannot pinpoint the specific sources of air pollution. Further study is required to determine the sources responsible for methane concentrations in the Four Corners region; however, it is known that a significant amount of methane is emitted during oil and gas well completion (Howarth et al. 2011). Methane is also emitted from process equipment, such as pneumatic controllers, and liquids unloading at oil and gas production sites. Ground-based, direct source monitoring of pneumatic controllers conducted by the Center for Energy and Environmental Resources (Allen et al. 2014b) show that methane emissions from controllers exhibit a wide range of emissions, and a small subset of pneumatic controllers emitted more methane than most. Emissions measured in the study varied significantly by region of the U.S., the application of the controller and whether the controller was continuously or intermittently venting. The Center for Energy and Environmental Resources had similar findings of variability of methane emissions from liquid unloading (Allen et al. 2014a). In October 2012, USEPA promulgated air quality regulations controlling volatile organic compounds (VOC) emissions at gas wells. These rules require air pollution mitigation measures that reduce the emissions of VOCs. These same mitigation measures have a co-benefit of reducing methane emissions. Future ground-based and space-borne studies planned in the Four Corners region with emerging pollutant measurement technology may help to pinpoint significant, specific sources of methane emissions in the region.

The Air Resources Technical Report summarizes information about GHG emissions from oil and gas development and their effects on national and global climate conditions. While it is difficult to determine the spatial and temporal variability and change of climatic conditions, what is known is that increasing concentrations of GHGs are likely to accelerate the rate of climate change.

3.2.2 Impacts from Alternative B: Proposed Action

Methodology and assumptions for calculating air pollutant and greenhouse gas emissions are described in the Air Resources Technical Report (USDI/BLM 2014). This document incorporates the sections discussing the modification of calculators developed by the BLM to address emissions for one horizontal oil well. The calculators give an approximation of criteria pollutant, HAP, and GHG emissions to be compared to regional and national emissions levels. Also incorporated into this document are the sections describing the assumptions used in developing the inputs for the calculator (USDI/BLM 2014).

Direct and Indirect Impacts

Table 3-4 shows estimated emissions from one proposed horizontal oil well for criteria pollutants, VOCs and GHGs. 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 2011 emissions inventory (USEPA 2014).

Oil storage tanks on the well location may result in venting of VOCs. Oil well production is generally presented as barrels per day produced. 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 3-4. Criteria pollutant and VOC emissions estimated for construction of one horizontal oil well; average 25 days to drill and complete

Activity	NO _x	CO	VOC	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/yr)								
Oil Haul Truck and Small Truck (100 bbl/day)	0.009	0.006	0.0012	0.0009	0.0008	-	0.0001	3.88
Total	6.13	1.64	0.55	2.54	0.29	0.11	0.01	671.54

(1) NO_x – nitrogen oxides

(2) CO – carbon monoxide

(3) VOC – volatile organic compounds

(4) PM₁₀ – particulate matter with an aerodynamic diameter equal to or less than 10 microns

(5) PM_{2.5} – particulate matter with an aerodynamic diameter equal to or less than 2.5 microns

(6) SO₂ – sulfur dioxide

(7) CH₄ – methane

(8) CO₂ – carbon dioxide

Table 3-5. Analysis area emissions in tons/year, 2011

County	NO _x ⁽¹⁾	CO ⁽²⁾	VOC ⁽³⁾	PM ₁₀ ⁽⁴⁾	PM _{2.5} ⁽⁵⁾	SO ₂ ⁽⁶⁾
McKinley	11,952.9	17,007.8	3,891.2	70,096.4	7,645.2	1,381.1
Rio Arriba	12,012.3	27,344.6	19,149.8	33,761.2	4,130.6	60.4
San Juan	42,231.5	63,568.9	26,110.8	76,638.3	9,201.0	5,559.3
Sandoval	4,143.8	19,513.9	4,373.1	39,343.0	4,510.8	109.3

County	NO _x ⁽¹⁾	CO ⁽²⁾	VOC ⁽³⁾	PM ₁₀ ⁽⁴⁾	PM _{2.5} ⁽⁵⁾	SO ₂ ⁽⁶⁾
La Plata	4,838.2	17,116.3	3,740.1	2,330.0	919.6	127.9
Total	75,187.7	144,551.5	57,265.1	222,168.9	26,407.2	7,237.9

⁽¹⁾ NO_x – nitrogen oxides

⁽²⁾ CO – carbon monoxide

⁽³⁾ VOC – volatile organic compounds

⁽⁴⁾ PM₁₀ – particulate matter with an aerodynamic diameter equal to or less than 10 microns

⁽⁵⁾ PM_{2.5} – particulate matter with an aerodynamic diameter equal to or less than 2.5 microns

⁽⁶⁾ SO₂ – sulfur dioxide

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 from the proposed action

	NO _x ⁽¹⁾	CO ⁽²⁾	VOC ⁽³⁾	PM ₁₀ ⁽⁴⁾	PM _{2.5} ⁽⁵⁾	SO ₂ ⁽⁶⁾
Total Emissions	75,187.7	144,551.5	57,265.1	222,168.9	26,407.2	7,237.9
Horizontal Gas Well Emissions	6.28	1.94	0.65	2.55	0.30	0.13
Percent Increase	0.008	0.001	0.001	0.001	0.001	0.002

⁽¹⁾ NO_x – nitrogen oxides

⁽²⁾ CO – carbon monoxide

⁽³⁾ VOC – volatile organic compounds

⁽⁴⁾ PM₁₀ – particulate matter with an aerodynamic diameter equal to or less than 10 microns

⁽⁵⁾ Values derived from average emissions for any well drilling in the analysis area. Calculated results available upon request.

⁽⁶⁾ PM_{2.5} – particulate matter with an aerodynamic diameter equal to or less than 2.5 microns

⁽⁷⁾ SO₂ – sulfur dioxide

Hazardous Air Pollutants

The formulas used for calculating HAPs in the calculators 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/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/year.

Total Greenhouse Gases

The available statewide GHG summary combines GHG emissions from CO₂ and CH₄. To compare the GHG emissions from the proposed action estimated by the calculator with statewide GHG emissions, carbon dioxide equivalent (CO₂e) emissions for both CH₄ and CO₂ were summed. The total statewide GHG emission estimate for 2007 was 76,200,000 metric tons CO₂e (76.2 million metric tons) (NMED 2010). The estimated CO₂e metric tons emissions from one horizontal gas well (623.2 metric tons) would represent a 0.0008 percent increase in New Mexico CO₂ emissions.

Cumulative Impacts

The FFO manages federal hydrocarbon resources in San Juan, Sandoval, Rio Arriba, and McKinley Counties. There are approximately 21,150 active oil and gas wells in the San Juan Basin. About 14,843 of

the wells in these counties are federal wells. Analysis of cumulative impacts for reasonable development scenarios 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 2014).

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 2014). 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 2014) 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.

3.3 Soils

3.3.1 Affected Environment

Surficial geology in the analysis area is composed of the Nacimiento Formation and soils are classified as Badland and Blancot-Councilor-Tsosie association, 0 to 5 percent slopes (USDA/SCS 1987).

The Nacimiento Formation consists of non-marine fluvial depositions created during the Paleocene in the San Juan Basin (New Mexico Bureau of Geology and Mineral Resources 2003). The formation is comprised mostly of shale, interbedded with medium to fine grained sandstone and conglomeratic sandstone (McLemore et al. 1986). The Nacimiento Formation is well-known for containing a significant early Paleocene vertebrate fossil record (Williamson and Lucas 1992).

The Badland mapping unit occurs throughout the entire Lybrook D34-2307 proposed project area and on a majority of the Lybrook L34-2307 proposed project area. The Badland mapping unit is classified as

somewhat excessively drained and highly erodible. Badlands are steep or very steep, commonly non-stony, barren land dissected by many intermittent drainage channels. Runoff potential is very high, and geologic erosion is active (USDA/SCS 1987).

The Blancot-Councilor-Tsosie association occurs on the southeastern portion of the Lybrook L34-2307 proposed well pad area. The Blancot-Councilor-Tsosie association, 0 to 5 percent slopes, is found in upland areas on ridges, valley sides and stream terraces. The soil mapping unit is composed of approximately 40 percent Blancot fine sandy loam, 30 percent Councilor fine sandy loam, and 25 percent Tsosie clay loam. This mapping unit is very deep and well drained. The major limitations of this mapping unit are water erosion and blowing soil (USDA/SCS 1987).

3.3.2 Impacts from Alternative B: Proposed Action

Direct and Indirect Impacts

The proposed action would affect approximately 15.4 acres of soils from two mapping units. Badland soils are found throughout a majority of the analysis area. Construction would result in temporary displacement, compaction, and mixing of soils. The approved working areas of the well pads and new access roads (approximately 3.8 acres) would remain as bare, compacted soil for the life of the project (approximately 30 years) and would be subject to an undetermined amount of wind and water erosion until the wells and roads are completely reclaimed. Compaction of the soils during construction and operation of the proposed action, coupled with implementation of design features described below, would limit soil impacts from erosion. Soils are most susceptible to erosion during construction, when strong winds or precipitation events during soil-disturbing activities could mobilize soils. The impact on soils would be localized and short to long term.

Industry-related vehicle and pedestrian traffic would be restricted to proposed disturbance areas and existing roads. Following construction activities, unused areas would be reseeded with the BLM-approved seed mixes to stabilize soils and prevent erosion. Following construction, vehicle traffic would be restricted to existing bladed roads to prevent erosion, soil mixing, and compaction in adjacent areas. Proper soil salvage, storage, and reclamation will allow adequate infiltration and permeability rates and maintain soil moisture, which is necessary for plant growth and vigor, and minimize surface runoff. Encana would meet all the FFO Bare Soil Reclamation Procedure requirements and standards. The site-specific Reclamation Plans are attached to the Surface Use Plan of Operations for the proposed well pads. Proper reclamation and monitoring will reduce the opportunity for soil erosion.

Cumulative Impacts

The cumulative impact analysis area for the proposed action is the Escavada Wash watershed (hydrologic unit code 10). Past, present, and future developments are expected to result in a range of short- and long-term impacts to soils, including disturbance, temporary or permanent increases in erosion prior to reclamation, and reduction of soil loss to erosion where reclamation and re-vegetation occurs. One hundred and five oil and gas wells have been developed in the Escavada Wash watershed. These wells have resulted in approximately 371 acres of surface disturbance. Based on the RFD (Engler et al. 2014), oil and gas development in the watershed may result in approximately 2,116 acres of short-term disturbance and 489 acres of long-term disturbance. The proposed action would result in approximately 15.4 acres of short-term surface disturbance and 3.8 acres of long-term disturbance in the Escavada Wash

watershed, or approximately 0.7 percent of the RFD estimated disturbance in the Escavada Wash watershed. Impacts from the proposed action are not expected to contribute appreciably to cumulative impacts to soils when added to past, present, and reasonably foreseeable actions.

3.4 Water Resources

3.4.1 Affected Environment

Surface Water

The project area is located in the Upper Colorado River Hydrologic Region, within the Escavada Wash sub-watershed. The project area is characterized by varied badlands terrain and level to moderately rolling sagebrush shrublands in the headwaters area of Escavada Wash on the southwest side of Sisnathyel Mesa. Surface drainage from the proposed project would flow southwest into Escavada Wash, which empties into the Chaco River approximately 25 miles west-southwest of the project area.

The project area was surveyed for the presence of jurisdictional wetlands and other Waters of the U.S. Jurisdictional Waters of the U.S. are ephemeral, perennial, and intermittent bodies of water- including tributaries, wetlands, and ponds- that connect either directly or indirectly to navigable or interstate water ways. The BLM/FFO and U.S. Army Corps of Engineers Durango Regulatory Division have determined that jurisdictional waters may include USGS watercourses (i.e., “blue line” on USGS 1:24,000 topographic maps). Jurisdictional Waters of the U.S. are regulated by the U.S. Army Corps of Engineers.

A field assessment was made to determine if drainages supported a defined bed-and-bank feature based on scour and deposition processes and if it was directly or indirectly connected to a navigable or interstate water way, as shown in Table 3-7. If scour and deposition features were present, geomorphic features were used to measure ordinary high water mark.

Table 3-7. Project component, ordinary high water mark measurement, and type of waters of the U.S. in the analysis area

Project Component	Ordinary High Water Mark		Type
	Width (inches)	Height (inches)	
Lybrook D34-2307 Access Road	9	1.5	Riverine, ephemeral, streambed
	6	1	Riverine, ephemeral, streambed
Lybrook L34-2307 Well Pad	30	2	Riverine, ephemeral, streambed
	20	1	Riverine, ephemeral, streambed
	18	2	Riverine, ephemeral, streambed
	20	1	Riverine, ephemeral, streambed
Lybrook L34-2307 Access Road	8	2	Riverine, ephemeral, streambed
	24	2	Riverine, ephemeral, streambed

3.4.2 Impacts from Alternative B: 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 15.4 acres of soil as a sediment source entering area drainage ways in the short term, and approximately 3.8 acres would remain exposed on the well pads and access roads after interim reclamation. Vegetation cover is generally low to 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, particularly during and following storm events. Slight alterations in project 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 the drainages would be minimized through the implementation of best management practices (BMPs) and other preventive measures, such as re-establishment of vegetation and proper site hydrological diversions.

The disturbance created within the ordinary high water mark of the drainages within the proposed Lybrook L34-2307 well pad would be covered under U.S. Army Corps of Engineers Nationwide Permit #39 (Commercial and Institutional Developments). Encana would consult with the U.S. Army Corps of Engineers and submit a pre-construction notification to the district engineer for authorization of Nationwide Permit #39 prior to commencing the proposed action. The disturbance created within the ordinary high water mark of the drainages within the proposed Lybrook L34-2307 and Lybrook D34-2307 access road ROWs would be covered under U.S. Army Corps of Engineers Nationwide Permit #14 (Linear Transportation Projects). Encana would not be required to submit a pre-construction notification to the district engineer for authorization of Nationwide Permit #14; the proposed action would not result in the loss of greater than 1/10 acre of Waters of the U.S., and the proposed action would not result in a discharge in a special aquatic site, including wetlands.

Water used for well drilling and completions would be sourced from one or more permitted private water wells: one source would be POD Number SJ 2105; the second source has been assigned the Permit Number RG-82771 through RG-82771-S-2 by the NMOSE; and a third source has been assigned the Permit Number SJ-00960-S-2 by the NMOSE. 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 the well pad. 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. Containment structures sufficiently impervious to prevent a discharge to waters of the U.S., such as containment dikes, containment walls, drip pans, or equivalent protective structures would be installed and maintained. Any spills of non-freshwater fluids would be immediately cleaned up and removed to an approved disposal site in accordance with federal and state regulations.

Cumulative Impacts

The cumulative impacts analysis area for assessing impacts to water resources is the Escavada Wash watershed. Reasonably foreseeable development within the Escavada Wash watershed may include an estimated additional 326 oil and gas wells and related facilities and 39 miles of new roads based on the assumption that 196 new well pads could be developed in the watershed. Surface-disturbing activities associated with these actions may directly affect an estimated 2,116 acres. Cumulative effects to water resources from the proposed action would be greatest shortly after construction begins and would decrease over time as reclamation efforts progress.

The proposed action would cumulatively contribute approximately 3.8 acres of long-term disturbance in the watershed. Cumulative impacts to surface waters would be related to short-term sedimentation or flow changes. Surface-disturbing activities other than the proposed action that may cause accelerated erosion include—but are not limited to—construction of roads, 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.

3.5 Upland Vegetation

3.5.1 Affected Environment

The analysis area is located within the Arizona/New Mexico Plateau eco-region and is further classified as San Juan/Chaco Tablelands and Mesas (Griffith et al. 2006). The analysis area is within Great Basin desert scrub community, with sagebrush series interspersed with barren badland features (Dick-Peddie 1993). Approximately 2.7 acres of existing disturbance associated with roads, pipeline corridors, and well pads occurs within the analysis area.

The proposed action area consists of sagebrush flats and badland features. The sagebrush flat areas are dominated by big sagebrush (*Artemisia tridentata*) with an understory of blue grama (*Bouteloua gracilis*) and James' galleta (*Pleuraphis jamesii*). Vegetation found within the badland feature areas include Powell's saltweed (*Atriplex powellii*), slenderleaf buckwheat (*Eriogonum leptophyllum*), and basin daisy (*Platyschukhria integrifolia*). Table 3-8 lists the project components with the estimated percent vegetation cover and number of trees observed within the analysis area.

Table 3-8. Percent vegetation cover and number of trees present in the analysis area

Component	Vegetation Cover (%)	Number of Trees
Lybrook D34-2307 Well Pad	10-30	25
Lybrook D34-2307 Access Road/Pipeline	20-30	7
Lybrook D34-2307 TUA	0-10	3
Lybrook L34-2307 Well Pad	10-20	35
Lybrook L34-2307 Access Road/Pipeline	0-10	5

3.5.2 Impacts from Alternative B: 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 15.4 acres of undisturbed vegetation. The proposed action would result in the removal of approximately 75 piñon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees. Potential impacts include 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 analysis area vegetation communities. Trees may not re-establish in the area for several decades. Disturbed areas would be expected to re-vegetate in 2 or more years. There would be a long-term loss of approximately 3.8 acres of Great Basin desert scrub vegetation for well access and operation.

Re-vegetation of well pad construction zones and the pipeline ROWs would be initiated by Encana within 120 days of well completion and pipeline construction. All vegetation removed during site-clearing activities would be mowed and incorporated into stockpiled topsoil. Trees that are 3 inches or greater in diameter would be cut and de-limbed. The proposed action would be reseeded with the Badland Community seed mix.

Cumulative Impacts

The cumulative impact analysis area for vegetation and noxious weeds is the Escavada Wash watershed. One hundred and five oil and gas wells have been developed in the Escavada Wash watershed. These wells have resulted in approximately 371 acres of surface disturbance. Based on the RFD (Engler et al. 2014), oil and gas development in the watershed may result in approximately 2,116 acres of short-term disturbance and 489 acres of long-term disturbance. Other activities that may impact vegetation in the analysis area include livestock grazing, vegetation management, wildfire, and major ROW projects. The proposed action would result in approximately 18.1 acres of short-term surface disturbance to undisturbed vegetation and 3.8 acres of long-term disturbance in the Escavada Wash watershed. The proposed action would contribute approximately 0.7 percent of the RFD estimated disturbance in the Escavada Wash watershed. When added to past, present, and future actions, the proposed action is not expected to result in significant cumulative impacts.

3.6 Noxious Weeds and Invasive Species

3.6.1 Affected Environment

Executive Order 13112, Invasive Species (February 3, 1999), mandates that federal agencies take actions to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause. Also, pursuant to the Noxious Weed Management Act of 1998 (76-7D-1 to 76-7D-6 NMSA), the New Mexico Department of Agriculture has identified several species to be targeted as noxious weeds for control or eradication. Additionally, the BLM/FFO maintains a list of invasive and non-native plant species of concern (USDI/BLM 2003b). The FFO currently uses the New Mexico State Department of Agriculture (NMSDA) noxious weed list and

while the definition of the classes are generally the same, the actual list and designations for species can be different.

BLM listed species are broken into class designations A, B, and C. Class A species are identified as non-native with limited or no distribution. Eradication and prevention of infestation of these species is of the highest priority. Class B species are described as non-native plants that have been found in limited areas of the field office planning area, and containment and prevention are priorities. The Class C designation is defined as non-native plants currently widespread throughout the management area and “long-term programs” to control the species are encouraged (USDI/BLM 2003b).

One noxious weed species, halogeton, was observed along the Lybrook L34-2307 proposed access road and pipeline ROW and in the northern half of the Lybrook L34-2307 proposed well pad. Halogeton is classified by the NMSDA as a Class B species. No other noxious weed species were identified in the project area.

3.6.2 Impacts from Alternative B: Proposed Action

Direct and Indirect Impacts

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. Since halogeton is located in the analysis area, direct impacts would include the potential to distribute seed to other areas along the ROWs, while indirect impacts would include the potential to transport seeds to off-site locations that may not be infested. There would be a long-term potential for non-native invasive weeds to establish in the area. The potential for these impacts would be minimized by adherence to the project design features.

Prior to construction, Encana would work with the FFO to determine when pretreatment of the halogeton in the project area is appropriate and necessary. Equipment would be washed prior to entering and when leaving the construction area. Encana would be responsible for monitoring and controlling any non-native invasive weed species within the permitted ROWs for the life of the pipeline.

Cumulative Impacts

The cumulative impact analysis area for the proposed action is the Escavada Wash watershed (hydrologic unit code 10). Past, present and future activities in the cumulative impacts analysis area such as livestock grazing, off-road vehicle travel, vegetation management, oil and gas exploration and private development have contributed to the establishment and distribution of noxious weeds. One hundred and five oil and gas wells have been developed in the Escavada Wash watershed. These wells have resulted in approximately 371 acres of surface disturbance. Based on the RFD (Engler et al. 2014), oil and gas development in the watershed may result in approximately 2,116 acres of short-term disturbance and 489 acres of long-term disturbance. The proposed action would result in approximately 15.4 acres of short-term surface disturbance and 3.8 acres of long-term disturbance in the Escavada Wash watershed, or approximately 0.7 percent of the RFD estimated disturbance in the Escavada Wash watershed. When combined with the past, present, and future activities, the proposed action would have a negligible contribution on the establishment and distribution of noxious weeds within the cumulative impacts analysis area.

3.7 Migratory Birds

3.7.1 Affected Environment

Under the MBTA and Executive Order 13186, federal agencies are required to consider impacts to migratory birds from management activities. The BLM migratory bird conservation policy for the planning area is detailed in Instruction Memorandum No. NM-F00-2010-001 (USDI/BLM 2010). This management policy establishes a consistent approach for addressing migratory bird populations and habitats when by making project level implementation decisions. The management policy also outlines BMPs 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 Sandoval County and the surrounding area administered by the BLM/FFO. Data collected through breeding bird surveys coordinated by 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 Great Basin desert shrub (sage-grass) habitat.

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).

No recently active nests were recorded within the analysis area during the biological surveys.

3.7.2 Impacts from Alternative B: Proposed Action

Direct and Indirect Impacts

Executive Order 13186 calls for increased efforts to fully implement the MBTA. 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 avian species with a known range of distribution in the BLM/FFO planning area that utilize the sage-grass habitat that occur on the NMPIF “Highest Priority” and USFWS “Birds of Conservation Concern 2008” lists.

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 3-9.

Table 3-9. Migratory bird species of concern potentially occurring within the analysis area and effects from the proposed action

Species	Habitat Type	Effects
Grasshopper sparrow (<i>Ammodramus savannarum</i>)	Sage-grass	May be positively affected due to conversion to grassland.
Sage sparrow ¹ (<i>Amphispiza belli</i>)	Sage-grass	May be positively affected due to conversion to grassland.
Burrowing owl (<i>Athene cucularia</i>)	Sage-grass	No effect; nests in abandoned prairie dog burrows.
Ferruginous hawk (<i>Buteo regalis</i>)	Sage-grass/piñon-juniper interface	May be negatively affected by conversion of 15.4 acres of foraging habitat.
Mountain plover (<i>Charadrius montanus</i>)	Sage-grass	No effect; no suitable habitat in the analysis area.
Long-billed curlew (<i>Numenius americanus</i>)	Sage-grass	May be positively affected due to conversion to grassland.
Sage thrasher ¹ (<i>Oreoscoptes montanus</i>)	Sage-grass	May be positively affected due to conversion to grassland.
Bendire's thrasher (<i>Toxostoma bendirei</i>)	Sage-grass	May be positively affected due to conversion to grassland.

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

Direct impacts to migratory birds would include the disturbance and modification of approximately 15.4 acres of undisturbed Great Basin desert scrub vegetation. The proposed action would result in the removal of approximately 75 piñon pine and Utah juniper trees. There would be a long-term loss of approximately 3.8 acres of habitat that would be converted to industrial use. Approximately 1,273 feet of new road would be added to the transportation network, resulting in habitat fragmentation and an increase in edge habitat. Migratory birds would be impacted by disturbance during construction, drilling, and completion; these impacts would be short term. During production, impacts to migratory birds would be related to an increase in habitat fragmentation and disturbance from periodic traffic for maintenance and fluid removal.

Impacts to migratory birds would be greater should construction occur during the breeding season of May 15 through July 31. Construction, drilling, and completions during this period could result in nest destruction or may cause some nest abandonment in adjacent areas. Pre-construction surveys would be conducted to identify any active nests should construction occur during the breeding season. Migratory birds could come into contact with chemicals or fluids stored on-site. Open pits would be netted and vent caps placed on all open pipes to prevent 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

The cumulative impacts analysis area for assessing impacts to migratory birds is the Escavada Wash watershed. Habitat disturbance and fragmentation in the analysis area is primarily the result of oil and gas development (including well pads, access roads, and pipeline corridors). The direct and indirect habitat

disturbance, fragmentation, and human activities associated with these disturbances could deter birds from utilizing portions of the PPA and adjacent areas. The proposed action would contribute to direct and indirect habitat disturbance and fragmentation in the analysis area. Cumulative impacts to obligate bird species would occur due to the collective removal of nesting, cover and foraging habitat and increased fragmentation within the analysis area.

Reasonably foreseeable development within the Escavada Wash watershed may include an estimated additional 326 oil and gas wells and related facilities and 39 miles of new roads based on the assumption that 196 new well pads could be developed in the watershed. Surface-disturbing activities associated with these actions may directly affect an estimated 2,116 acres of wildlife habitat with a long-term loss of approximately 489 acres of habitat. Other reasonably foreseeable actions within the watershed that could impact migratory birds would include livestock grazing, 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 3.8 acres of Great Basin desert scrub habitat. The proposed action would contribute to cumulative habitat fragmentation within the watershed from the construction of approximately 1,273 feet of new road. The proposed action would not result in significant impacts to migratory birds when combined with past, present, and future actions.

3.8 Special Management Species

3.8.1 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.

The proposed action, which includes both the proposed Lybrook D34-2307 and Lybrook L34-2307 projects, would be located on federal land managed by the BLM/FFO. Table 3-8 lists the BLM special management species that have the potential to occur in the analysis area. All of the species have the potential to occur throughout the proposed action footprint. A Biological Survey Report for each proposed project component was prepared. The Biological Survey Reports provide the basis for the findings listed in Table 3-10.

Table 3-10. Special status species with potential to occur in the analysis area

Species	Habitat Associations
Mammals	
Townsend’s big-eared bat (<i>Corynorhinus townsendii</i>)	Roosts mostly in caves or mines; can roost in abandoned buildings at night. In summer, this species occurs widely across the state and can be found over desert scrub, desert-mountains, oak-woodland, piñon-juniper, and coniferous forests.
Birds	
Bendire’s thrasher (<i>Toxostoma bendirei</i>)	Typically inhabits sparse desert shrubland and open woodland with scattered shrubs.

Species	Habitat Associations
Ferruginous hawk (<i>Buteo regalis</i>)	Flat or rolling terrain in grasslands, shrub-steppes, deserts, and badlands; prefers elevated nest sites (e.g., buttes, utility poles, trees, and ledges).
Golden eagle (<i>Aquila chrysaetos</i>)	In the western U.S., mostly open habitats in mountainous, canyon terrain. Nests primarily on cliffs and in trees.
Prairie falcon (<i>Falco mexicanus</i>)	Arid, open regions of grassland or scrub vegetation with cliff formations that are at least 30 feet high. Breeding cliffs sometimes are in semi-open regions with scattered conifer trees and occasionally dense woodlands.
Piñon jay (<i>Gymnorhinus cyanocephalus</i>)	Primarily associated with piñon-juniper habitat. Nests in wooded areas with relative high canopy cover.
Plants	
Brack’s hardwall cactus (<i>Sclerocactus cloveriae</i> ssp. <i>brackii</i>)	Sandy clay of the Nacimiento Formation in sparse shadscale scrub (5,000 to 6,000 feet).

Two BLM special management species, Brack’s hardwall cactus (*Sclerocactus cloveriae* ssp. *brackii*) and piñon jay (*Gymnorhinus cyanocephalus*) were observed within the analysis area during biological surveys. Table 3-11 provides the number of individual Brack’s hardwall cacti that were recorded during project-related biological surveys.

Table 3-11. Brack’s hardwall cactus observations

	Number and Location of Cacti
Lybrook D34-2307	90 located within the proposed well pad
Lybrook L34-2307	200 located within the proposed well pad

3.8.2 Impacts from Alternative B: Proposed Action

Direct and Indirect Impacts

The analysis area provides potential foraging habitat for Townsend’s big-eared bat (*Corynorhinus townsendii*). No potential roosting habitat would be modified or removed by the proposed action. Impacts to this bat species would be limited to avoidance of the area during nighttime drilling or completion activities when they may incidentally forage in the area. These impacts would be short term and limited to summer months when the species could be in the analysis area.

The analysis area provides suitable nesting habitat for Bendire’s thrasher (*Toxostoma bendirei*). Most of the approximate 147,000 acres within the Escavada Wash watershed contain varying elements of desert scrubland community, nesting habitat for Bendire’s thrasher. The proposed action would result in modification of approximately 15.4 acres of undisturbed Great Basin desert scrub habitat. The likelihood of this species nesting within the 15.4 acres of proposed disturbance, even after reclamation, is low. Should construction and drilling occur during the breeding season, Bendire’s thrasher would likely avoid

the area. Pre-construction surveys would be conducted to identify any active nests within the proposed disturbance area with a 50 foot buffer if construction should occur between May 15 and July 31. This design feature would avoid adverse impacts to nesting Bendire's thrasher.

The project area provides potential foraging and dispersal habitat for piñon jay. Piñon jay were observed in the project area. No suitable nesting habitat for this species would be removed by the proposed project. Trees are widely scattered in the area. Approximately 75 trees would be removed from the project area resulting in a long-term loss in food source and perching habitat for piñon jay. Noise and human activity may also cause disturbance and nest abandonment in areas adjacent to the proposed action. No nests were identified in the project areas during the project surveys. A pre-construction survey would be required if the proposed project is scheduled to be constructed during the bird breeding season.

The analysis area contains Great Basin desert scrub habitat, providing potential foraging habitat for golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), and prairie falcon (*Falco neomexicanus*). No potential nesting habitat for these species would be modified or removed by the proposed action. An unknown stick nest in good condition with signs of activity was observed within the action area during the biological survey of the proposed Lybrook D34-2307 project area in May 2014. The nest did not appear to be recently active during biological survey of the proposed project area in June 2015. No raptors were observed at the nest location during either biological survey. Direct impacts would include the modification of approximately 15.4 acres of undisturbed foraging habitat. Approximately 75 piñon and juniper trees of various ages and sizes would be removed by the proposed action, resulting in a long-term loss of potential perch sites. This loss of perch habitat is not expected to adversely affect the foraging abilities of these raptor species, given the abundance of suitable sites in the surrounding area. After reclamation, there would be a short- to long-term change in vegetation density and composition. This could affect the prey base for these raptors. Approximately 3.8 acres of potential foraging habitat would be converted to industrial use in the long term. Raptors may avoid the analysis area during construction, drilling, and operation due to disturbance and activity from human and vehicle presence and associated noise.

The proposed projects would result in the disturbance of up to 15.4 acres, or <.01% of Brack's fishhook cactus habitat of the approximate 77,000 acres of potential habitat within the Escavada Wash watershed. Of this, approximately 11.6 acres would be reseeded. The remainder, 3.8 acres, would remain disturbed throughout the life of the proposed projects. It is possible that Brack's fishhook cacti could grow within reclaimed portions of the proposed project areas, although the likelihood of these species populating disturbed areas is unlikely.

The entire 15.4 acres of disturbance is considered to be long-term disturbance due to the disruption of unstable soils that will likely not support the reestablishment of Brack's cactus in short term. Habitat for Brack's cactus may be localized or specific to certain environments within the PPA. Any long-term surface disturbance incrementally diminishes availability of the surface to Brack's cactus, reducing opportunities for growth. Site-specific management measure will be required to reduce the impacts to Brack's cactus and its habitat.

A total of approximately 290 individual Brack's hardwall cacti were recorded during biological surveys in the proposed Lybrook D34-2307 and Lybrook L34-2307 project areas. To minimize impacts to Brack's cactus, Encana conducted spatial analyses and determined there was no alternative to develop the

minerals in Sections 34 and 33 and also avoid Brack's cactus habitat due to the extent of the habitat and operational issues with wellbore reach, and artificial lift constraints. Rough topography and drainages limit the options for locating the proposed well pads. Refer to Section 2.3 for further details on Alternatives Considered but Eliminated.

Impacts to Brack's cactus are minimized by co-locating the wells with existing disturbance. The proposed Lybrook D34-2307 would be co-located with the existing Federal B #5 while the proposed Lybrook L34-2307 would be co-located with the plugged and abandoned Federal B #4 well pad.

Under the proposed action, Encana is permitting one well per pad; however, the future intention is to drill 4 wells from each proposed pad. Drilling multiple wells from a single well pad minimizes disturbance and effects to Brack's cactus.

Cumulative Impacts

The BLM/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 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 raptor 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 cumulative impacts analysis area for assessing impacts to BLM special management species is the Escavada Wash watershed. Reasonably foreseeable development within the Escavada Wash watershed may include an estimated additional 326 oil and gas wells and related facilities and 39 miles of new roads based on the assumption that 196 new well pads could be developed in the watershed. Surface-disturbing activities associated with these actions may directly affect an estimated 2,116 acres of BLM special management species habitat. The proposed action would result in the long-term loss of approximately 15.4 acres of nesting habitat for Bendire's thrasher, and 3.8 acres of foraging habitat for golden eagles, ferruginous hawk, and prairie falcons. Approximately 15.4 acres of potential and occupied Brack's cactus habitat would be removed for the long term (< 0.001% habitat loss within the Escavada Wash watershed). Other reasonably foreseeable actions within the planning area that could impact BLM special management species would include livestock grazing, agriculture, commercial and residential development, mining, and vegetation management. Indirect impacts from habitat fragmentation due to development, changes in OHV use due to increased roads, and rock/fossil collection would also occur. Public lands involving special status plant and animal species habitats have mostly been leased to oil and gas development with terms and conditions to protect these species and their habitat. The overall cumulative impact of activities proposed for all resource decisions on special status plants and animals are projected to be low at localized areas within the short- and long-term. The proposed action would not contribute appreciably to a cumulative habitat loss for BLM special management species within the planning area.

3.9 Wildlife

3.9.1 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 is dominated by a Great Basin desert scrub vegetation community with areas of barren badland features. Wildlife common to this habitat include mule deer (*Odocoileus hemionus*), fox (*Vulpes* sp.), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), and reptiles (snakes and lizards). Coyote (*Canis latrans*), fox (*Vulpes* sp.), and pocket gopher (*Geomyidae* sp.) sign (burrows, tracks, scat) were observed within the analysis area.

3.9.2 Impacts from Alternative B: 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 15.4 acres of undisturbed vegetation including removal of an estimated 75 piñon and juniper trees of varying ages and sizes that are primarily located within the proposed Lybrook D34-2307 and Lybrook L34-2307 well pad areas. Vegetation communities within the analysis area provide forage for big game and other wildlife species. Since the vegetation removed would not be replaced with the same species and because the removal of vegetation in previously undisturbed areas 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 changes in composition of vegetation. The majority of direct habitat loss would be short term, as areas reclaimed would recover their value as wildlife habitat. However, there would be a long-term loss of approximately 3.8 acres for well operation and access. Most species observed or expected to inhabit the area are generalists and would be minimally affected by the changes in vegetation composition.

Mule deer and elk (*Cervus canadensis*) have been shown to avoid natural gas wells, roads, and areas immediately surrounding them, resulting in a loss of effective habitat. Hebblewhite (2011) summarized that the average zone of influence reported in eight different studies extended about 1,000 meters (3,281 feet) from roads and wells. The nature and extent of this avoidance is dependent upon the type of

vegetation—particularly the amount of cover present, topography, the volume of traffic, and whether or not vehicles stop or continue moving; however, responses varied within seasons and among species. Disturbance is a primary factor in effective habitat loss, as it can alter the ways wildlife use or move through an area and could push individual animals from preferred habitat into less suitable habitat. Such displacement 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 the increasing number of gas wells and accompanying roads and the decline in mule deer fawn to doe ratios.

Since there is so much variability between studies, and no studies specific to the BLM/FFO have been completed, a conservative buffer of 400 meters (1,312 feet) was selected to quantify the potential effective habitat loss resulting from the proposed action. Based on a 400-meter buffer of the proposed action, indirect wildlife habitat loss would affect approximately 335 acres.

Avoidance by wildlife would depend on the species, time of day, time of year, human activity level, topography, and cover type. It should also be noted that the zone of influence around roads and well pads does not imply 100 percent avoidance (Hebblewhite 2011). Impacts from effective habitat loss would be greatest during construction and drilling and would decrease over time in correlation to human and vehicular activity levels.

During construction, drilling, and completion, there would be short-term impacts to area wildlife because of human and vehicular activity and associated noise. Wildlife in the area would be displaced to adjacent habitat or may temporarily avoid the area during construction activities. Once the project is complete, wildlife would likely return to the area. It is possible that small wildlife, particularly burrowing species, may be killed during construction. 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 near daily basis. Heavy-duty vehicles (semi-trucks) would access the well sites 1 to 2 times a day for approximately 6 months, after which traffic trips would decrease to approximately 1 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. Any spills would be promptly cleaned up, and Encana maintains an emergency response plan. All chemicals or fluids stored on-site would be properly contained and would have secondary containment.

Construction activities would be confined to the permitted area to avoid further disruption to wildlife. Re-vegetation would be initiated immediately following construction 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

The cumulative impacts analysis area for assessing impacts to wildlife is the Escavada Wash watershed. Reasonably foreseeable development within the Escavada Wash watershed may include an estimated additional 326 oil and gas wells and related facilities and 39 miles of new roads based on the assumption that 196 new well pads could be developed in the watershed. Surface-disturbing activities associated with these actions may directly affect an estimated 2,116 acres of wildlife habitat. 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 3.8 acres of habitat loss in the long term and up to approximately 335 acres of effective wildlife habitat loss in the planning area. The proposed action would contribute to cumulative habitat fragmentation within the planning area from the construction of approximately 0.25 mile of new road. Approximately 0.4 mile of existing road would be upgraded and would not contribute to habitat fragmentation. The proposed action is not expected to result in significant cumulative impacts when added to past, present, and future actions.

3.10 Cultural Resources

3.10.1 Affected Environment

The proposed 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).

BLM Manual 8100, *The Foundations for Managing Cultural Resources* (2004) defines a cultural resource as "a definite location of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups. (cf. "traditional cultural property"). Cultural resources are concrete, material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and utilizing for public benefit described in this Manual series. They may be but are not necessarily eligible for the National Register (a.k.a. "historic property")."

In the broadest sense cultural resources include sites, buildings, structures, objects, and districts/landscapes (NPS 1997). Cultural resources (prehistoric or historic) 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. Traditional Cultural Properties (TCPs) are cultural resources that are eligible for the National Register of

Historic Places (NRHP) and have cultural values, sometimes sacred, that transcend for instance the values of scientific importance that are normally ascribed to cultural resources such as archaeological sites and may or may not coincide with archaeological sites (Parker and King 1998). Historically Native American communities are most likely to identify TCPs, although TCPs are not restricted to those associations. Some TCPs are well known while others may only be known to a small group or otherwise only vaguely known. Native American tribal perspectives on what is considered a TCP are not necessarily limited by a places National Register eligibility or lack thereof.

The National Register of Historic Places (NRHP; 36 CFR Part 60) is the basic benchmark by which the significance of cultural resources are evaluated by a federal agency when considering what effects its actions may have on those resources. To summarize, to be considered eligible for the NRHP a cultural resource must meet one or more of the following criteria: a) are associated with events that have significantly contributed to the broad patterns of our history; or b) are associated with the lives of persons significant in our past; or c) embody distinctive characteristics of the type, period, or method of construction, or represents the work of a master, or possesses high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; or d) have yielded, or may be likely to yield, information that is important in a pre-history or history. The resource, as applicable, must possess one or more of the following aspects of integrity; location, design, setting, materials, workmanship, feeling, and association. In the event a determination of eligibility cannot be made, the resource is treated as eligible (a historic property).

Section 106 of the NHPA and its implementing regulations (36 CFR Part 800) requires federal agencies to consider what effect their licensing, permitting, funding or otherwise authorizing an undertaking, such as an APD or ROW, may have on properties eligible for the National Register. Pursuant to 36 CFR 800.16 (i), “Effect means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register.” Effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative. Area of Potential Effect (APE) means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is typically defined as areas to be directly disturbed and areas in immediate close proximity. Cultural resources are identified and reported through a combination of literature review and pedestrian survey consistent with guidelines set forth in the *Procedures for Performing Cultural Resources Fieldwork on Public Lands in the Area of New Mexico BLM Responsibilities* (BLM 2005).

BLM/FFO compliance with Section 106 of the NHPA is adhered to by following the State Protocol Agreement between New Mexico BLM and New Mexico State Historic Preservation Officer (BLM-SHPO 2014), which is authorized by the National Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers (NPA 2012), and other applicable BLM handbooks.

Cultural resources within the entire APE for the proposed action were identified by a literature review and an archaeological BLM Class III level (100 percent) pedestrian survey by LAC and two reports were prepared and submitted to the BLM.

The Class III inventory identified no cultural sites within the APE of the Lybrook D34-2307 (LAC Report 2014-2u; BLM Report 2015(IV)040F) or the Lybrook L34-2307 (LAC Report 2014-2v; BLM Report 2015(IV)041F). No TCPs are known to exist in the APE.

3.10.2 Impacts from Alternative B: Proposed Action

Direct and Indirect Impacts

There are no known historic properties within the APE. The proposed action will have no direct or indirect impacts on historic properties (no historic properties affected).

Cumulative Impacts

The Cumulative Impacts Analysis Area is the associated watershed(s). The United States is divided and sub-divided into successively smaller hydrologic units which are classified into six levels nested within each other, from the largest geographic area (region) to the smallest geographic area (subwatershed). The boundaries are distinguished by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters (USGS 2013, NRCS 2013). Hydrologic units can be viewed as a naturally defined landscape and impacts to cultural resources in one part of that landscape could, theoretically, affect a broader understanding of the interrelationships between sites in the landscape as a whole. The smallest hydrologic unit area, typically from 10 to 40 K acres (15 to 62 mi²; HUC 12) or combination thereof are used as the CIAA.

The cumulative impacts analysis area for cultural resources is the proposed project area and the Headwaters Escavada Wash subwatershed. The Headwaters Escavada Wash subwatershed totals 36,264 acres. Based on New Mexico Cultural Resource Information System data (NMCRIS; July 2015) there are 202 recorded sites and approximately 18% of the subwatershed (6,711 ac) has been inventoried for cultural resources by 143 unique investigations since 1975. The cultural resources inventory coverage in the cumulative impacts analysis area is likely higher as not all survey data is digitally available (e.g., Navajo lands, surveys since July 2015). There are no properties listed on the National Register of Historic Places, New Mexico State Register of Cultural Properties, Chaco Protection Sites, World Heritage Sites, or National Historic Trails within the cumulative impacts analysis area.

- What impacts would surface disturbance for the proposed action have on historic properties in the cumulative impacts analysis area?

There will be no negative cumulative impact on known historic properties as they are being avoided by relocating the surface disturbing components of the proposed action away from the property. There will be no known negative cumulative impact on the landscape from the proposed action that would affect the seven aspects of integrity (location, design, setting, materials, workmanship, feeling, association) of known historic properties. A positive cumulative effect is the additional scientific information yielded by the archaeological survey both in terms of site specific information and the amount of the landscape inventoried for cultural resources.

- What impacts would the project have on unknown (buried, not visible) historic properties in the cumulative impacts analysis area?

Risks of impacting unknown (i.e., buried) historic properties is normally negligible as cultural resources “discoveries” during surface disturbing components of a proposed action are infrequent in the FFO. Since fiscal year 2000, 28 discoveries have occurred in association with 21,290 actions (e.g., road, well, pipeline, etc.), or 1:760. During that period 153,626 acres of land were inspected for cultural resources, with an average of 7.2 acres per action and one discovery per 5,472 acres per discovery. All authorizations (e.g., APDs, ROWs) have stipulations, under penalty of law, requiring the reporting of and avoidance of further disturbing cultural discoveries during a proposed action. Where the risk of discoveries can be reasonably expected (e.g., within ≤ 100 feet of a known historic property or in environmental settings known or suspected to be conducive to buried sites), archaeological monitoring by a qualified and permitted archaeologist is normally required during initial disturbance (e.g., blading, trenching). If buried historic properties are discovered, collaborative steps are taken to protect them in place or recover their important information.

3.11 Paleontological Resources

3.11.1 Affected Environment

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

The BLM/FFO recognized eight paleontological specially designated areas in the RMP in order to preserve important paleontological resources for scientific study, protection, and other public benefits (USDI/BLM 2003b, page 4-117). The BLM determined that these areas require special management attention to protect and prevent irreparable damage to important paleontological resources. The proposed Cluster 48B action area 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). The Lybrook Fossil Area is managed by the BLM, which contains approximately 26,000 acres of land within its boundary. The explicit management goal for the area is to promote scientific study and protect fossil resources. Pursuant to the BLM RMP (USDI/BLM 2003a), ROWs in the SDA are granted on a case-by-case basis with stipulations that protect paleontological values.

3.11.2 Impacts from Alternative B: Proposed Action

Direct and Indirect Impacts

The proposed project was assessed individually based on analyses conducted for the BLM/FFO 2003 RMP using the BLM’s PFYC system, geographic information system-based locality data, known paleontological locality information, existing paleontological reports for the area, aerial photos, soils

maps, existing reports, and scientific publications for the area. BLM personnel took part in the siting of project components.

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

Cumulative Impacts

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

3.12 Traffic and Transportation

3.12.1 Affected Environment

The transportation infrastructure in the proposed project area includes an extensive road network used to access oil and gas development facilities, residences, and local commercial establishments. These roads were built and are maintained by the New Mexico Department of Transportation (NMDOT), private industry, and Sandoval County depending on the land ownership and agreements among these entities.

The primary routes accessing the analysis area are U.S. Highway 550, Indian Service Route 7061 (Star Lake Road), County Road 7950 (the road into Chaco Culture National Historical Park), and several unmaintained dirt roads and two-tracks. No roads that would be used to access the analysis area components carry weight limitations.

Chaco Culture National Historical Park receives approximately 40,000 visitors a year. These visitors enter the park by utilizing County Road 7950. Visitors identified aspects that added to or detracted from their experience at Chaco Culture National Historical Park. Chaco Culture National Historical Park's remoteness and ability to explore the features of the park added to their experience (Freimund and Dalenberg 2010).

A recent study conducted by TRIP (TRIP 2013) shows an increase of vehicle miles traveled in New Mexico by 58 percent between 1990 and 2011. The report also suggests that vehicle miles traveled in New Mexico will increase 40 percent by 2030. Traffic data are not available for BLM or USDI Bureau of Indian Affairs (BIA) roads. Recent traffic counts on U.S. Highway 550 by NMDOT are listed in Table 3-12 in Average Annual Daily Traffic (AADT) levels (NMDOT 2014). The Rio Arriba/Sandoval County line is approximately 4.25 miles west of the junction of U.S. Highway 550 Indian Service Route 7061 (Star Lake Road), which access the analysis area. The junction of U.S. Highway 550 and the Lybrook Refinery entrance is located approximately 8.5 miles west the junction of U.S. Highway 550 and Indian Service Route 7061.

Traffic levels on U.S. Highway 550 at the Sandoval/Rio Arriba county line doubled in average annual traffic levels between 2011 and 2013, and an increase of approximately 13 percent occurred at the junction of U.S. Highway 550 and the Lybrook Refinery Entrance. The greatest change in AADT was a 46 percent increase in eastbound traffic.

Table 3-12. Traffic counts of U.S. Highway 550 near the project area

Year	Junction Lybrook Refinery Entrance	Sandoval/Rio Arriba County Line
2011	5,030	2,622
2012	5,196	2,686
2013	5,665	5,249

3.12.2 Impacts from Alternative B: Proposed Action

Direct and Indirect Impacts

In accordance with the Surface Use Plan of Operations for the proposed well pads, existing roads would be maintained in the same or better condition as existed prior to the commencement of operations, and maintenance would continue until final abandonment and reclamation of the well. Encana would inspect and maintain the roads as outlined in the Surface Use Plan of Operations. Under the proposed action, approximately 0.4 mile of existing road would be upgraded to provide access to the proposed Lybrook D34-2307 well pad.

The proposed action would not utilize County Road 7950 and would not impact the visitor experience from the County Road going into the Chaco Cultural National Historical Park.

Approximately 0.25 mile of new road would be constructed. As with existing roads, Encana would be responsible for road maintenance until the wells are plugged and abandoned.

Workers would be on-site 10 hours a day for 6 days a week and for the duration of well pad and access road construction. During drilling, workers would be on-site 24-hours a day for up to 21 days per well (typically 10 to 12 days). Except for flaring, completion activities would occur during daylight hours only. Traffic levels within the project area would increase for the duration of construction, drilling, completion, pipeline construction, and reclamation.

Vehicles accessing the proposed well pads would include light-duty trucks, such as pick-ups and welding rigs, and heavy-duty vehicles, such as water trucks, 2-ton bobtails, and semi-trucks. Depending on each stage of the proposed action (i.e., construction, drilling, completion), traffic levels could vary widely. Generally, during mobilization/demobilization, there would be an increase in average daily traffic above what is estimated for most stages of the proposed action. During mobilization/demobilization, equipment, tanks, pipe, sand, and other materials would be moved in/out of the well pad areas; therefore, most of the traffic would be heavy-duty vehicles. Mobilization/demobilization would normally take 2 days for each process and would occur at the stage of the project (e.g., construction, drilling, etc.). The highest increase in daily traffic levels would occur during the completion stage during which trucks hauling in sand, water, and other materials would be accessing the sites. Table 3-13 lists the activity, number of days to complete each activity, and number of daily and round trips that are estimated to occur under the proposed action.

Traffic estimates are based on a conservative timeframe for each stage and the high end of the anticipated range of trips that could occur.

Table 3-13. Estimated traffic levels resulting from one well

Activity	Length (days)	Total Number Round Trips	Average Daily Round Trips
Construction	18	40	2
Drilling	12	354	30
Completion	10	1,240	124
Flow testing	20	489	24
Well-tie pipeline construction	21	180	9
Reclamation	30	257	9
Total	111	2,560	33

Based on the AADT measured at the Sandoval/Rio Arriba county line on U.S. Highway 550 (Table 3-12), the proposed action would increase daily traffic levels on U.S. Highway 550 by less than 1 percent during construction and reclamation and by about 2 percent during completion when the highest traffic levels would occur. Roads that spur from U.S. Highway 550 and lead to the proposed well pad would be subject to a greater increase in traffic levels since these roads have lower traffic levels than the highway. Increased traffic, particularly heavy trucks, would result in wear and tear on the dirt roads, along with increased maintenance of the road network in the proposed project area. These impacts would be short term for the duration of construction.

Area residents or other motorists may experience delays other traffic disruptions during the work week depending on the stage of development of the proposed action. These impacts would be greater for those residents living within 1,000 feet of the proposed locations and along the access routes into the locations. Increased traffic may pose collision hazards for workers and public motorists. Fugitive dust may impair worker and motorist visibility. These impacts would be short term, occurring for the duration of construction, drilling, and completion activities. All road crossings would be manned with flaggers and spotters during heavy construction and during mobilization and demobilization. Orange flagging and barriers would be put in place to restrict public access to the work site. Water would be applied to roads, if needed, to minimize fugitive dust. Following reclamation, existing roads would be rehabilitated if needed.

During production, there would be light- and heavy-duty vehicles accessing the proposed wells for monitoring, maintenance, and liquid removal. Initially the wells would be expected to produce water, which would decline rapidly in volume over approximately 6 months. Produced water would be stored on-site in tanks and removed via truck to a disposal facility. Table 3-14 lists the number of truck trips and average daily/monthly trips per well for a 3-year period. In addition, one pickup would access each well pad daily for the duration of production

Table 3-14. Average daily truck trips per well for 3-year period

Timeframe	Truck Trips	Average Daily Trips
Month 1	73	2
Month 2	63	2
Month 3	48	2
Month 4	39	1
Month 5	34	1
Month 6	30	1
Month 7-12	28	1 per month
Year 2	19	1.5 per month
Year 3	12	1 per month

Cumulative Impacts

The cumulative impacts analysis area for traffic and transportation is the Escavada Wash watershed. Encana personnel would access the well pads on a regular basis (up to six times per week) to inspect and monitor the locations. Trucks would also access the locations on a regular basis to remove liquids. The RFD projected approximately 39 miles of new road within the Escavada Wash watershed. The proposed action would add approximately 0.25 mile of new road to the overall cumulative disturbance in the area. This increase to the road network and the anticipated increase in traffic levels in the project area would result in cumulative impacts within the scale of development and effects analyzed in the 2003 PRMP/FEIS (USDI/BLM 2003a) and estimated in the RFD (Engler et al. 2014) when added to past, present, and reasonably foreseeable activities.

3.13 Livestock Grazing

3.13.1 Affected Environment

There are 208 grazing allotments managed by the FFO with approximately 390 grazing authorizations that permit primarily cattle and sheep grazing within in the FFO boundaries. A very limited number of these allotments also permit goats and occasionally horses for ranch use only. Allotments range in size from approximately 20 to over 100,000 acres. For all 208 allotments, the FFO permits a total of approximately 119,162 active animal unit months (AUMs), of which approximately 9,228 are Navajo Free Use. Under the Taylor Grazing Act of 1937, allotments can be permitted through Section 3 (permits issued on public lands within grazing districts established by the Act) or Section 15 (grazing leases issued on public lands outside the grazing districts established by the Act). Of the 208 FFO grazing allotments, 143 are Section 3 allotments, and 65 are Section 15 allotments. There are approximately 325 authorizations on Section 3 allotments, of which 3 are very large Navajo community allotments. There are 65 authorizations on the Section 15 allotments. For the Section 15 allotments, 30 are administered by the BIA under a Memorandum of Understanding; 5 are managed under the Navajo Nation Tribal Ranches program, and 30 are located near Lindrith, New Mexico. There are an additional 21 allotments that are

within or overlap the FFO boundary that are managed by the Rio Puerco Field Office (RPFO) through an interagency agreement. On these 21 allotments, the RPFO only administers the grazing; the FFO manages all other uses on these allotments.

The proposed action would be located entirely within the boundaries of the Counselor Community (6015) grazing allotment. The allotment is approximately 100,713 acres in size and is comprised of public, Indian allotted, state, and tribal trust lands. Table 3-15 lists details of this allotment.

Table 3-15. Details of the grazing allotment in the analysis area

Allotment Number	Livestock Number	Livestock Type	Period Begin Date	Period End Date	AUM
6015	146	Cattle	03/01	02/28	1,431
	2	Horse	03/01	02/28	24
	2,287	Sheep	03/01	02/28	4,447

AUM = Animal Unit Month

3.13.2 Impacts from Alternative B: Proposed Action

Direct and Indirect Impacts

Surface disturbance associated with construction of the proposed action would remove approximately 15.4 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 about 0.9 AUM in the Counselor Community allotment, at an estimated 17 acres per AUM (100,713 acres or 5,902 AUMs). There would be a long-term loss of approximately 0.2 AUM in the Counselor Community allotment, based on 17 acres per AUM. Reclaimed areas would be expected to re-vegetate within 1 to 2 years following reclamation. Reseeding of disturbed areas with the approved seed mix that 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, horses, and sheep may occur in the analysis area, depending on the time of year. Livestock could become trapped in an open trench and long sections of an 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.

Livestock could come into contact with chemicals or fluids stored on-site. Use of a closed-loop system would minimize potential impacts to livestock from exposure to chemicals or fluids during drilling and completion. Any spills would be promptly cleaned up, and Encana maintains an emergency response plan. All chemicals or fluids stored on-site would be properly contained and would have secondary containment.

Cumulative Impacts

The cumulative impacts analysis area for impacts to grazing from the proposed action is the Counselor Community grazing allotment. An estimated 342 acres of short-term disturbance has occurred within the allotment from the construction of 99 well pads. This amount of disturbance equates to approximately 0.33 percent of the allotment acreage. The proposed action would contribute approximately 3.8 acres of long-term disturbance in the allotment. Cumulatively, the proposed, past and reasonably foreseeable long term disturbance would approximate 74.25 acres (0.07 percent). Other reasonably foreseeable activities within the allotment that would impact forage resources include off-highway vehicle traffic, vegetation treatments, and grazing. When added to past, present, and reasonable foreseeable activities within the grazing allotments, the proposed action would not result in measurable changes to the allotment's carrying capacity or to available AUMs.

3.14 Environmental Justice

3.14.1 Affected Environment

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, requires that federal agencies identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

Environmental justice refers to the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, programs, and policies. It focuses on environmental hazards and human health to avoid disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Guidance on environmental justice terminology developed by the President's CEQ (1997) is discussed below.

- *Low-income population.* A low-income population is determined based on annual statistical poverty thresholds developed by the U.S. Census Bureau. In 2012, poverty level was based on total income of \$11,720 for an individual and \$23,283 for a family of four (U.S. Census Bureau 2012a). A low-income community may include either a group of individuals living in geographic proximity to one another or dispersed individuals, such as migrant workers or Native Americans.
- *Minority.* Minorities are individuals who are members of the following population groups: American Indian, Alaskan Native, Asian, Pacific Islander, Black, or Hispanic.
- *Minority population area.* A minority population area is so defined if either the aggregate population of all minority groups combined exceeds 50 percent of the total population in the area or if the percentage of the population in the area comprising all minority groups is meaningfully greater than the minority population percentage in the broader region. Like a low-income population, a minority population may include either individuals living in geographic proximity to one another or dispersed individuals.

- *Comparison population.* For the purpose of identifying a minority population or a low-income population concentration, the comparison population used in this study is the state of New Mexico as a whole.

Low-income Populations

The study area for this analysis includes McKinley, Rio Arriba, Sandoval, and San Juan counties. Income and poverty data estimates for the study area counties from the U.S. Census Bureau as shown in Table 3-16, indicate that in 2002, the percent of the population living below the poverty level in the socioeconomic study area as a whole was slightly above that of the state (21.3 percent and 20.6 percent), but it is much higher than the national average of 12.1 percent. The data also indicate that by 2012 the gap between the population living below the poverty level in the socioeconomic study area as a whole (21.5 percent) had widened from the population living below the poverty level in the state (17.7 percent). In addition, the population living below the poverty level in the United States had increased to 15.9 percent by 2012. Poverty levels in 2012 ranged from 37.7 percent in McKinley County to 13.7 percent in Sandoval County. Only that of Sandoval County was below the state average.

Table 3-16. Study area county population in poverty (2002-2012)

	McKinley County	Rio Arriba County	Sandoval County	San Juan County	Study Area Total	New Mexico	United States
Number and percent of Population in Poverty 2002	21,766	7,165	19,934	22,152	71,017	421,123	34,569,951
	30.2%	17.7%	11.1%	18.2%	21.3%	20.6%	12.1%
Number and percent of Population in Poverty 2012	27,296	8,806	18,502	25,802	80,406	327,444	48,760,123
	37.7%	22.0%	13.7%	20.3%	21.5%	17.7%	15.9%
Median Household Income 2002	\$25,197	\$30,557	\$45,213	\$34,329	N/A	\$34,827	\$45,409
Median Household Income 2012	\$29,821	\$36,900	\$57,376	\$45,901	N/ A	\$42,828	\$51,371
Classified as Low Income Population in 2012 based on CEQ guidelines?	No	No	No	No	No	NA	NA

Source: U.S. Census Bureau 2013

Similarly, estimates from 2012 indicate that Sandoval and San Juan counties had household median incomes (\$57,376 and \$45,901) that were above the state level of \$42,828. McKinley County (\$29,821) and Rio Arriba County (\$36,900) were below that of the state in 2012, as shown in Table 3-16. While no area communities meet the CEQ definition of a low-income population area (50 percent or higher), the highest poverty rates were seen in Bloomfield (29 percent), Española (26.3 percent), and Bernalillo (24.1 percent), as shown in Table 3-17.

Table 3-17 Study area key community race/ethnicity and poverty data

Community	Percent Population Racial or Ethnic Minority	Classified as Minority Population based on CEQ?	Percent of Individuals Below Poverty	Classified as Low-income Population based on CEQ?
Aztec	36.4	No	14.4	No
Bernalillo	78.8	Yes	24.1	No
Bloomfield	55.8	Yes	29.0	No
Espanola	91.6	Yes	26.3	No
Farmington	48.8	No	15.5	No
Gallup	76.9	Yes	20.9	No
Rio Rancho	46.7	No	9.8	No

Source: U.S. Census Bureau 2012

Note: American Community Survey estimates are based on data collected over a 5-year time period. The estimates represent the average characteristics of populations between January 2008 and December 2012 and do not represent a single point in time.

Census Tracts are geographic regions within the United States that are defined by the U.S. Census Bureau in order to track changes in a population over time. Census Tracts are based on population sizes and not geographic areas. The average population of a Census Tract is about 4,000 people, so rural areas that are sparsely populated may have very large Census Tracts, while densely populated urban areas may have very small Census Tracts.

When broken down by Census Tract, 3 out of 87 tracts in the socioeconomic study area have greater than 50 percent of individuals living below the poverty line: Census Tract 9440 in eastern McKinley County had an individual poverty rate of 54.6 percent; Census Tract 9405 in southwestern McKinley County had an individual poverty rate of 59.4 percent; and Census Tract 9409 in northwestern Sandoval County had an individual poverty rate of 51.9 percent (U.S. Census Bureau 2012). These three Census Tracts are all relatively large, indicating a sparsely populated, rural area.

Minority Populations

Based on 2008-2012 data, minorities made up 59.5 percent of the population in New Mexico, compared to 36.3 percent in the United States as a whole (refer to Table 3-18). The proportion of minorities in the socioeconomic study area (65.3 percent) substantially exceeded the United States and is slightly higher than the state average. At the county level, the minority population ranged from 89.7 percent in McKinley County to 52.8 percent in Sandoval County. Within relevant tribal nations, Native Americans represented the vast majority of the population. The largest minority groups were Hispanics/Latinos in Rio Arriba and Sandoval counties and Native Americans in McKinley and San Juan counties.

Table 3-18. Study area county population by race/ethnicity (2008-2012)

Population	McKinley County	Rio Arriba County	Sandoval County	San Juan	Study Area	New Mexico	United States	Jicarilla Apache Nation	Navaho Nation	Ute Mountain Nation
Hispanic or Latino	9,744	28,714	46,334	24,496	109,288	952,569	50,545,275	382	2,958	99
ethnicity of any race	13.6%	71.4%	35.3%	19%	29%	46.3%	16.4%	11.6%	1.7%	6.0%
White alone	7,413	5,370	61,977	54,218	128,978	831,543	196,903,968	74	3,762	47
	10.3%	28.6%	47.2%	42.2%	34.67%	40.5%	63.7%	2.3%	2.2%	2.9%

Population	McKinley County	Rio Arriba County	Sandoval	San Juan	Study Area	New Mexico	United States	Jicarilla Apache Nation	Navaho Nation	Ute Mountain Nation
Black or African American alone	353 0.5%	149 0.4%	2,704 2.1%	794 0.6%	4,000 1.08%	35,586 1.7%	37,786,591 12.2%	0 0%	250 0.1%	5 0.3%
American Indian or Alaskan Native alone	52,358 72.8%	5,629 14.0%	15,964 12.2%	46,676 36.3%	120,627 32.43%	176,766 8.6%	2,050,766 0.7%	2,692 82.0%	162,920 94.3%	1,429 87.0%
Asian alone	506 0.7%	173 0.4%	1,685 1.3%	464 0.4%	2828 0.76%	25,411 1.2%	14,692,794 4.8%	73 2.2%	834 0.5%	14 0.9%
Native Hawaiian and Other Pacific Islander alone	38 0.1%	7 0%	100 0.1%	72 0.1%	217 0.06%	989 <.01%	480,063 0.2%	0 0%	209 0.1%	0 0%
Some Other Race	7 <.01%	22 0.1%	437 0.3%	84 0.1%	550 0.15%	3,623 0.2%	616,191 0.2%	0 0%	102 0.1%	0 0%
Two or more Races	1,469 2.0%	137 0.3%	2,101 1.6%	1,796 1.4%	5,503 1.48%	28,800 1.4%	6,063,063 2.0%	62 1.9%	1,660 1.0%	49 3.0%
Classified as Minority Population based on CEQ guidelines?	Yes	Yes	Yes	Yes		Yes	NA	Yes	Yes	Yes

Source: US Census Bureau 2012b

CEQ = Council on Environmental Quality

Note: American Community Survey estimates are based on data collected over a 5-year time period. The estimates represent the average characteristics of populations between January 2008 and December 2012 and do not represent a single point in time.

Based on the CEQ definition of a minority population area (minority residents exceed 50 percent of all residents), Bernalillo, Bloomfield, Española, and Gallup all are considered minority communities.

When examined at the Census Tract level, there are 24 out of 87 tracts that have a minority population greater than 50 percent. These range from Census Tract 6.1, located just north of the city of Aztec with a minority population of 80.5 percent, to Census Tract 107.17, located north of the city of Rio Rancho with a minority population of 50.2 percent (US Census Bureau 2012b). These Census Tracts are relatively small and are based around the city of Rio Rancho and the Aztec/Farmington/Bloomfield area.

Native American Populations

Data in Table 3-18 account for a substantial portion of the study area population in some areas, notably McKinley and San Juan counties, where the population is 72.8 and 36.3 percent American Indian,

respectively. As shown in Table 3-19, three tribal governments have reservations within the study area: the Jicarilla Apache Nation, the Navajo Nation, and the Ute Mountain Nation. The Southern Ute Nation has lands just north of the planning area in the State of Colorado, but none within the study area. Almost one half of the study area is tribal lands. Each tribe maintains a general concern for protection of and access to areas of traditional and religious importance and for the welfare of plants, animals, air, landforms, and water on reservation and public lands. Policies established in 2006 by the BLM and U.S. Forest Service, in coordination with federal tribes, ensure access by traditional native practitioners to area plants. The policy also ensures that management of these plants promotes ecosystem health for public lands. The BLM is encouraged to support and incorporate into their planning traditional native and native practitioner plant-gathering for traditional use (Boshell 2010).

Table 3-19. Tribal nations in the study area

Tribe	Acres in Study Area	General Location
Jicarilla Apache Nation	739,600	The majority of the Jicarilla Apache Nation is located in western Rio Arriba County, but within the eastern portion of the study area
Navajo Nation	860,900	A portion of the Navajo Nation extends into western San Juan County and into the western portion of the study area
Ute Mountain Nation	103,500	A portion of the Ute Mountain Nation extends into the northern portion of San Juan County, just east of the Navajo Nation, and into the northern portion of the study area
Unknown	196,300	Lands located in the southern portion of the planning area

Source: BLM GIS 2014, U.S. Census Bureau 2014

3.14.2 Direct and Indirect Impacts

In compliance with Executive Order 12898, this assessment determined that the proposed action is not expected to result in disproportionate shares of negative environmental impacts affecting any group of people due to a lack of political or economic strength. There would be no measurable or disproportionate impacts to minority or low-income populations associated with the proposed action.

3.15 Public Health and Safety

3.15.1 Affected Environment

Public health and safety concerns are related to vehicle travel on area roads and public and worker safety around natural gas/oil wells, pipelines, or other production facilities. Worker safety concerns include working near loud equipment, heavy equipment and moving parts, and flammable and/or explosive material. Other health and safety concerns identified include the risk of pipeline rupture, leaks, or explosion.

There is a risk of accidental spills and illegal dumping of non-hazardous and hazardous materials. Contamination of surface waters, near-surface drinking water aquifers, and soil resources caused by surface degradation due to accidental spills and leaks of chemicals and waste products are also of

concern. Potential impacts to surface water and shallow groundwater resources are addressed in detail in Section 3.4–Water Resources.

The proposed wells would be located near other wells, pipeline ROWs, other oil and gas facilities, and a network of dirt surface access roads. Public risk associated with well drilling includes increased traffic on public roads, wildfire, pipeline leakage, rupture, fire, and explosion. Additional public health and safety risks include spills of wastes, chemicals, or hazardous materials. Roads in the area are generally unimproved dirt surface and are used to access natural gas and oil facilities. These roads may become hazardous or impassable during periods of inclement weather.

3.15.2 Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed action would be completed in a manner consistent with all applicable Occupational Safety and Health Administration regulations and appropriate industry standards to minimize risk of accidents. Impacts to the public would be minimized by controlling access to all work and operation areas. All road crossings would be manned with flaggers and spotters during heavy construction close to the area and during mobilization and demobilization. Orange flagging and barriers would be put in place to restrict public access to the work site. All roadway speed limits would be observed to reduce potential for traffic accidents. Additionally, hauling of materials or equipment would follow NMDOT regulations. Water would be applied to roads, if needed, to minimize fugitive dust. Following construction, existing roads would be rehabilitated, if needed.

Disposal of any liquid and solid waste generated during construction, operation, and maintenance activities would be done at permitted facilities. Encana would implement measures for safe handling and storage of materials. In the event of a hazardous material spill, releases would be contained and disposed in accordance with federal and state regulations. The proposed well pads and pipelines would be constructed and operated to meet all industry standards and applicable state and federal requirements.

There would be short-term direct or indirect public health and safety risks during well pad and pipeline construction, drilling, and completion of the proposed wells. Long-term public health and safety risks would be minimal and associated with production equipment operation and travel for routine maintenance.

Cumulative Impacts

The cumulative impacts analysis area is the Escavada Wash sub-watershed. Other reasonably foreseeable activities in the project area that could affect public health and safety include construction and operation of pipelines, well pads, and associated facilities; mining; prescribed fire; and vehicular travel on unimproved dirt roads. The construction and operation of the proposed wells and pipelines would contribute negligibly to public health and safety concerns when considered with past, present, and reasonably foreseeable actions in the BLM/FFO planning area.

4. SUPPORTING INFORMATION

4.1 Tribes, Individuals, Organizations, or Agencies Consulted

The BLM fulfills its responsibilities under the NHPA through a number of agreements. The National Programmatic Agreement (NPA 2012) between the BLM, Advisory Council on Historic Preservation (ACHP), and the National Council of State Historic Preservation Officers allows the agency to fulfill its NHPA responsibilities according to the provisions of the NPA in lieu of 36 CFR 800.3 through 800.7 regulations. The NPA, which applies to all BLM activities below specified thresholds, provides among other things, regulatory relief in many instances from the requirement for case-by-case review by State Historic Preservation Officers (SHPOs) and the ACHP, in exchange for managers' maintenance of appropriate staff capability and observance of internal BLM standards as set out in the 8100 Manual series.

The New Mexico BLM has a two-party protocol with the New Mexico SHPO (BLM/SHPO 2014) specifically encouraged by the NPA. This protocol details how the New Mexico BLM and SHPO will regulate their relationship and consult. Specifically, this document outlines among other things, how and when consultation will be conducted between the BLM, SHPO, Tribes, and the public. The protocol also outlines when case-by-case SHPO consultation is or is not required for specific undertakings and the procedures for evaluating the effects of common types of undertakings and resolving adverse effects to historic properties. These common types of undertakings regularly include the common actions undertaken in the BLM/FFO.

Table 4-1 contains a list of tribes, individuals, organizations, and agencies invited to attend the on-site for the project.

Table 4-1. Tribes, Individuals, Organizations, and Agencies Invited to the On-Site

Name	Tribe, Organization, or Agency	Attended On-Site
Colleen Cooley	Dine Care	No
Thomas Singer	Western Environmental Law Center	No
Mike Eisenfeld	San Juan Citizens Alliance	No
Sarah White	Interested Public	No
Kyle Tisdale	Western Environmental Law	No
Samantha Ruscavage-Barz	WildEarth Guardians	No
Tim Ream	WildEarth Guradians	No
Victoria Gutierrez	Interested Public	No
Pete Drovers	Earthworks	No
Jeremy Nichols	WildEarth Guardians	No
Anson Wright	Chaco Alliance	No
Bruce Baizel	Earthworks	No
Tweetie Blancett	Interested Public	No
Lori Goodman	Dine Care	No
Penny Anderson	Western Resource Advocates	No
Samuel Sage	Counselor Chapter – Navajo Nation	No
Don Schrieber	Interested Public	No

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. Table 4-2 lists the name, title, and affiliation of the personnel.

Table 4-2. Tribes, Individuals, Organizations, and Agencies Invited to the On-Site

Name	Title	Organization or Agency
Mike Flaniken	Environmental Protection Specialist	BLM/FFO
Jillian Aragon	Realty Specialist	BLM/FFO
Shane Trautner	Rangeland Management Specialist	BLM/FFO
Sherri Landon	Paleontologist	BLM/FFO
Alberta Wethington	Permit Processing Tech.	BLM/FFO
Jim Copeland	Archaeologist	BLM/FFO
Geoffrey Haymes	Archaeologist	BLM/FFO
Ester Willetto	Tribal Program Coordinator	BLM/FFO
John Kendall	Threatened and Endangered Species Biologist	BLM/FFO
Joey Herring	Project Manager/Sr. Biologist	Ecosphere
Danielle Sullivan	Sr. Technical Editor	Ecosphere
John Dodge	Biologist	Ecosphere
Kylan Frye	Biologist	Ecosphere
Tae Hillyer	Biologist	Ecosphere
Matthew Zabka	Biologist	Ecosphere
Lucas Phipps	GIS Specialist	Ecosphere
Steven Fuller	Archaeologist	La Plata Archaeological Consultants
Leslie Sesler	Archaeologist	La Plata Archaeological Consultants
Paul Stirniman	Archaeologist	La Plata Archaeological Consultants
Greg Hovezak	Archaeologist	La Plata Archaeological Consultants
Deb Silverman	Archaeologist	La Plata Archaeological Consultants

4.3 References

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Appendix A – Maps and Photographs

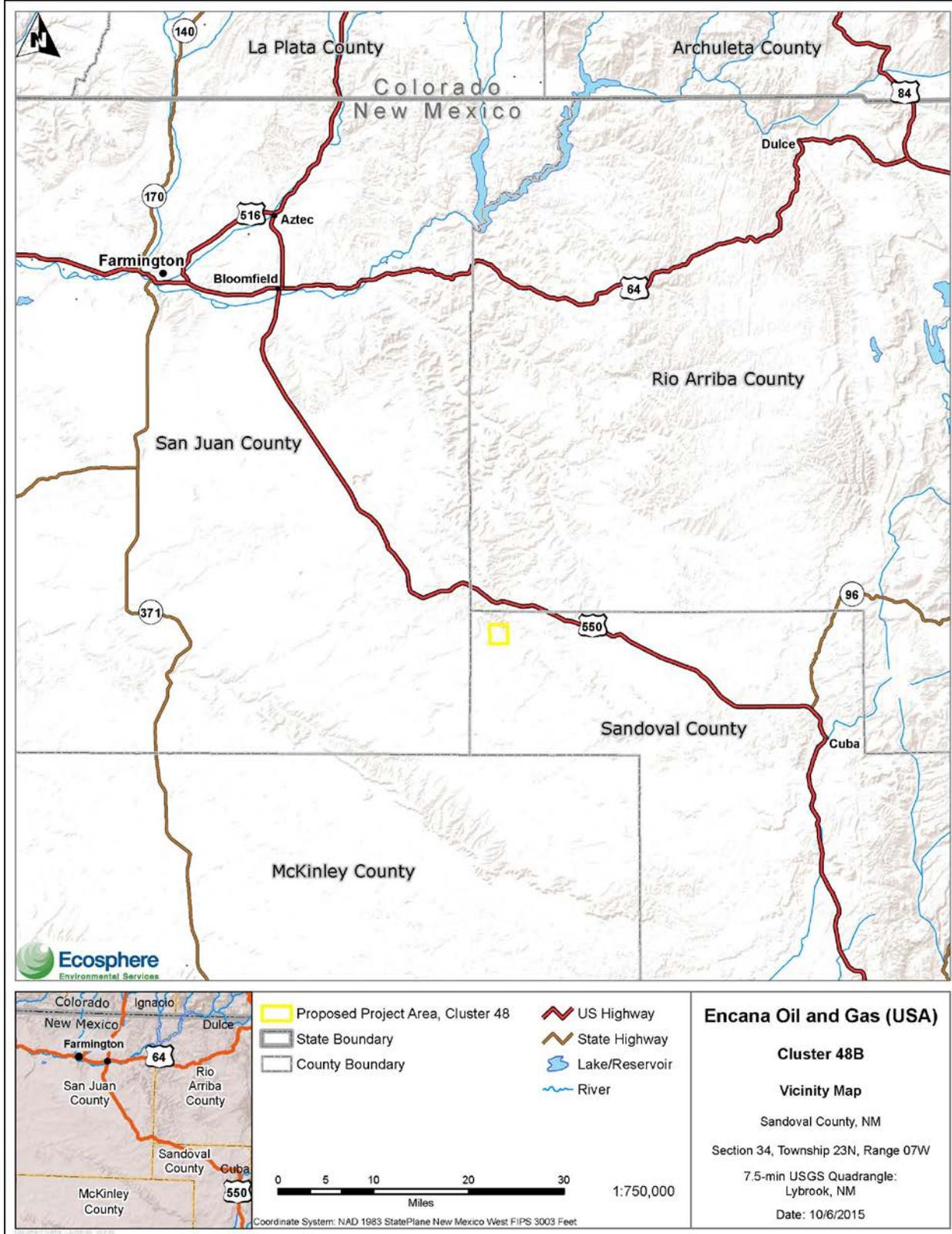


Figure 1. Proposed Cluster 48B and vicinity

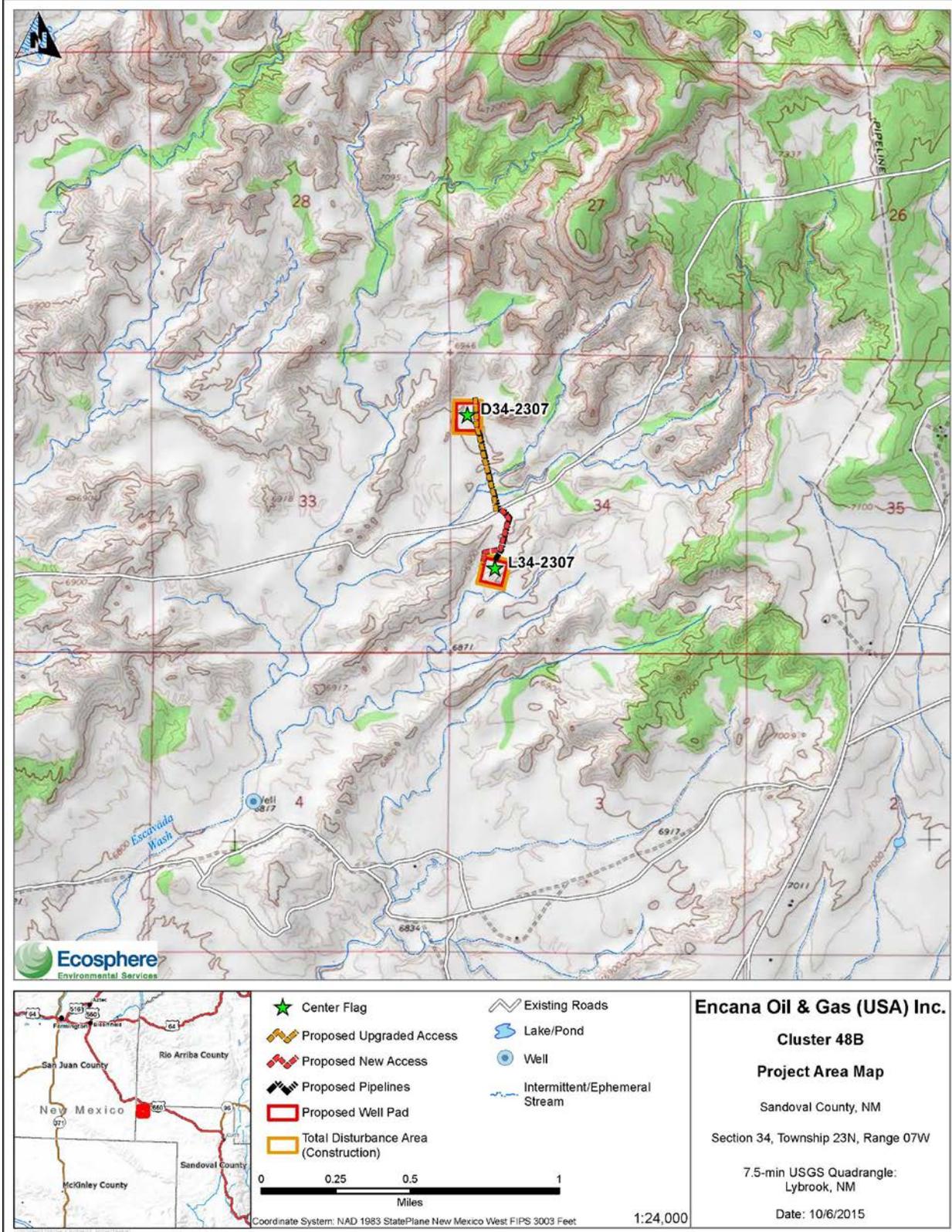


Figure 2. Proposed Cluster 48B Project Area

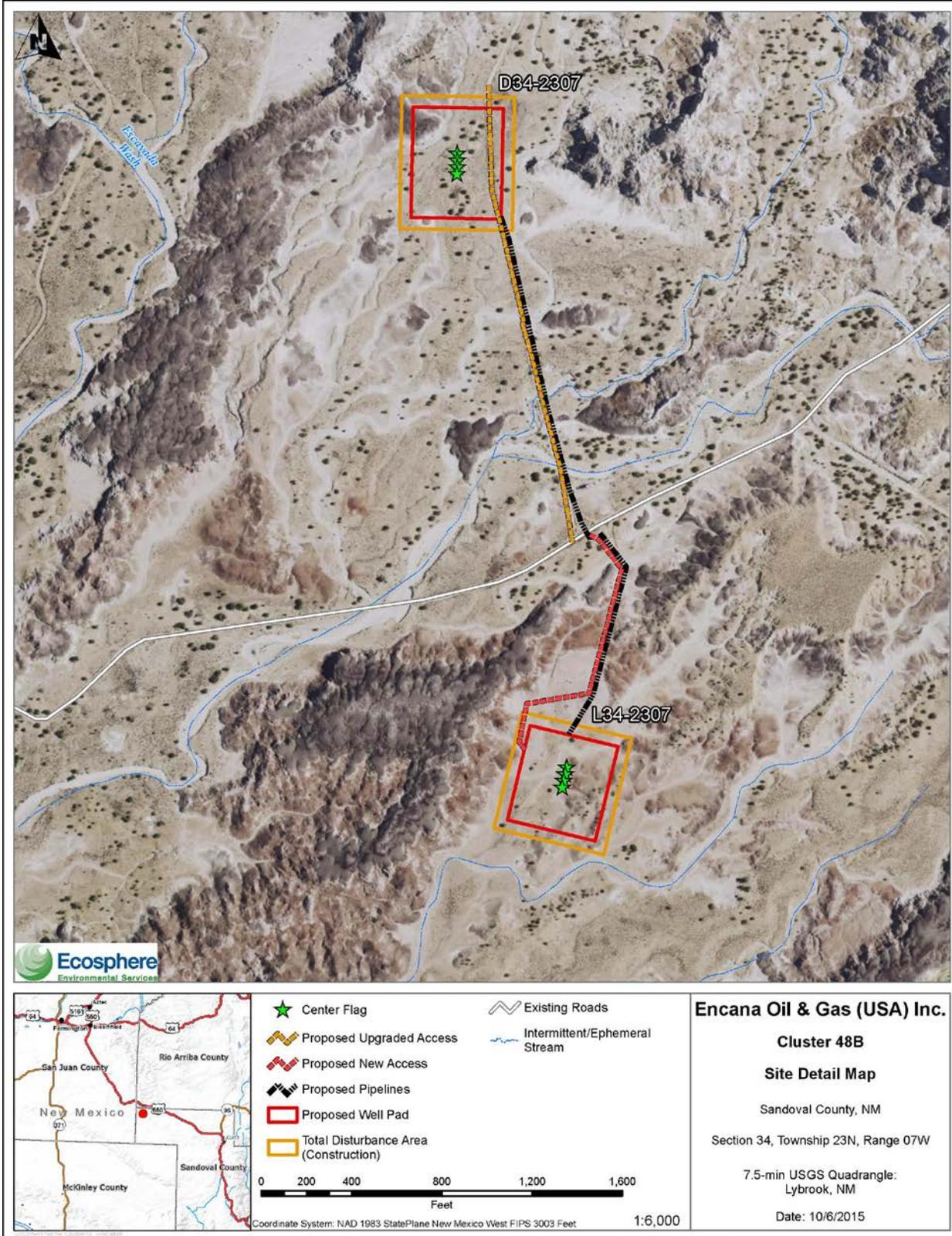


Figure 3. Proposed Cluster 48B Site Detail Map



Photograph 1. Lybrook D34-2307 from the center stake looking north



Photograph 2. Lybrook D34-2307 from beginning of the access road



Photograph 3. Lybrook L34-2307 from center stake looking north



Photograph 4. Lybrook L34-2307 from beginning of the access road