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Howell A 3B Natural Gas Well Project

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1. PURPOSE AND NEED FOR ACTION

1.1. Background

Burlington Resources Oil & Gas Company LP (Burlington) has filed an application for permit to drill (APD) for the Howell A 3B natural gas well with the Bureau of Land Management's Farmington Field Office (FFO). The proposed well would require a new stand-alone well location. The proposed action would include the construction of a well pad, the drilling, production, and final abandonment of a Blanco Mesaverde gas well, and the construction of the associated well-tie pipeline. This action is being proposed on public lands with federal minerals both administered by the Bureau of Land Management (BLM).

The proposed Howell A 3B well and associated facilities are proposed for development within the San Juan Basin of northwestern New Mexico, approximately 17 miles east of Aztec, in San Juan County, New Mexico (Figure 1). The legal location description for the proposed Howell A 3B well project is as follows:

> 359' FNL and 1574' FWL of Section 9 in Township 30N, Range 08W, New Mexico Principal Meridian (NMPM), in San Juan County, New Mexico.

The proposed well would be directionally drilled to a bottom hole location with the following legal location:

> 710' FSL and 1930' FWL of Section 4 in Township 30N, Range 08W, New Mexico Principal Meridian (NMPM), in San Juan County, New Mexico.

An approved APD, issued by the BLM, would authorize Burlington to construct, drill, operate and finally abandon the proposed well and any on-lease access road and associated facilities. The Howell A 3B gas well would allow Burlington to develop their lease and provide additional natural gas for the national energy market, which would also generate federal and state tax revenue as well as revenue for Burlington.

This site-specific analysis tiers into and incorporates by reference the information and analysis contained in the Farmington Proposed Resource Management Plan/Final Environmental Impact Statement (PRMP/FEIS) (BLM 2003a). The PRMP/FEIS is available for review at the Farmington Field Office, Farmington, New Mexico, or on the World Wide Web at http://www.nm.blm.gov/ffo/ffo_home.html. This environmental assessment (EA) addresses site-specific resources and effects of the proposed action that were not specifically covered within the PRMP/FEIS, as required by the National Environmental Policy Act of 1969 (NEPA), as amended (Public Law 91-90, 42 United States Code [USC] 4321 et seq.).

1.2. Purpose and Need for Action

The purpose of the action is to provide Burlington with reasonable access to BLM managed lands to develop their mineral lease. The need for the action is established by the BLM's responsibility to respond to the APD under the Mineral Leasing Act of 1920, as amended (30 USC 181 et seq.).

1.3. Decision to be Made

Based on the information in this EA, the BLM-FFO will decide whether or not to issue the APD, and if so, under what terms and conditions. Under the National Environmental Policy Act (NEPA) (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 actions warranting further analysis in an Environmental Impact Statement (EIS). The BLM-FFO Field Manager is the responsible officer who will decide either:

- To approve the APD with design features as submitted;
- To approve the APD with additional mitigations;
- To analyze the effects of the proposal in an EIS; or
- To deny the APD.

1.4. Conformance with Applicable Land Use Plan(s)

The Proposed Action is in conformance with the September 2003 Farmington Resource Management Plan (RMP) with Record of Decision (ROD), as updated in December 2003 (BLM 2003b). The proposed action is located in an area identified in the ROD as open to oil and gas leasing and development (BLM 2003b, p. 3). 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, while at the same time minimizing environmental damage and providing for the rehabilitation of affected lands (BLM 2003c, p. 2-2).

The proposed action area is located within the Rattlesnake Canyon Wildlife Specially Designated Area (SDA). The 2003 RMP management goal for the Rattlesnake Canyon SDA is "to support increases in potential wildlife" (BLM 2003c, p. C-171). The RMP allows for oil and gas development in the SDA with management prescriptions as mitigating measures. Management prescriptions mandated for this SDA applicable to the proposed action are as follows:

- For new and current oil and gas leases, seasonal timing limitation on drilling and construction from 12/1 through 3/31.
- Allow ROWs on a case-by-case basis with special management constraints and mitigation.
- Implement Class III and IV VRM Designation.

1.5. Relationship to Statutes, Regulations or Other Plans

BLM regulates oil and gas development so as to minimize environmental effects to public lands as required by numerous federal laws, including:

- The Endangered Species Act of 1973 (P.L. 94-325),
- The Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-712),
- The Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. 668-668d),
- The Federal Water Pollution Control Act of 1948 (Clean Water Act), as amended (33 U.S.C. Chap. 26),
- The Clean Air Act of 1963, as amended (P.L. 88-206),
- The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 U.S.C. Chap. 103),
- The Antiquities Act of 1906, as amended (P.L. 52-209),
- The National Historic Preservation Act of 1966, as amended (P.L. 89-665),
- The Archaeological and Historic Preservation Act of 1974 (P.L. 86-253),
- The Archaeological Resources Protection Act of 1979, as amended (P.L. 96-95),
- The American Indian Religious Freedom Act of 1978, as amended (42 U.S.C. 1996), and
- The Native American Graves Protection and Repatriation Act of 1990 (P.L. 101-601).

Burlington would comply with all applicable federal and State of New Mexico laws and regulations (Appendix B). Non-point source pollution is an identified problem in the planning area that is directly associated with soil stability and water quality. The New Mexico Energy, Minerals and Natural Resources Department requires operators to follow "pit rule" guidelines contained within NMAC 19.15.17 in an effort to reduce ground water contamination from industry related activities. Mandated by the Clean Water Act (CWA), efforts to reduce non-point source pollution through implementation of erosion control and management practices are an important part of BLM's management activities. Industrial activities disturbing land may require permit coverage through a National Pollution Discharge Elimination System (NPDES) storm water discharge permit. Oil and gas development in New Mexico, however, is exempt from NPDES regulation per 40 CFR Part 122. Upon determination, a U.S. Army Corps of Engineers Section CWA 404 Permit for the discharge of dredge and fill materials may also be required. Operators are required to obtain all necessary permits and approvals prior to any disturbance activities.

Consultation with the USFWS, as required by Section 7 of the Endangered Species Act (ESA) of 1973, was conducted as part of the Farmington PRMP/FEIS (Consultation No. 2-22-01-I-389) to address cumulative effects of RMP implementation on federally listed threatened and endangered species or

designated critical habitat. The consultation is summarized in Appendix M of the PRMP/FEIS. Farmington Field Office staff reviewed the action alternatives and determined they would be in compliance with threatened and endangered species management guidelines outlined in the September 2002 Biological Assessment (Consultation No. 2-22-01-I-389). Water for well construction would be sourced from the Pump Wash Hole #1, an existing (declared) source that has been filed with the New Mexico State Engineer's Office. No new water depletions would result. No further consultation with the U.S. Fish and Wildlife Service is required.

The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful. Executive Order (EO) 13186 was signed on January 10, 2001, directing executive departments and agencies of the federal government to take certain actions to further implement the MBTA including developing and implementing a Memorandum of Understanding (MOU) with the USFWS that would promote the conservation of migratory bird populations. A MOU was developed and entered into by the BLM and the USFWS on April 12, 2010 to accomplish EO 13186 and to ensure the successful implementation of BLM and USFWS migratory bird conservation responsibilities. The MOU To Promote the Conservation of Migratory Birds presents collaborative methods to promote the conservation of migratory bird populations by identifying and implementing strategies which avoid or minimize adverse impacts to migratory birds. The BLM and USFWS have agreed that implementation of the MOU will be in harmony with existing agency missions, and the MOU does not supersede any legal requirements or existing species conservation processes and procedures such as ESA recovery plans. It is also understood that the BLM may not be able to fulfill all aspects of the MOU upon signing (MOU Section IX (I)).

The MOU to Promote the Conservation of Migratory Birds entered into by the BLM and the USFWS was not completed during the development of the revised FFO RMP. Consultation on the Biological Assessment (BA) with the USFWS for the RMP was completed on October 2, 2002, the Environmental Impact Statement (EIS) was completed in March 2003, and the Record of Decision (ROD) for the RMP was signed in September of 2003. There are no management constraints or mitigation measures pertaining to the MBTA listed within the RMP, BA, EIS, or ROD. Revision and/or adoption of some elements of the MOU into the RMP may be required. Currently, effects to migratory birds are addressed and mitigated at the project level as outlined in the Migratory Bird Treaty Act – BLM/FFO Interim Management Policy (Instruction Memorandum No. NM-F00-2010-001, BLM 2010).

Until such time as further guidance related to the MOU is issued, the BLM will continue to analyze impacts to migratory birds in NEPA documents, list the MBTA as a Law the owner of any BLM permit must comply with, and utilize best management practices and mitigation measures that minimize impacts to migratory birds as outlined in Instruction Memorandum No. NM-F00-2010-001.

Compliance with Section 106 responsibilities of the National Historic Preservation Act are adhered to by following the BLM – New Mexico State Historic Preservation Office (SHPO) protocol agreement, which is authorized by the National Programmatic Agreement between the BLM, the Advisory Council on Historic Preservation, and the National Conference of Council of State Historic Preservation Officers.

Additionally, the APD Operator shall:

- Comply with all applicable Federal, State of New Mexico and local laws and regulations. A listing of selected federal laws and regulations applicable to the proposed action can be found in Appendix B.
- Obtain the necessary permits for the construction, drilling, completion, production and abandonment of this well and pipeline tie including water rights appropriations, the installation of water management facilities, water discharge permits, and relevant air quality permits.
- Certify that a Surface Use Agreement has been reached with private landowners where required.
- Obtain any relevant and/or required New Mexico Environment Department (NMED) air quality permits.

The State of New Mexico Oil Conservation Commission (NMOCC) has assigned spacing rules for producing oil and gas formations. Recently, the NMOCC has authorized infill provisions for the increased

density for the Basin Dakota, Blanco Mesaverde, and Basin Fruitland Coal pools. This has resulted in numerous wells being proposed and approved within the proposed project area and throughout the San Juan Basin. Minimum spacing is currently at 80 acres per well for the Blanco Mesaverde pool.

This EA considers the requirements of these and other laws and regulations, as applicable. The proposed action, including environmentally-protective design features, complies with the laws and regulations indicated above. Operators are required to obtain all necessary permits and approvals prior to any disturbance activities.

1.6. Scoping, Public Involvement, and Issues

Scoping is the initial means by which the BLM identifies potential issues related to a proposed action. External scoping was conducted through posting this project on the FFO's on-line NEPA logs (http://www.blm.gov/nm/st/en/prog/planning/nepa_logs.html). The logs track initiation and approval of environmental documents that are being or have been completed as part of the BLM's responsibilities under NEPA. The public is encouraged to provide comments or request information on projects listed in the logs. Public comments are considered during the NEPA analysis and decision-making process for the applicable project, contingent on the project's schedule status. No public comments have been received to date.

Additional issues identification occurs during FFO internal review of the proposed action and during the planning level in-field onsite inspection. Internal review of the proposed action is initiated when the project is presented by Burlington to the FFO. During the onsite inspection, all areas of proposed surface disturbance are inspected by FFO to ensure that potential effects to natural resources and other elements of the human environment would be minimized. Potential issues identified prior to and/or during the onsite inspection are evaluated at the ground level. Alternatives to the different aspects of the proposed action are considered or developed as needed in order to address identified issues. These alternatives are carried forward as design features of the proposed action, viable alternatives to the proposed action, or as alternatives considered but not analyzed in detail.

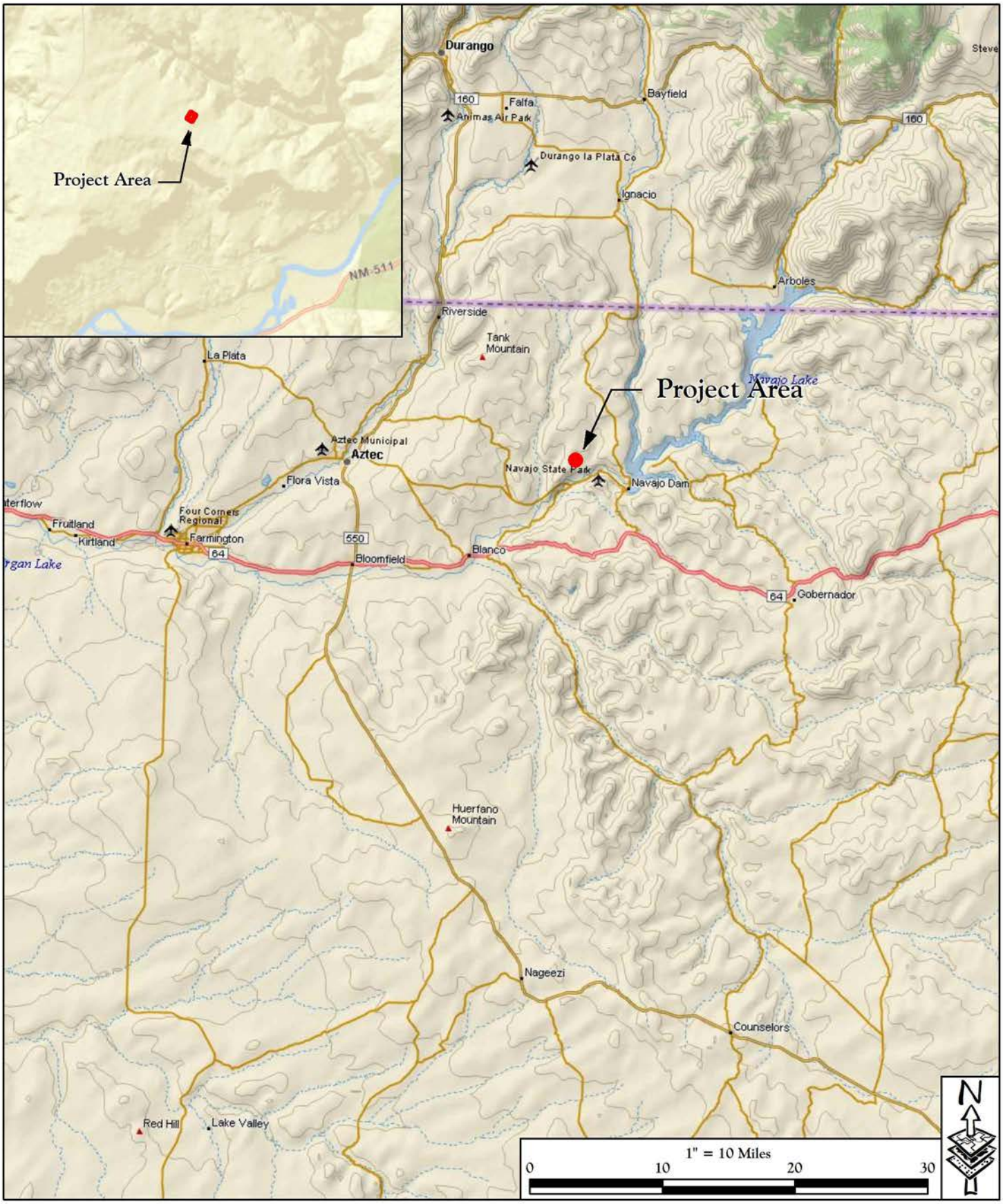
The FFO conducted an onsite inspection of the proposed action area on June 11, 2014. On June 23, 2014, a team of FFO resource specialists, known as an Interdisciplinary (ID) Team, reviewed the proposed action. The following issues have been identified:

- *Air Quality and Climate* – Would the proposed action affect air quality by increasing dust and other pollutants, or result in a changed climate of the region?
- *Water Quality* –What risks do drilling and production activities pose to groundwater quality?
- *Vegetation* – How would the proposed action alter area vegetation?
- *Noxious Weeds* – How would the proposed action affect the spread of noxious weeds in the action area?
- *Wildlife* – How would the proposed action affect available wildlife habitat, habitat fragmentation, and the distribution/displacement of wildlife species in the action area?
- *Special Status Species* – How would the proposed action affect Special Status Species habitat and prey distribution?
- *Migratory birds* – How would the proposed action affect migratory bird nesting, habitat, species composition and distribution?
- *Cultural* – Would the proposed action impact any cultural resources eligible for inclusion on the National Register of Historic Places?

1.6.1. Issues Considered but Not Analyzed

Native American Religious Concerns – For the proposed action, identification efforts were limited to reviewing existing published and unpublished literature (e.g. Van Valkenburgh 1941, 1974; Brugge 1993; Kelly et al 2006), the site-specific Class III survey report prepared for the proposed action, and a review by the BLM's cultural resources program regarding the presence of TCPs 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 (ARPA; 16 USC 470) within the proposed action area. The proposed action would not impact any known Traditional Cultural Properties, prevent access to sacred sites, prevent the possession of sacred objects, or interfere with or hinder the performance of traditional ceremonies and rituals pursuant to the American Indian Religious Freedom Act of 1978 (42 USC 1996) or Executive Order (EO) 13007.



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ROAD/VICINITY MAP

HOWELL A 3B
ENVIRONMENTAL ASSESSMENT

FIGURE 1

Sources: ESRI, DeLorme, AND, Tele Atlas, First American, ESRI Japan, UNEP-WCMC, USGS, METI, ESRI Hong Kong, ESRI Thailand, Procalculo Prosis

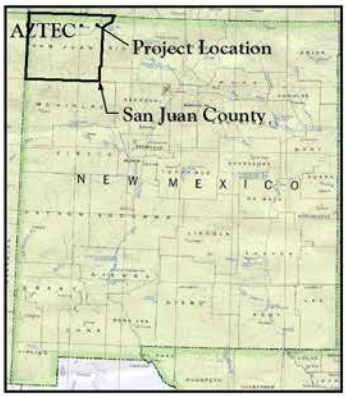
PROJECT LOCATION:
Township 30 North, Range 08 West, Section 09.
New Mexico Principal Meridian,
San Juan County, New Mexico.

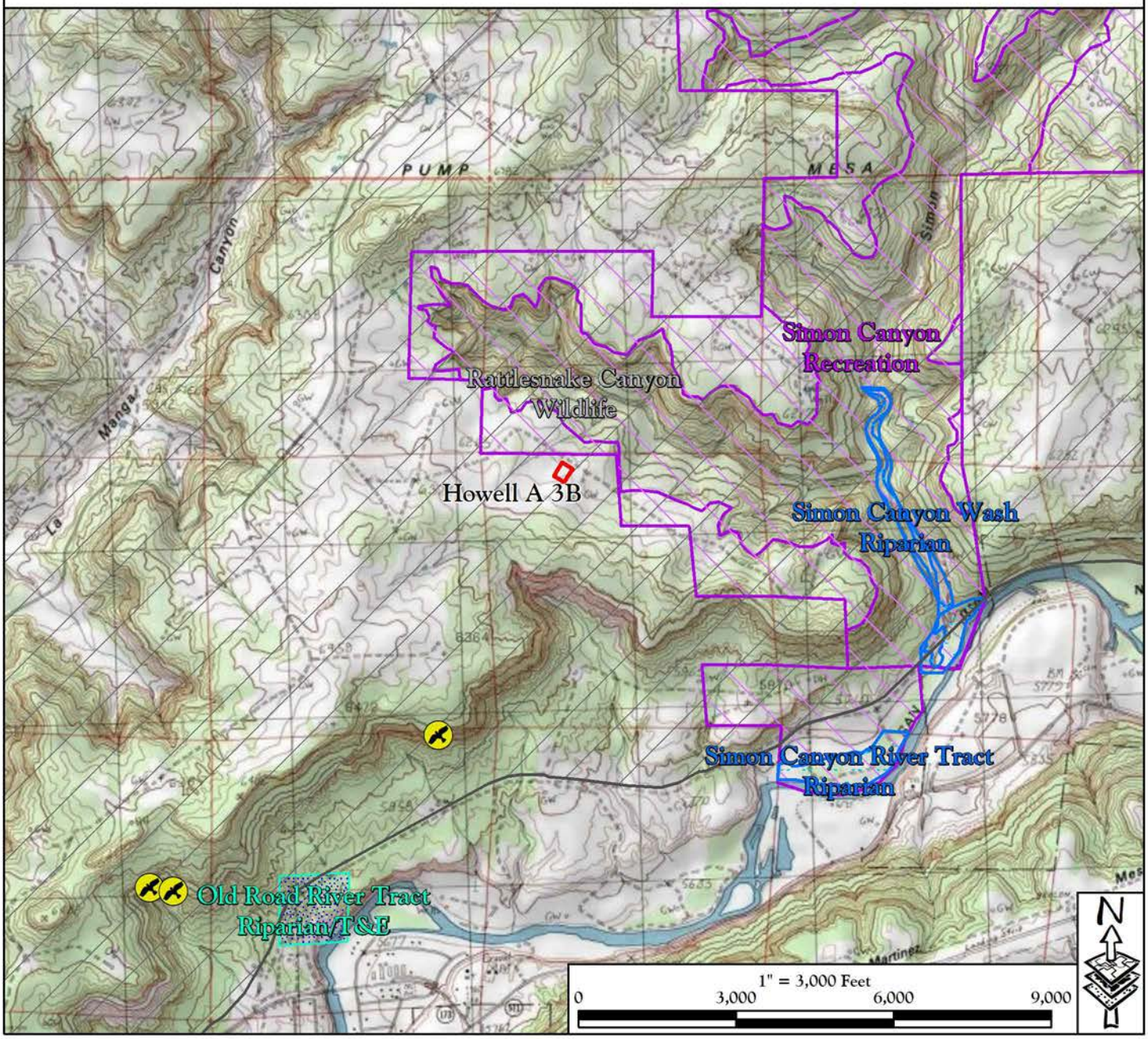
WELLHEAD LOCATION:
Latitude: 36.831869° N
Longitude: 107.684660° W

BOTTOMHOLE LOCATION:
Latitude: 36.834803° N
Longitude: 1017.683445° W

LEGEND

- Proposed Well Pad
- Recreation SDA
- Wildlife SDA
- Ephemeral Wash SDA
- Riparian/T&E
- Golden Eagle Nest





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PROJECT LOCATION MAP

HOWELL A 3B
ENVIRONMENTAL ASSESSMENT

FIGURE 2

Source: Archuleta, New Mexico 7.5' USGS Quadrangle

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AERIAL SITE MAP

HOWELL A 3B
ENVIRONMENTAL ASSESSMENT

FIGURE 3

Source: Aerial photo provided by Bing Maps 2010 (http://www.bing.com/maps/).

2. PROPOSED ACTION AND ALTERNATIVE(S)

2.1. Proposed Action

BLM proposes to approve Burlington's APD for the Howell A 3B. Developing the proposed Howell A 3B would involve constructing a well pad, drilling and completing the well, and constructing and installing associated facilities including a well-tie pipeline. The proposed pipeline would be owned and operated by Enterprise Field Services, LLC.

The proposed Howell A 3B well and associated facilities would be located on Pump Mesa approximately 2.0 miles north of the intersection of State Highways 173 and 511in Navajo Dam, and approximately 1.6 miles west of the confluence of the San Juan River and Simon Canyon as depicted on the Archuleta, New Mexico, 7.5-minute United States Geological Service (USGS) quadrangle map (Figure 2). The project area elevation is 6,249 feet above mean sea level.

The geographic coordinates for the surface location of the proposed wellhead are:
Latitude: 36.831869° N
Longitude: 107.684660° W (NAD 83)

The proposed well would be directionally drilled to the following bottom hole location:
Latitude: 36.834803° N
Longitude: 1017.683445° W (NAD 83)

2.1.1. Construction Phase

The proposed action would include the construction of a level well pad surface of approximately 230 feet by 300 feet. Unless limited by surface resources, there would be an additional 50-foot construction zone around the perimeter of the proposed pad to contain the cut and fill slopes and top soil storage. The well pad would be constructed using a D-8 bulldozer. Clearing for the well pad is needed to provide space and a level surface for a drilling rig, completion rig and other heavy equipment to safely access and drill the well. The maximum cut would be 8 feet at the southeast corner (Corner No. 6) and the maximum fill would be 9 feet at the northwest corner (Corner No. 3). The well location, including the construction zone, would require a total of approximately 3.03 acres of land for construction.

A new access road 56 feet in length, 30 feet in width, would be required to access the proposed Howell A 3B well pad. Fifty feet of the proposed access road would be contained within the proposed well pad construction zone and would not add to new surface disturbance. The proposed access road would result in 0.004 acre of new surface disturbance. Approximately 1.1 miles of the existing access from the proposed well location west to the intersection with the main road would be upgraded to "Gold Book" standards as part of the proposed action. Improvements would include the installation of 24" corrugated metal culverts as needed.

An associated 101-foot pipeline tie would be constructed tying the proposed Howell A 3B gas well to the existing Woodriver 2 pipeline. The pipeline would be constructed within a 40-foot wide right-of-way (ROW). Approximately 20 feet of the ROW width would overlap the proposed access road. All but 13 feet of the proposed pipeline would be contained within the proposed well pad and would not add to new surface disturbance (see Figure 3 below and the Howell A 3B survey plats located in Appendix A). The proposed pipeline would result in 0.006 acre of new surface disturbance.

Total surface disturbance associated with the Howell A 3B well pad, access road, and pipeline tie would be no more than 3.04 acres as some of the proposed disturbances overlap.

For a detailed description of design features and construction practices associated with the well proposed under the proposed action, refer to the subject APD on file at the FFO, Farmington, New Mexico. For the proposed well, recommended design features shall be implemented as Conditions of Approval (COAs)

attached to the approved APD. A summary of the approximate acreage of disturbance associated with the proposed action is contained in Table 1 below.

Table 1. Cumulative Acreages for the Proposed Howell A 3B Well Pad, Access Road, and Pipeline Tie.

Project Components	New Disturbance Acreage	Existing Disturbance Acreage	Total Acreage "footprint"
Well Pad	3.03		3.03
Access Road	0.004	0.03*	0.004
Pipeline Tie	0.006	0.09*	0.006
TOTALS	3.04	0	3.04
* Disturbance would occur within the proposed well pad and would not add to the project footprint.			

2.1.2. Drilling and Completion

After the well pad is constructed, a drilling rig would be moved onto the location and assembled. Drilling to the Blanco Mesaverde formation would require approximately 14-21 days. After the well has been drilled, completion would take approximately an additional 14-21 days. The total time for construction, drilling, and completion is expected to last four (4) to eight (8) weeks. During the construction, drilling, and completion phase, both heavy equipment and light vehicles would use the proposed and existing BLM roads to access the well site. Traffic would include drilling rigs, large tractor-trailers, construction equipment, water trucks, drilling and production equipment and supplies, tanks, and numerous light pick-ups. Fresh water for drilling and completion will be sourced from permitted sources only.

Burlington will set surface well bore casing at a depth specified by the FFO to protect shallow groundwater aquifers. During drilling and completion, a trash receptacle and a chemically treated portable toilet would be on location for trash and sewer disposal. Produced hydrocarbons would be put in tanks on location during completion work. Produced water would be put in onsite tanks or within a lined reserve pit during completion work. All wastes would be disposed of in a proper manner as required by federal and state law and as described in the COAs.

2.1.3. Production Phase

After the well is completed, the portions of the pad not required for production equipment and vehicular access would be re-contoured and seeded with an approved FFO seed mix. Reclamation and reestablishment of vegetation will reduce erosion and replace habitat thereby reducing effects to water resources, soils, vegetation, wildlife, livestock, and visual resources. Approximately 1.58 acres of the well location would remain in use for production equipment. These areas would not be reclaimed until final abandonment of the individual well. After production of the well begins, normal upkeep would be required. One pick-up truck would visit the well site approximately every other day during the normal work week to check on production and resolve any problems that may occur at the well. Trucks would be used to remove produced water stored in tanks on the site. The frequency of water hauling would depend on the amount of water the well produces and may vary from once a day to once a month. Surface effects of a work-over rig would be similar to the effects described for drilling, although usually to a lesser degree. The estimated production phase of the well is 20 to 30 years.

2.1.4. Abandonment Phase

When the well is no longer commercially viable, it would be plugged and abandoned. Down-hole well abandonment would be carried out under current BLM regulations for plugging of the well and surface restoration. Surface equipment would be removed, except for an aboveground marker that would contain individual well identification information including the location of the plugged hole. The underground pipeline ties are usually plugged and left in place. The well pad and access road, if not needed for other purposes, would be re-contoured and re-vegetated as specified in the approved COAs and ROW grant stipulations in order to diminish evidence of the previous activities.

2.1.5. Design Features

Field resource investigations of the proposed well pad were conducted on June 11, 2014 by specialists from the BLM and SME Environmental, Inc. At the onsite inspection, all areas of proposed surface disturbance were inspected to ensure that potential effects to natural resources would be minimized. Additional resource protection design features determined at the June 11, 2014 onsite include:

- All project activities will be confined to the permitted areas only.
- A timing restriction will be observed from December 1st through March 31st on all construction, drilling, and completion operations to protect wintering wildlife.
- Noise standards of 48.6 dB(A)Leq will be achieved at established agency receptor points within the nearby Simon Canyon Recreation SDA to reduce effects to the recreating public.
- All available topsoil, along with brush, will be stockpiled for redistribution during reclamation. This will improve the success of revegetation and reduce erosion.
- Excavated materials from the cuts shall be used on the fill portions of the location.
- A diversion ditch will be constructed above the cut slope on the south side of the proposed well pad in order to drain stormwater to the west and around the pad. This will minimize erosion in the project area and improve reclamation success.
- A silt retention pond will be constructed in the well pad construction zone at Corner No. 2 (southwest corner) to reduce run-off velocity and settle sediment from storm water diverted from the cut slope.
- The development of reserve pits will comply with New Mexico Administrative Code (NMAC) 19.15.17 rules governing the siting of open pits and below-grade tanks in order to protect any nearby surface or groundwater resources.
- Cut material from the reserve and burn pits will be stockpiled on the location or used to construct the back-walls of the burn pit.
- The reserve pit will be lined with an impervious material, at least 20 mils thick in order to reduce the risk of groundwater contamination.
- All pits and holes on the proposed well pad will be fenced to exclude livestock and wildlife in order to prevent injury to animals.
- Pits that contain petroleum will be netted to exclude birds, especially any protected under the Migratory Bird Treaty Act (MBTA).
- Large permanent storage tanks will have a secondary containment structure in order to contain any accidental leaks from the tank thereby protecting surface and ground water resources.
- Fluids either stored on location or associated with the pipeline will be contained in tanks during all operations in order to reduce the risk of soil and water contamination.
- The grazing permittee must be contacted prior to construction activities.
- The existing access road from the proposed well pad west 1.1 miles will be crowned, ditched and upgraded to meet BLM “Gold Book” standards. 24” diameter corrugated metal pipe culverts will be installed in the access road as needed. The existing road will be capped with sandstone. This will reduce erosion and improve the integrity of the road.
- The proposed access road will be constructed and maintained to BLM “Gold Book” standards.
- Culverts for the proposed access road and other necessary hydrologic BMPs will be installed as necessary for proper drainage and sediment management.
- Upon interim reclamation, the reserve and blow pits will be filled utilizing existing disturbance only.
- Slopes to be reclaimed will be re-contoured to pre-construction topographical contours.
- All disturbed areas not needed for vehicle travel surfaces or aboveground production equipment will be reclaimed and seeded as described in Appendix D.
- Removed topsoil and vegetation will be placed on reclamation areas to aid in re-vegetation and erosion control. Brush may be shredded and incorporated into the redistributed topsoil.
- Aboveground equipment, specifically tanks, will be low profile to reduce visual effects.
- Above ground structures shall be painted to blend with the natural color of the landscape. Paint color will be Juniper Green as depicted on BLM’s Standard Environmental Colors Chart (BLM Publication BLM/WY/ST-08/015+8450).

Standard FFO stipulations to be included herein as design features include, but are not limited to:

- All aspects of the proposed action will be in compliance with all applicable federal and State of New Mexico regulations.
- All pits will meet State of New Mexico, Oil Conservation Division (NMOCD) pit guidelines and requirements, NMAC 19.15.17.
- Any compressors installed onsite will be limited to emissions of no more than 2 grams per horsepower-hour of nitrogen oxides (NOx) for engines of 300 horsepower or less to limit cumulative air quality effects.
- All FFO cultural resources stipulations will be followed as indicated in the Cultural Resource Records of Review, attached to the 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, project area reduction and/or specific construction avoidance zones, and employee education. All employees, contractors, and sub-contractors of the project will be informed by the project proponent that cultural sites are to be avoided by all personnel, personal vehicles, and company equipment, and 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 (16 U.S.C. 470aa-mm). In the event of a cultural resources discovery during construction, the project proponent will immediately stop all construction activities in the immediate vicinity of the discovery and immediately notify the archaeological monitor, if present, or the BLM. The BLM would then evaluate or cause the site to be evaluated. Should a discovery be evaluated as significant (e.g., National Register, NAGPRA, ARPA), it will be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM.
- If impacts to federally threatened, endangered, proposed, or candidate species; FFO Special Management Species; or migratory birds, nests, or eggs are observed during the implementation of the proposed action, the FFO will be notified, and specific mitigation measures directed at the species' needs will be implemented under the direction of the FFO.
- If an active bird nest is observed during construction, construction activities that could result in take as defined by the MBTA would halt until practicable or reasonable avoidance alternatives are identified, the birds have fledged, or a migratory bird take permit has been granted from the USFWS.
- It will be the operator's responsibility to monitor, control, and eradicate all invasive, non-native plant species within the proposed project area throughout the life of the proposed project. The operator will contact the BLM-FFO regarding acceptable weed-control methods. If the operator does not hold a current Pesticide Use Permit, a Pesticide Use Permit will be submitted prior to pesticide application. Only pesticides authorized for use on BLM lands will be used. 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.
- If significant amounts of chemicals are stored on-site, governmental agencies will be notified as required under the Emergency Planning and Community Right to Know Act (1986). The notification of releases such as natural gas, natural gas liquids, and petroleum, outside the facility site is required under the Comprehensive Environmental Response Compensation and Liability Act, 1980 (CERCLA) and under BLM NTL-3A. The well location will have an informational sign, as directed under 43 CFR 3160.
- All FFO paleontological resources stipulations will be followed as indicated in the COAs attached to the APD. All employees, contractors, and sub-contractors of the project will be informed by the project proponent that paleontological sites are to be avoided by all personnel, personal vehicles, and company equipment, and that it is illegal to collect, damage, or disturb the resource. Such activities are punishable by criminal and or administrative penalties under the provisions of the Paleontological Resources Preservation Act of 2009 (Sections 6301-6312 of the Omnibus Public Lands Act of 2009, 16 USC 470aaa).

2.2. No Action

The No Action alternative would deny the approval of the proposed application, and the current land and resource uses would continue to occur in the proposed project area. No mitigation measures would be

required. The No Action Alternative provides a baseline reference, enabling decision makers(s) to compare the magnitude of environmental effects of the alternatives.

2.3. Alternatives Considered but Eliminated from Detailed Study

Alternatives to the proposed action are developed to explore different ways to accomplish the purpose and need while responding to potentially controversial issues related to the proposed action. Alternatives to the proposed action were considered. No other reasonable alternatives to the proposed action were apparent during or after the on-site of the Howell A 3B project.

Vertical and directional drilling alternatives were investigated within the dedicated spacing unit for the well. The proposed Howell A 3B is a Blanco Mesaverde natural gas well. The proposed action is a directional well located adjacent to an existing access road. Drilling vertically to the targeted bottom hole is not preferred due to the rough topography and limited infrastructure within the canyon where the bottom hole is located. Developing a well pad and access road in the canyon would require considerable excavation and filling to create level surfaces, and therefore, greater surface disturbance than the proposed action. In addition, the access road and pipeline would be considerably longer than for the proposed action, likely longer than 1,500 feet. Other new surface locations in the vicinity were evaluated, but ruled out due to archaeological resources.

Twinning existing well locations in the area was also considered. Three co-located wells are north of the proposed well and two co-located wells are south of the proposed well. The most recent wells drilled at each of the co-locations are Fruitland Coal wells which are shallower than the other earlier drilled Mesa-verde and Dakota formation wells on those locations. Each of the coal wells have been cavitated which makes it impractical to drill a well to a deeper location in the vicinity of the cavitated wells. Drilling through the cavitated areas could damage the producing zone of the existing well and it is possible that drilling fluids and casing cement could be lost in the cavitation zone. In order to avoid impacts to the existing wells and to ensure successful completion of the proposed well, twinning or co-locating the existing wells was ruled out.

The proposed well location was chosen in order to avoid archaeological resources and existing production zones, while reducing the amount of new long term surface disturbance. No other alternatives were identified that would create less disturbance to the human environment while facilitating an appropriate location suitable to reach the targeted formation and drilling window.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the environment that would be affected by implementation of the proposed action and any alternatives described in Section 2. The No Action alternative reflects the current situation within the project area and will serve as the baseline for comparing the environmental impacts of the analyzed alternatives. Aspects of the affected environment described in this section focus on the relevant major resources or issues.

3.1. Air Resources

3.1.1. Affected Environment

The proposed well is located in San Juan County, New Mexico. Additional general information on air quality in the area is contained in Chapter 3 of the Farmington PRMP/FEIS. In addition, new information about greenhouse gases (GHGs), and their effects on national and global climate conditions has emerged since this document was prepared. On-going scientific research has identified the potential impacts of GHG emissions such as car bon dioxide (CO_2) methane (CH_4); nitrous oxide (N_2O); 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; (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 Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality, including six nationally regulated ambient air pollutants (criteria pollutants). These criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2) and lead (Pb).EPA has established National Ambient Air Quality Standards (NAAQS) for criteria air pollutants. The NAAQS are protective of human health and the environment.EPA 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. EPA has proposed or completed actions recently to implement Clean Air Act requirements for greenhouse gas emissions. Climate has the potential to influence renewable and non-renewable resource management.

Air Quality

Criteria Air Pollutants

The Air 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. EPA's Green Book web page (USEPA 2013) reports that all counties in the Farmington Field Office area are in attainment of all National Ambient Air Quality Standards (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. Total emissions of criteria pollutants from each source sector were calculated by adding together the emissions from the four counties that are located in FFO: San Juan, McKinley, Rio Arriba, and Sandoval.

"Design Concentrations" are the concentrations of air pollution at a specific monitoring site that can be compared to the NAAQS. The 2012 design concentrations of criteria pollutants are listed below in Table 2. There is no monitoring for CO and lead 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 2. 2012 Criteria Pollutant Monitored Values in San Juan County (USEPA 2014)

Pollutant	2012 Design Concentration	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[3,4]	60 µg/m^3[3,6]
$PM_{2.5}$	14 µg/m^3	24 hour	35 µg/m^3[3,3]	150 µg/m^3[3,6]
SO_2	19 ppb	1-hour	75 ppb[5]	

[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 EPA estimates that there was less than 0.01 ton per square mile of lead 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 value. The air quality index (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 (100-150), unhealthy (>150), very unhealthy and hazardous. 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% 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). 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. Number of Days classified as "unhealthy for sensitive groups" (AQI 101-150) or worse (USEPA 2013a)

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

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 (BLM 2014). The EPA 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 semiarid climate regime typified by dry windy conditions and limited rainfall. Summer maximum temperatures are generally in the range of 80 or 90 degrees Fahrenheit (°F), and winter minimum temperatures are generally in the teens to 20s. Temperatures occasionally reach above 100°F in June and July and have dipped below zero 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 4 shows climate normals for the 30-year period from 1981 to 2010 for the Farmington, New Mexico, area.

Table 4. Climate Normals for the Farmington Area, 1981-2010

Month	Average Temperature (OF (1))	Average Maximum Temperature (OF)	Average Minimum Temperature (OF)	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: BLM 2013; data collected at New Mexico State Agricultural Science Center - Farmington
(1) degrees Fahrenheit

The Air Resources Technical Report summarizes information about greenhouse gas 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.

3.1.2. Impacts from the Proposed Action

Methodology and assumptions for calculating air pollutant and greenhouse gas emissions are described in the Air Resources Technical Report (BLM 2014). This document incorporates the sections discussing the modification of calculators developed by the BLM to address emissions for one conventional gas well. The calculators give an approximation of criteria pollutant, HAP, and greenhouse gas (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 (BLM 2014).

Direct and Indirect Impacts

Criteria Air Pollutants

Table 5 shows estimated emissions from one proposed conventional gas well for criteria pollutants, volatile organic compounds (VOC), and greenhouse gasses (GHG). For comparison, Table 6 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).

Table 5. Criteria Pollutant and VOC Emissions Estimated for Construction of One Conventional Gas Well; Average 9 Days to Drill and Complete

Activity	NOx	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2	CH4	CO2
One time operations (tons)*								
Construction	1.98	0.54	0.18	0.90	0.10	0.04	0.003	215.55
Completion	0.18	0.04	0.01	0.01	0.01	-	-	19.80
Interim Reclamation	0.006	0.006	0.006	0.001	-	0.003	-	1.24
Final Reclamation	0.008	0.008	0.008	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)								
Equipment Leaks	-	-	-	-	-	-	0.013	-
Field Compression	0.14	0.29	0.10	0.01	0.01	-	-	19.30
Total	**2.44**	**0.92**	**0.31**	**0.93**	**0.13**	**0.05**	**0.02**	**268.46**

Table 6. Analysis Area Emissions in Tons/Year, 2011

County	NOX(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
Total	**70,340.5**	**127,435.2**	**53,525.0**	**219,838.9**	**25,487.6**	**7,110.0**

(1) NO_X – nitrogen oxides
(2) CO – carbon monoxide
(3) VOC – volatile organic compounds
(4) PM_{10} – 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) SO_2 – sulfur dioxide

Table 7 displays the percent increase in total emissions in the analysis area from the proposed action to construct and operate one conventional gas well.

Table 7. Percent Increase in Analysis Area Emissions from the Proposed Action

	NOX(1)	CO(2)	VOC(3)	PM_{10}(4,5)	$PM_{2.5}$(5,6)	SO_2(5,7)
Total Emissions	70,340.5	127,435.2	53,525.0	219,838.9	25,487.6	7,110.0
Conventional Gas Well Emissions	2.44	0.92	0.31	0.93	0.13	0.05

	NOX[1]	CO[2]	VOC[3]	PM_{10}[4,5]	$PM_{2.5}$[5,6]	SO_2[5,7]
Percent Increase	**.003**	**.0007**	**.0006**	**.0004**	**.0005**	**.0007**

[1] NO_X – nitrogen oxides
[2] CO – carbon monoxide
[3] VOC – volatile organic compounds
[4] PM_{10} – 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] SO_2 – 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 0.031 tons/year reported here should be considered a very gross estimate.

Total Greenhouse Gases

The available statewide GHG summary (NMED 2010) combines GHG emissions from CO_2 and CH_4. To compare the GHG emissions from the Proposed Action estimated by the calculator with statewide GHG emissions, CO_2e emissions for both CH_4 and CO_2 were summed. The total statewide GHG emission estimate for 2007 was 76,200,000 metric tons CO_2e (76.2 million metric tons; NMED 2010). The estimated CO_2e metric tons emissions from one conventional gas well (243.5 metric tons) would represent a 0.0003 percent increase in New Mexico CO_2 emissions.

Cumulative Impacts

The FFO manages Federal hydrocarbon resources in San Juan, Sandoval, Rio Arriba, and McKinley counties. There are approximately 21,150 wells in the San Juan Basin. About 18,483 of the wells in these counties are Federal wells. Analysis of cumulative impacts for reasonable development scenarios and RFDS 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 (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 (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 (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.

3.2. Groundwater Resources

3.2.1. Affected Environment

The proposed project area overlays the Uinta-Animas aquifer. The Uinta-Animas aquifer contains fresh to moderate saline water. In general, areas of the aquifer that are recharged by infiltration from precipitation or surface water sources contain relatively fresh water. Groundwater depth in the project area was researched utilizing the Office of the State Engineer's (OSE) New Mexico Water Rights Reporting System database and New Mexico Oil Conservation Division (OCD) online records for other nearby gas wells (Howell A 3, 4E, and 301; Moore B 4A; Woodriver 2, 2A, 2B, Com 300, and Com 300S). OCD records of four cathodic wells associated with nearby gas wells show ground water depth to range between 130 and 565 feet deep at 500 feet to 2,300 feet away from the proposed well site. OSE data of the seven nearest permitted water wells (1.5 miles to 1.8 miles away) shows an average depth to ground water of 12 feet. These permitted water wells are located along the San Juan River and likely do not represent groundwater depth in the action area. Water for drilling will be sourced from the Pump Wash Hole #1.

3.2.2. Impacts from the Proposed Action

Direct and Indirect Impacts

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

Hydraulic fracturing is a common process in the San Juan Basin and applied to nearly all wells drilled. The producing zone targeted by the proposed action is well below any underground sources of drinking water. No impacts to freshwater-bearing groundwater aquifers are expected to occur from hydraulic fracturing of this proposed well.

Cumulative Impacts

No cumulative impacts to usable groundwater aquifers are expected as no direct or indirect impacts are expected.

3.3. Upland Vegetation

3.3.1. Affected Environment

Vegetation within the proposed project area is comprised of a sagebrush (*Artemisia* sp.) shrub community. There are approximately 435,500 acres of sagebrush or desert scrub habitat in the BLM/FFO planning area (BLM 2003a, pg 3-31). The overall vegetative cover was approximately 70% throughout the proposed project area. The vegetative community was generally dominated by big sagebrush (*A. tridentata*), galleta (*Hilaria jamesii*), plains pricklypear (*Opuntia polyacantha*), and snakeweed (*Gutierrezia sarothrae*). See Appendix C for a detailed list of vegetation observed in the project area.

Noxious Weeds and Invasive Species

Cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola iberica*) are two weedy species present within the proposed action area. Cheatgrass is listed by the State of New Mexico as a Class C noxious weed (NMDA 2009). Class C species are widespread in the state; management decisions for these species should be determined at the local level, based on feasibility of control and level of infestation (NMDA 2009).

3.3.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Effects to vegetation would result from the removal and modification of vegetation. Construction of the proposed action would result in 3.04 acres of surface disturbance which would primarily remove previously undisturbed native vegetation. The area of native vegetation to be removed would be minimal relative to the overall area of similar habitat in the FFO planning area. With the implementation of design features, the proposal is projected to have moderate short and low long term effects on area vegetation.

Following completion of the proposed well, disturbed areas not needed for operations and vehicular traffic will be immediately re-contoured and seeded with an FFO prescribed seed mixture (approximately 1.46 acres). The re-establishment of vegetation is expected to take at least three (3) to five (5) growing seasons, depending on precipitation. Initial vegetation in interim reclaimed areas is likely to be dominated by grasses of the reclamation seed mix and ruderal forbs. Natural re-establishment of the native sagebrush shrubland may take 15 to 30 years (Bunting 1984). During the production phase of the proposed well, vehicular activity would be restricted to the existing and proposed access roads and turn-around area on the proposed well pad. The remaining long term disturbances will be reclaimed upon final project abandonment as outlined in the APD COAs and pipeline ROW grant stipulations.

Noxious Weeds and Invasive Species

Indirect effects of increased vehicle traffic in the area, especially any interstate traffic, may result in establishment of invasive/noxious weeds. Invasive/noxious plants generally out-compete native species where bare ground is created. It will be the operator's responsibility to monitor, control, and eradicate all noxious/invasive weeds within the proposed project area during the life of the project.

Cumulative Impacts

Past, present, and reasonably foreseeable actions affecting vegetation in the action area can include wildfires, prescribed fires, mechanical and chemical vegetation treatments, grazing, recreation, firewood gathering, and oil and gas development. There was no evidence of recent wildfires in the action area, and BLM GIS data of known fires does not indicate any documented wildfires or prescribed burn in the action area in recent history. There were also no signs of effects to vegetation from recreation or firewood gathering in the action area.

Effects of past, present, and reasonably foreseeable oil and gas development would be similar in type as those described for the proposed action. Analysis of cumulative effects for reasonably foreseeable development of 9,942 new oil and gas wells on public lands in the San Juan Basin was presented in the Farmington PRMP/FEIS, Chapter 4. The currently proposed action is included in the total analyzed. The reasonably foreseeable development scenario developed for the Farmington RMP demonstrated 522 wells would be drilled annually for federal minerals. Current APD permitting trends within the FFO confirm that these assumptions are still accurate.

Total surface disturbance projected by the PRMP/FEIS was 18,577 acres with 805 miles of new roads over twenty years. The Upper San Juan watershed, where the proposed action is located, contains approximately 657,318 acres with an estimated 3,853 existing oil and gas wells and 24,978 acres of existing long-term oil and gas disturbance (BLM 2003a). Based on the reasonable foreseeable development predictions in the 2003 RMP/FEIS, the projected number of wells with potential to occur in the Upper San Juan watershed is estimated to increase to 6,001 wells, an increase of 2,148 wells. With

the addition of these wells and approximately 174 miles of well roads, future long-term disturbance is estimated to increase by 5,717 acres to 30,695 acres. The proposed action, at 1.45 acres of long-term disturbance, would add to the existing and future disturbance by less than 0.005%. Proposed new long term surface disturbance would not have a noticeable incremental impact on vegetation when added to other past, present, and reasonably foreseeable oil and gas development related impacts to vegetation.

Effects of ongoing grazing on vegetation can include direct loss of vegetation, and indirect effects to vegetation resulting from disturbance and exposure of soils. Grazing in the FFO is managed to control the effects of grazing on soils through rest, rotation, and range improvement measures. The proposed action would remove vegetation, but with interim reclamation, the long term effect would be minimized. The proposed action is unlikely to induce a noticeable effect on vegetation outside of the project area as a result of increased grazing pressure resulting from the displacement of grazing in the project area. The incremental impact of the proposed action on soils when added to the impact of ongoing grazing in the action area would be minor.

Past BLM vegetation treatments in the project area include a seeding effort across 647 acres of sagebrush shrubland in 1969. More recently, Tebuthiuron (an herbicide targeted at shrubs) was applied across 598 acres of similarly located sagebrush shrubland within and adjacent to the project area in 1995. It appears that the effects of these actions have stabilized in the project area over the past 19 to 45 years. The proposed action would not have a noticeable incremental impact on vegetation when added to other past, present, and reasonably foreseeable actions.

3.4. Wildlife

3.4.1. Affected Environment

General Wildlife

The proposed action area provides habitat for resident mule deer (*Odocoileus hemionus*) and Rocky Mountain elk (*Cervus elaphus*) (USU 2004, NMDGF 2009). Local populations of deer and elk may migrate seasonally, but the project area is not known to be within a winter concentration area. Habitat utilization by deer within the project area was evidenced through observed tracks and scat. Cottontail rabbit (*Sylvilagus audubonii*) scat and a number of song birds were also observed. Based on the habitat within the proposed project area, other common mammal species most likely to occur would be deer mouse (*Peromyscus maniculatus*), black-tailed jackrabbit (*Lepus californicus*), and coyote (*Canis latrans*). No prairie dogs or evidence of burrows or colonies were observed within the proposed action areaAppendix C provides a detailed list of local flora and fauna observed in the study area.

The proposed action would be located in the BLM/FFO designated Rattlesnake Canyon Wildlife Area (BLM 2003c, p. C-171). There are a total of 110,160 acres within the boundary of this management area, of which 89,173 are public land acres (BLM) and 98,276 are federal mineral acres. . The SDA contains habitat for resident mule deer and elk, and formerly saw an influx of winter migrating ungulates. The SDA also supports a wide array of wildlife including black bear (*Ursus americanus*), mountain lion (*Felis concolor*), coyote, bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), and wild turkey (*Meleagris gallopavo*). Management prescriptions have been developed for the SDA to support increases in potential wildlife.

Migratory Birds

Executive Order 13186 dated January 17, 2001 calls for increased efforts to more fully implement the Migratory Bird treaty Act of 1918. In keeping with this mandate, the BLM/FFO has issued an interim policy to minimize unintentional take as defined by the EO 13186 and to better optimize migratory bird efforts related to BLM/FFO activities (BLM 2010). In keeping with this policy, a list of priority birds of conservation concern which occur in similar eco-regions as the proposed action area was compiled through a review of existing bird conservation plans including:

- Fish and Wildlife Service (USFWS) Birds of Conservation Concern (BCC)
- New Mexico Partners in Flight (NMPIF) New Mexico Bird Conservation Plan

- Comprehensive Wildlife Conservation Strategy for New Mexico (CWCS)
- Gray Vireo Recovery Plan
- The North American Waterbird Conservation Plan
- Recovery plans and conservation plans/strategies prepared for federally-listed candidate species.

The selected species have a known distribution in the FFO area and may be affected by various types of perturbations. These species and a brief assessment of their habitat are as follows:

Table 8. Migratory Birds with Potential to Occur in the Proposed Action Area

Species Name	Habitat Associations	Potential to Occur in the Proposed Action Area
Brewer's sparrow (*Spizella breweri*)	Closely associated with sagebrush, preferring dense stands broken up with grassy areas.	Open sagebrush-grassland in the analysis area could provide suitable habitat for the species.
Ferruginous hawk (*Buteo regalis*)	Grasslands and semi-desert shrub; occasionally piñon-juniper edge habitat.	Proposed action area contains suitable habitat for foraging, but not nesting.
Golden eagle (*Aquila chrysaetos*)	Open habitats including grasslands, sagebrush, farmlands, and tundra. Nests in cliffs or occasionally trees in rugged country.	Proposed action area contains suitable habitat for foraging, but not nesting.
Loggerhead shrike (*Lanius ludovicianus*)	Open country interspersed with improved pastures, grasslands, and hayfields. Nests in sagebrush areas, desert scrub, and woodland edges.	Open sagebrush-grassland in the analysis area could provide suitable habitat for the species.
Mountain bluebird (*Sialia currucoides*)	Open piñon-juniper woodlands, mountain meadows, and sagebrush shrublands; requires larger trees and snags for cavity nesting.	Species observed in the action area.
Mourning dove (*Zenaida macroura*)	Open country, scattered trees, and woodland edges. Feeds on ground in grasslands and agricultural fields. Roost in woodlands in the winter. Nests in trees or on ground.	Open sagebrush-grassland in the analysis area could provide suitable habitat for the species.
Sage sparrow (*Amphispiza belli*)	Large and contiguous areas of tall and dense sagebrush. Negatively associated with seral mosaics and patchy shrublands and abundance of greasewood.	Open sagebrush-grassland in the analysis area could provide suitable habitat for the species. Low shrub height mat be limiting factor.
Sage thrasher (*Oreoscoptes montanus*)	Shrub-steppe dominated by big sagebrush. Positively correlated with sagebrush cover, shrub height, horizontal patchiness, and bare ground; negatively correlated with annual grass cover.	Open sagebrush-grassland in the analysis area could provide suitable habitat for the species. Low shrub height mat be limiting factor.
Scaled quail (*Callipepla squamata*)	Brushy arroyos, cactus flats, sagebrush or mesquite plains, desert grasslands, Plains grasslands, and agricultural areas. Good breeding habitat has a diverse grass composition, with varied forbs and scattered shrubs.	Open sagebrush-grassland in the analysis area could provide suitable habitat for the species.
Swainson's hawk (*Buteo swainsoni*)	A mixture of grassland, cropland, and shrub vegetation; nests on utility poles and in isolated trees in rangeland. Nest densities higher in agricultural areas.	Open sagebrush-grassland in the analysis area could provide suitable habitat for the species.
Vesper sparrow (*Pooecetes gramineus*)	Dry montane meadows, grasslands, prairie, and sagebrush steppe with grass component; nests on ground at base of grass clumps.	Species observed in the action area.

A complete list of migratory birds observed in the project area can be found in Appendix C.

3.4.2. Impacts from the Proposed Action

Direct and Indirect Impacts

General Wildlife

Effects of oil and gas development on wildlife can result from direct habitat loss, noise, increased human activity due to greater road access, and habitat fragmentation (BLM 2003a). Some wildlife species react positively to certain oil and gas activities, some negatively, and some show no reaction at all. Species would continue to inhabit the area or conversely move out of the area, and the populations may increase or decrease depending on the available adjacent forage and habitat present.

The proposed action would have no noticeable increase in the amount of road within the action area. The proposed action would remove approximately 3.04 acres of sagebrush shrubland and understory forage in the short term. The habitat types observed are not unique to the action area and are widespread and common throughout the 657,318-acre Largo watershed.

Vehicular traffic and increased human activity in the area could have a negative effect due to disturbance and potential road kills to big game and some wildlife species, especially during construction and drilling. Light truck traffic would continue yearlong, at approximately the present level following construction and drilling. Limited research has been conducted to analyze the indirect impact of such activities on big game. Sawyer et al. (2006) examined winter habitat selection of mule deer before and during development of a natural gas field, in the sagebrush and sagebrush-grassland communities of the Pinedale Anticline Project Area of Wyoming. Results of this study recorded mule deer avoidance of otherwise suitable habitats within 1.7-2.3 miles of natural gas wells and suggested substantial indirect habitat loss from energy development. Observed shifts in deer distribution as the study progressed were toward less-preferred and presumably less suitable habitats.

Sawyer et al (2006) conducted their study in an area of extensive rolling sage brush with little topographic relief, high deer populations, and little oil and gas development. Road densities within the FFO area are approximately 10 times greater than those in the Wyoming study area, but piñon-juniper woodland cover and broken topography in the FFO area may mitigate some of the impacts of oil and gas development. While there have not yet been any published studies on the impact of oil and gas development on deer and elk populations in the FFO area, there is some data to indicate that increases in development have correlated with potential decreases in mule deer populations. In the Rosa Mesa area just southeast of Navajo Reservoir, 20 years of helicopter surveys have shown a negative correlation between numbers of gas wells and wintering fawn to doe ratios (J. Hansen, personal communication, June 2014). For the period 1994 through 2002, the average total number of deer was 362 versus 295 for the period 2003 through 2012. The average number of fawns per 100 does was 69 for the first period versus 51 for the second. The average number of wells during the first period was 151 versus 289 for the second. It has not been determined to what degree the changes in deer populations are a result of natural processes such as precipitation, forage condition, predators, disease, etc.

The project area would be re-vegetated during reclamation, but the species composition and percent cover may be different than the original vegetation. Since the vegetation removed would not necessarily be replaced with the same species, and in the same percentage, an alteration in habitat utilization could occur. Some burrowing animals may be killed or displaced, and their burrows destroyed during construction activities.

Moderate to high levels of noise would be generated in the immediate vicinity of construction, drilling, and completion activities. These effects would be temporary, lasting only the few weeks that these activities would occur. Displacement of animal species away from the well pad could occur. Noise and activity associated with construction would not affect wintering wildlife within the Rattlesnake Canyon SDA due to the winter construction closure (BLM 2003c p.C-171).

Habitat fragmentation associated with the proposed action would be limited as the proposed well location lies immediately adjacent to an existing access road and a short distance from other existing well

locations. The proposed action would add somewhat to the existing habitat fragmentation. With implementation of proposed design features, wildlife effects are anticipated to be moderate in the short term and low in the long term for the proposed action.

The rapid and permanent reestablishment of vegetation and cover will minimize direct effects to wildlife habitat. All wildlife hazards associated with construction and operation of the proposed action will be fenced, or contained in storage tanks.

Migratory Birds

The proposed action would remove approximately 3.04 acres of native mixed sagebrush shrubland habitat and understory species including bunch grass. The removal of sagebrush shrubland could decrease potential nesting habitat for birds such as the vesper sparrow that often breed in such habitats. No avifauna was observed utilizing the habitat within the proposed action area for nesting at the time of the onsite survey. The proposed project area provides potential foraging habitat for golden eagles, peregrine falcons, ferruginous hawks, prairie falcons, and bald eagles. Effects to habitat would result in an immediate, direct, and temporary loss of no more than 3.04 acres of potential raptor foraging habitat. This loss of habitat may alter population dynamics of prey species available to raptors. Raptors and other migratory birds may avoid the area during project construction and drilling activities. Effects are expected to be low and short-term.

Based on the information available from the North American Breeding Bird Survey routes, it appears that the likelihood of more than one migratory bird nest in the project area is low. No old nests or other signs of nesting from previous breeding seasons were detected during the biological surveys conducted June 11, 2014. The amount of projected habitat removal is negligible when compared to the total amount of available habitat.

Direct effects to adult birds are unlikely due to their agility and ability to avoid equipment and activities. Direct effects to nests, eggs, or young could be avoided through resource specific stipulations and design features. Indirect effects on birds in the project area are difficult to predict. Ongoing studies have shown mixed effects of oil and gas development, including compressor noise on nesting migratory birds. Frances and Ortega (2006 unpublished report to BLM) found no significant difference in nest density or nest success between sites with or without wellhead compressors. Some species, such as black-chinned hummingbird (*Archilocus alexandri*) and house finch (*Carpodacus erythrinus*), were more common on sites with compressors while others, such as mourning dove (*Zenaida macroura*) and spotted towhee (*Pipilo erythrophthalmus*), appeared to either avoid or nest further from compressors. Holmes and King (2006) found that sage sparrow had lower nest survival in an area with ongoing gas development, while Brewer's sparrow (*Spizella breweri*) had higher survival rates when compared with populations in an undeveloped control area. Short term construction activities may temporarily disrupt birds and bird nesting. Long term disturbance within the project area would be negligible and would be associated with intermittent noise from well equipment and periodic maintenance activities.

Due to the limited scope of the proposed action, the relatively small area of disturbance, and the availability of adjacent suitable habitat, the anticipated effects on migratory bird populations and species as a whole would be low in the short term and long term.

If an active nest is observed prior to or during construction, construction activities that could result in take as defined by the MBTA would be restricted until practicable or reasonable avoidance alternatives are identified, the birds have fledged, or a migratory bird take permit has been granted from the USFWS.

Cumulative Impacts

Past, present, and reasonably foreseeable actions affecting wildlife in the action area include vegetation treatments, grazing, hunting, and oil and gas development. Past vegetation treatments appear to be repopulated with sagebrush, the cover type prior to the treatment, but shrub height may be lower than previously undisturbed shrublands. Grazing and hunting in the action area are managed by the BLM and State of New Mexico respectively.

Cumulative effects to wildlife could result from impacts to individual animals, loss of habitat, and fragmentation of habitat. Cumulative habitat loss and fragmentation can also decrease habitat functionality. The proposed action is unlikely to directly impact individual animals, but the proposed action would result in a minute incremental increase in habitat loss (Section 3.3.2 - Cumulative Effects). The cumulative effects of the proposed action from fragmentation would be limited as the proposed well would be adjacent to an existing road in an area of existing development.

Cumulative effects of oil and gas development on habitat functionality can result from noise, activity, and habitat loss and fragmentation. Cumulative oil and gas effects can be assessed based on cumulative development density. Current well density within the Upper San Juan watershed is 3.8 wells per square mile with 24 acres of disturbance per square mile (BLM 2003a, Table 3-1). Well density within the Rattlesnake Canyon SDA is approximately 8.9 wells per square mile. There are currently 9 wells within the one square mile surrounding the proposed action. Disturbance within this square mile was estimated to be approximately 18.2 acres using GIS analysis of orthography. Using the impact thresholds as described in Watkins et al. (2007) one can get an estimate of the level of current impacts to mule deer from current gas field development.

- *Moderate* impacts are based on 1-4 wells and < 20 acres of disturbance per section. Impacts can be minimized or avoided through effective management practices and habitat treatments.
- *High* impacts are based on 5-16 wells and 20-80 acres disturbance per section. Impacts are increasingly difficult to mitigate and may not be completely offset by management and habitat treatments.
- *Extreme* impacts based on >16 wells or >80 acres disturbance per section. Habitat function is substantially impaired and cannot generally be recovered through management or habitat treatments.

Future development within the Upper San Juan watershed (including the proposed action) is expected to increase well density to 5.8 wells per square mile with 30 acres of disturbance per square mile (BLM 2003a). Well density will increase to 10 wells within the square mile surrounding the proposed action, with 21.2 acres of disturbance, as a result of the proposed action. The incremental effect of the proposed action would not increase the effects of well development to a higher threshold as described by Watkins et al 2007. Cumulative effects of intensive well development throughout the FFO planning area, including the project area, are analyzed further in the PRMP/FEIS (BLM 2003a). Measures, such as twinning existing locations, would help to mitigate effects of future well development on mule deer and wildlife in general.

3.5. Special Status Species

3.5.1. Affected Environment

In accordance with BLM Manual 6840, the Farmington Field Office of the Bureau of Land Management (FFO) has prepared a list of special management species to focus species management efforts toward maintaining habitats under a multiple use mandate, called FFO Special Management Species (SMS). The BLM manages certain sensitive species not federally listed as threatened or endangered in order to prevent or reduce the need to list them as threatened or endangered in the future. The authority for this policy and guidance is established by the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and Department of Interior Manual 235.1.1A. FFO SMS and BLM Sensitive Species (SS) are listed below in Table 9.

The proposed action area provides potential foraging habitat for American peregrine falcon (*Falco peregrinus anatum*), prairie falcon (*Falco mexicanus*), golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), and ferruginous hawk (*Buteo regalis*). Raptor nesting is unlikely due to a lack of prominent cliffs, other prominent rock features, or large trees in the action area. The proposed action area was visually scanned for raptors, raptor nests and whitewash. No SMS raptors or their sign were observed during the on-site field survey. According to the most recent BLM/FFO raptor nest geographic information system (GIS) data, no active raptor nests are located within 1/3 of a mile of the proposed project area. The nearest recorded raptor nest, a Golden eagle nest, is located 3 miles south of the proposed action. Two prairie dog colonies are located 3 miles from the proposed action.

Woodlands north and south of the project area may be suitable to support piñon jay (*Gymnorhinus cyanocephalus*) nesting and foraging. Spotted bat (*Euderma maculatum*) roost and forage habitat in the action area is limited, but the species is wide ranging and can occur far from roost sites and preferred foraging habitat.

Table 9, listed below, provides an evaluation of the potential for Special Management Species and Sensitive Species to occur in the proposed action area. The species' potential presence determinations are based on evaluation of the proposed action area habitat and the known habitat requirements of the listed species. None of these species were observed during the field survey of the proposed action. The proposed action area is not within the BLM/FFO designated potential habitat area for Brack's hardwall cactus (*Sclerocactus cloveriae var. brackii*) or Aztec gilia (*Aliciella formosa*).

Table 9. Special Management Species (SMS) and Sensitive Species (SS) of the BLM/FFO and their Potential to Occur in the Action Area

Species	Conservation Status		Habitat Associations	Potential to Occur in the Proposed Action Area
	BLM/ FFO	New Mexico		
Mammals				
Spotted bat (*Euderma maculatum*)	SS	NM-T	Roost in cracks and crevices within rocky cliffs, typically near open water. Show apparent seasonal change in habitat, occupying ponderosa pine woodlands in the reproductive season and lower elevations at other times of the year.	Rocky habitat in canyon in northern action area may provide suitable roost habitat; nearby water lacking.
Birds				
American peregrine falcon (*Falco peregrinus anatum*)	SMS	NM-T	Open country near lakes or rivers with rocky cliffs and canyons. Tall city bridges and buildings also inhabited.	Proposed action area contains suitable habitat for foraging, nesting unlikely.
Bald eagle (*Haliaeetus leucocephalus)*	SMS/ SS	NM-T	Near lakes, rivers and cottonwood galleries. Nests near surface water in large trees. May forage terrestrially in winter	Proposed action area does not contain suitable habitat for nesting, foraging opportunities unlikely.
Ferruginous hawk *(Buteo regalis)*	SMS		Grasslands and semi-desert shrub; occasionally piñon-juniper edge habitat. Nest on rock spires in NW New Mexico.	Proposed action area contains suitable habitat for foraging, nesting unlikely.
Golden eagle (*Aquila chrysaetos*)	SMS		In the West, mostly open habitats in mountainous, canyon terrain. Nests primarily on cliffs and trees.	Proposed action area contains suitable habitat for foraging, nesting unlikely.
Piñon jay (*Gymnorhinus cyanocephalus*)	SS		Large areas of piñon-juniper woodland. Reliant on piñon seeds.	Suitable woodland occurs north and south of the project area.
Prairie falcon *(Falco mexicanus)*	SMS		Arid, open country, grasslands or desert scrub, rangeland; nests on cliff ledges, trees, power structures.	Proposed action area contains suitable habitat for foraging, nesting unlikely.

BLM/FFO 2008, BLM/FFO 2012

3.5.2. Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed action would not result in direct effects on any SMS/SS or their nests, burrows, or roosts. Indirect effects of the proposed action would include changes in vegetation composition and a temporary increase of human intrusion into the area with associated increases in noise, dust, and vehicle traffic. Construction and drilling activities would potentially displace raptor prey base species until the completion of drilling. Nighttime drilling activities may displace foraging spotted bats. Effects to SMS/SS would be

limited due to the small area impacted relative to the range for these species and the availability of adjacent suitable habitat. Impacts to migratory birds would be limited through design features and MBTA conventions (Sections 1.4, 2.1.5, 3.5.2). The effects to SMS/SS are anticipated to be low in the short and long term.

Cumulative Impacts

Past, present, and reasonably foreseeable actions affecting predatory SMS/SS primarily include those actions that would affect prey species (primarily small mammals and large moths) and the habitat of prey species; actions such as the alteration or removal of vegetation and to a lesser extent increased human activity. Removal of habitat and increased human activity may also impact habitat suitability for piñon jay. Past, present, and reasonably foreseeable actions affecting prey species in the action area include grazing and oil and gas development.

As described above in Section 3.3.2 (Cumulative Effects), the proposed action would result in a minute incremental increase in long-term surface disturbance when added to past, present, and reasonably foreseeable future oil and gas development. The incremental effects on the SMS/SS prey base when added to ongoing livestock grazing would not be noticeable due to the limited scope of the proposed action and BLM management oversight of grazing activities in the action area. The proposed action would not have a noticeable incremental impact on SMS or SS when added to other past, present, and reasonably foreseeable actions.

3.6. Cultural Resources

3.6.1. Affected Environment

The proposed action is located within the archaeologically rich San Juan Basin of northwest New Mexico. In general, the history 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 (aka Anasazi; A.D. 1-1540), and the historic (A.D. 1540 to present), which includes Native American as well as later Hispanic and Euro-American settlers. Detailed descriptions of these various periods are provided in the Bureau of Land Management Farmington Field Office Final Environmental Impact Statement (2003) and will not be reiterated here. Additional information can also be found in an associated documented, Cultural Resources Technical Report (SAIC 2002).

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

The entire Area of Potential Effect (APE) for the proposed action was archaeologically surveyed by La Plata Archaeological Consultants (LAC) at a BLM Class III level (100%) and a report was prepared and submitted to the BLM in accordance with the Procedures for Performing Cultural Resources Fieldwork on Public Lands in the Area of New Mexico BLM Responsibilities (BLM 2005).

The Class III inventory identified no cultural sites within the APE (LAC Report 2014-7g, BLM Report 2014(III)069F).

3.6.2. Impacts from the Proposed Action

Direct and Indirect Impacts

There are no cultural sites within the APE. The proposed action will have no direct or indirect impacts on cultural sites.

Cumulative Impacts

There will be no negative cumulative impact on cultural resources as no cultural sites are present. A positive cumulative effect is the additional scientific information yielded by the archaeological survey.

4. SUPPORTING INFORMATION

4.1. List of Preparers

Table 10. Summary of Document Preparers

ID Team Member	Title	Organization
Steven Willems	Resource Protection Specialist	BLM
Jim Copeland	Archaeologist	BLM
Stanley Dykes	Natural Resource Specialist	BLM
John Hansen	Wildlife Biologist	BLM
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Amanda Nisula	Planning & Environmental Specialist	BLM
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Dale Wirth	Branch Chief	BLM
Sam Jaquez	Survey/Field Foreman	Jaquez Consulting, representing Burlington
Nathan Kirker	Biologist	SME

4.2. References

Armstrong, D. M., R. A. Adams, and J. Freeman. 1994. Distribution and ecology of bats of Colorado. Natural History Inventory of Colorado, No. 15. University of Colorado Museum, Boulder, Colorado.

Belnap, J., 1993, Recovery rates of cryptobiotic crusts: Inoculant use and assessment methods: Great Basin Naturalist, v. 53, p. 89-95.

Belnap, J., et al., 2001, Biological Soil Crusts: Ecology and Management, Technical Reference 1730-2, prepared for the U.S. Department of the Interior, Bureau of Land Management, National Science and Technology Center, Denver, Colo.

BISON (Biota Information System of New Mexico). Inter-net accessed October 2008.

Brugge, David M. 1993. *An Investigation of AIRFA Concerns Relating to the Fruitland Coal Gas Development Area*. Office of Contract Archaeology, University of New Mexico. Ms. on file, Bureau of Land Management, Farmington, New Mexico.

Bunting, S. C. 1984. Fires in sagebrush-grass ecosystems: successional changes. Pages 7-11 in K. Sanders and J.Durham, editors, Rangeland fire effects: a symposium. USDI Bureau of Land Management, Boise, ID.

Degenhardt, G. W., Painter, W. C., Price, A. H. 1996. Amphibian and Reptiles of New Mexico, 1st addition., University of New Mexico Press. USA

DeGraaf, R. M., V. E. Scott, R. H. Hamre, L. Ernst, and S. H. Anderson. 1991. Forest and Rangeland Birds of the United States, Natural History and Habitat Use. Agriculture Handbook 688.

Dunn, J. and Alderfer, J. 2006. National Geographic Field Guide to the Birds of North America. Washington, DC.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The birder's handbook. Simon & Schuster Inc., New York, NY.

Erdman, J.A., 1970. Pinyon–juniper succession after natural fires on residual soils of Mesa Verde, Colorado. Brigham Young University Science Bulletin Biological Series, Vol. 11, No. 2.

Fleischner, T.L., 1994, "Ecological Costs of Livestock Grazing in Western North America," Conservation Biology 8(3):629–644.

Gelbard, J.L., and J. Belnap, 2003, "Roads as Conduits for Exotic Plant Invasions in a Semiarid Landscape," Conservation Biology 17(2):420–432.

Grubb, T.G., and C.E. Kennedy. 1982. *Bald Eagle Winter Habitat on Southwestern National Forests*. General Technical Report RM-237. U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.

Ivey, R. D. 2003. Flowering Plants of New Mexico. RD & Ivey, Publishers Albuquerque, New Mexico.

Johnsgard, P. A. 1986. Birds of the Rocky Mountains. Colorado Associated Press. Boulder, Colorado.

Kaufmann, K. 1996. Lives of North American Birds. Sponsored by the Troy Peterson Institute. Houghton Mifflin Company. Boston and New York.

Kelly, Klara, Rena Martin, Richard Begay, Ted Neff, and Clifford Werito. 2006. *"We Will Help You With What We Know": Diné Traditional Cultural Places in Dinétah*. Museum of Northern Arizona Environmental Solutions, Inc., Flagstaff. Manuscript on file at Bureau of Land Management, Farmington, New Mexico.

Kochert, M. N., K. Steenhoff, C. L. McIntyre, and E. H. Craig. 2003. Golden Eagle (*Aquila chrysaetos*). *In* The Birds of North America, No. 684 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Monsen, S.B., et al., compilers, 2004, Restoring Western Ranges and Wildlands, Rocky Mountain Research Station, U.S. Forest Service, General Technical Report RMRS-GTR-136, Fort Collins, Colo., Sept.

New Mexico Department of Agriculture (NMDA). 2009. New Mexico Noxious Weed List, update April 2009. Available at http://www.nmda.nmsu.edu/media-releases.

New Mexico Department of Game and Fish (NMDGF). 2009. Elk range geospatial data of New Mexico. NMDGF Elk Program. Santa Fe, New Mexico

New Mexico Natural Heritage Program. 2004. http://nmnhp.unm.edu.

New Mexico Rare Plant Technical Council. 1999. http://nmrareplants.unm.edu.

Page, L.M. and B.M. Burr. 1991. A field guide to freshwater fishes. Houghton Mifflin Company, Boston, MA

Parker, Patricia L. and Thomas F. King. 1998. Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Park Service, *National Register Bulletin 38.* Washington.

Sawyer, H., R. Nielson, F. Lindzey, and L. McDonald. 2006. Winter Habitat Selection of Mule Deer Before and During Development of a Natural Gas Field. Journal of Wildlife Management 70:396-403.

Science Applications International Corporation (SAIC). 2002. Cultural Resources Technical Report; Background Information on Cultural Resources for the Farmington Draft RMP/EIS. Unpublished report available from the BLM Farmington Field Office. Farmington, New Mexico.

Sibley, D. A. 2000. National Audubon Society. The Sibley Guide to Birds. Alfred A. Knopf. New York, New York.

Stebbins, R. C. 2003. Peterson Field Guides. Western Reptiles and Amphibians, Third Edition. Houghton Mifflin Company. Boston. New York.

Terres, J.K. 1980. *The Audubon Society Encyclopedia of North American Birds*. Alfred A. Knopf, Inc. New York, New York. 1,109 pp.

U.S. Department of Agriculture, Soil Conservation Service (SCS). 1980. Soil Survey of San Juan County New Mexico (Eastern Part). Natural Resources Conservation Service

U.S. Department of Agriculture (USDA). 2007. Natural Resource Conservation Service Web Soil Survey. Available at http://websoilsurvey.nrcs.usda.gov/app/.

U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS). 2011. The PLANTS Database (http://plants.usda.gov, 16 March 2011). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA). 2009. FEMA Map Service Center. Available at http://www.fema.gov/hazard/flood/fl_before.shtm.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2001 Oil and Gas Resource Development for San Juan Basin, New Mexico: A 20-year, Reasonable Foreseeable Development (RFD) Scenario Supporting the Resource Management Plan FFO/BLM, Engler, July 2, 2001. See: http://www.blm.gov/pgdata/etc/medialib/blm/nm/field_offices/farmington/farmington_planning/ffo_rmp_docs.Par.59812.File.dat/RFD.pdf

U.S. Department of the Interior, Bureau of Land Management (BLM). 2002. *Biological Assessment: Impacts to Threatened and Endangered Species Related to the Resource Management Plan, BLM Farmington Field Office.* Farmington, New Mexico

U.S. Department of the Interior, Bureau of Land Management (BLM). 2003a. *Farmington Proposed Resource Management Plan and Final Environmental Impact Statement*. Farmington, New Mexico.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2003b. *Record of Decision; Farmington Proposed Resource Management Plan and Final Environmental Impact Statement*. Farmington, New Mexico.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2003c. *Farmington Resource Management Plan with Record of Decision*. Farmington, New Mexico.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2007. Farmington Field Office raptor data GIS layers. Unpublished data. Farmington, NM.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2008a. Special status species management policy 2008 update. Instruction Memorandum No. IM-NM-200-2008-001. Farmington Field Office, Farmington, NM.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2008b. *EA Guidance for Cultural Resources, Cultural ACECs, & Native American Religious Concerns.* Manuscript on file at Bureau of Land Management, Farmington, New Mexico.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2008c. Farmington Field Office Grazing Schedule. Unpublished data. Farmington, NM.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2010. Migratory Bird Treaty Act – BLM/FFO Interim Management Policy. Instruction Memorandum No. NM-F00-2010-001. Farmington Field Office, Farmington, NM.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2012. Farmington Field Office List of BLM Sensitive Species. Unpublished data. Farmington, NM.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2013. Farmington Field Office Bare Soil Reclamation Procedures. Available at :http://www.blm.gov/pgdata/etc/medialib/blm/nm/field_offices/farmington/farmington_planning/surface_use_plan_of.Par.69026.File.dat/FFO%20Bare%20Soil%20Reclamation%20Procedures%202-1-13.pdf. Accessed February 2013.

U.S. Department of the Interior, Bureau of Land Management (BLM). 2014. Air Resources Technical Report for Oil and Gas Development. Santa Fe: U.S. Department of Interior Bureau of Land Management.

U.S. Environmental Protection Agency (EPA). 2004. Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reserves. Office of Ground Water and Drinking Water (4606M).EPA 816-R-04-003.

U.S. Environmental Protection Agency (EPA). 2012. 2005 National-Scale Air Toxics Assessment. Retrieved February 27, 2014, from U.S. Environmental Protection Agency: http://www.epa.gov/ttn/atw/nata2005/

U.S. Environmental Protection Agency (EPA). 2013. The Green Book Nonattainment Areas for Criteria Pollutants. Retrieved February 25, 2014, from U.S. Environmental Protection Agency: http://www.epa.gov/airquality/greenbook/

U.S. Environmental Protection Agency (EPA). 2013a. Air Quality Index Report. Retrieved March 12, 2014, from U.S. Environmental Protection Agency: http://www.epa.gov/airdata/ad_rep_aqi.html

U.S. Environmental Protection Agency (EPA). 2014. Air Trends: Design Values. Retrieved February 25, 2014, from U.S. Environmental Protection Agency: http://www.epa.gov/airtrends/values.html

U.S. Environmental Protection Agency (EPA). 2014. The 2011 National Emissions Inventory. Retrieved February 27, 2014, from U.S. Environmental Protection Agency: http://www.epa.gov/ttn/chief/net/2011inventory.html

U.S. Fish and Wildlife Service (USFWS). 1985. Knowlton cactus (*Pediocactus knowltonii*) recovery plan. Albuquerque, New Mexico. 53 pp.

U.S. Fish and Wildlife Service (USFWS). 1995. Recovery plan for the Mexican spotted owl. Volume I. Albuquerque, NM.

U.S. Fish and Wildlife Service (USFWS). 1997a. Draft razorback sucker *Xyrauchen texanus* recovery plan. Denver, Colorado.

U.S. Fish and Wildlife Service (USFWS). 1998. Black-footed ferret (*Mustela nigripes*) fact sheet. Available at http://endangered.fws.gov/i/A07.html.

U.S. Fish and Wildlife Service (USFWS). 2002. Southwestern Willow Flycatcher Recovery Plan. Albuquerque, New Mexico. i-ix, 210 pp. Appendices A-O.

U.S. Fish and Wildlife Service (USFWS). 2004. Environmental assessment for designation of critical habitat for the Mexican spotted owl. Albuquerque, New Mexico. 67 pp.

U.S. Fish and Wildlife Service (USFWS). 2011. Southwest Region Ecological Services. Endangered Species List. Available at http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm.

United States Geographical Survey (USGS). 2007. National Cooperative Geologic Mapping Program. Available at http://ncgmp.usgs.gov/ncgmpproducts/.

Utah State University (USU), Mule Deer Mapping Project. 2004. Mule Deer Habitat of North America (geospatial data). RS/GIS Laboratory, USU. Logan, Utah

Valkenburgh, Richard F. Van. 1941. *Diné Bikeyah*. Department of the Interior, Office of Indian Affairs, Navajo Services, Window Rock. Ms. on file, Bureau of Land Management, Farmington, New Mexico.

Van Valkenburgh, Richard F. 1974. *Navajo Sacred Places* and *A Short History of the Navajo People.* Garland American Indian Ethnohistory Series, Navajo Indians, 3 Vols. Garland Publishing Inc., New York and London.

Watkins, B.E., C.J. Bishop, A. Bronson, B. Hale, B.F. Wakeling, L.H. Carpenter, and D. W. Lutz. 2007. Habitat Guidelines for Mule Deer – Colorado Plateau Shrubland and Forest Ecoregion. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies.

Wheeler, B.K. 2003. Raptors of Western North America. Princeton University Press, Princeton, NJ.

APPENDIX A. SURVEY PLATS

APPENDIX B. LAWS AND REGULATIONS THAT GOVERN FEDERAL OIL AND GAS DEVELOPMENT

Table B1. Laws and Regulations that Govern Federal Oil and Gas Development

LAW/REGULATION	RESOURCE PROTECTED	AUTHORITY
Clean Air Act (CAA)	Air Quality, Air Emissions and Permits.	New Mexico Environment Department (NMED)
Clean Water Act (CWA) 1977, as amended. Section 404 Permits.	Surface waters of the U.S., crossing/diversion of ephemeral washes	U.S. Army Corps of Engineers
Federal Water Pollution Control Act and Section 404 of the CWA.	Discharges into surface waters from point sources	New Mexico Water Quality Control Commission (NMWQCC)
Storm Water Pollution Prevention Plan (SWPPP), Section 402 of the CWA	Construction projects disturbing greater than 5 acres. Minimize erosion	USEPA
Safe Drinking Water Act 1974, as amended.	Surface and ground water	U.S. Environmental Protection Agency (USEPA)
Colorado River Salinity Control Act 1974, amendment of 1984: Public Law 93-320	Mandated Control of Salinity Runoff into the Colorado River Basin	BLM
Federal Land Management and Policy Act (FLPMA) of 1976.	BLM unique areas, ACECs. Issuing of energy related ROWS. Wilderness Areas	BLM
Surface Mining Control and Reclamation Act (SMCRA) of 1977.	Prime and Unique Farm Lands.	Natural Resource Conservation Service (NRCS)
Executive Order 11988 as amended.	Floodplains	All Agencies
Executive Order 11990.	Wetlands/Riparian Zones	All Agencies
Wild and Scenic Rivers Act of 1968 as amended.	Wild and Scenic Rivers	All Agencies
National Historic Preservation Act of 1966 as amended. Antiquities Act of 1906.	Cultural resources	All Agencies
American Indian Religious Freedom Act 1978. Native American Graves Protection and Repatriation Act (NAGPRA) 1990.	Native American Religious Concerns	All Agencies
Endangered Species Act (ESA) 1973 as amended. (Section 7)	Threatened and Endangered plant and animal species	U. S. Fish and Wildlife Service (U.S. FWS)
Bald and Golden Eagle Protection Act	Protection of Eagles	
Migratory Bird Treaty Act	Protection to Migratory Birds, Nests and Eggs.	U.S. FWS
National and New Mexico BLM Instruction Memoranda	BLM and New Mexico State Sensitive Species and Habitat.	BLM
Resource Conservation and Recovery Act (RCRA) of 1976	Use of Hazardous Materials	USEPA
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 660 as amended.	Use and Disposal of listed Hazardous Materials.	USEPA

LAW/REGULATION	RESOURCE PROTECTED	AUTHORITY
Executive Order #22898, February 1994.	Environmental Justice for environmental and health conditions in minority and low-income communities.	All Agencies
Federal Noxious Weed Act 1974, as amended and Executive Order 13112.	Designated Certain Plants as Noxious Weeds.	All Agencies
New Mexico Noxious Weed List	Noxious weeds for the State of New Mexico.	New Mexico Department of Agriculture.
Mineral Leasing Act (MLA) 1929, as amended. Associated Onshore Orders; National, State and Local.	Issue and managed federal oil and gas leases and related transportation pipelines.	BLM

APPENDIX C. PLANTS AND WILDLIFE OBSERVED IN THE PROJECT AREA

Table C1. Plant Species

Scientific Name	Common Name
Graminoid	
Agropyron cristatum	Crested wheatgrass
Bromus tectorum	Cheatgrass
Pleuraphis jamesii	Galleta
Sporobolus cryptandrus	Sand dropseed
Forbs	
Gutierrezia sarothrae	Broom snakeweed
Lappula occidentalis	Western sticktight
Lomatium parryi	Biscuitroot
Phlox longifolia	Longleaved phlox
Plantago patagonica	Woolly plantain
Salsola tragus	Russian thistle
Shrubs	
Artemesia tridentata	Big sagebrush
Cylindropuntia whipplei	Whipple cholla
Echinocereus triglochidiatus	Claret cup cactus
Opuntia polyacantha	Plains prickly pear

Table C2. Wildlife Species

Scientific Name	Common Name
Mammals	
Odocoileus hemionus	Mule deer
Sylvilagus audubonii	Desert cottontail
Birds	
Aphelocoma californica	Western scrub jay
Cathartes aura	Turkey vulture
Chondestes grammacus	Lark sparrow
Pooecetes gramineus	vesper sparrow
Sialia currucoides	Mountain bluebird
Sturnella neglecta	Western meadowlark
Falco sparverius	American kestrel

APPENDIX D. REVEGETATION PLAN

D.1. Site Description

The proposed project is located in an open shrubland dominated by sagebrush (*Artemesia tridentata*). Previous disturbances include an existing gas well access road, cattle grazing, and past vegetation treatments to decrease shrub cover and increase grass cover. SME did not identify any New Mexico Department of Agriculture listed Class A or Class B noxious weed species within the project area. See Appendix C of the Howell A 3B EA for a list of vegetation observed in the project area. The following photos of the project area were taken by an SME Environmental, Inc. (SME) biologist on June 11, 2014 prior to project implementation:

Figure D1. Well head facing west towards the working side of the proposed well pad. Note shrub cover.

Figure D2. Well head facing north towards the rear of the well pad and the existing access road (note trucks).

Figure D3. Well head facing east towards the pit side of the proposed well pad.

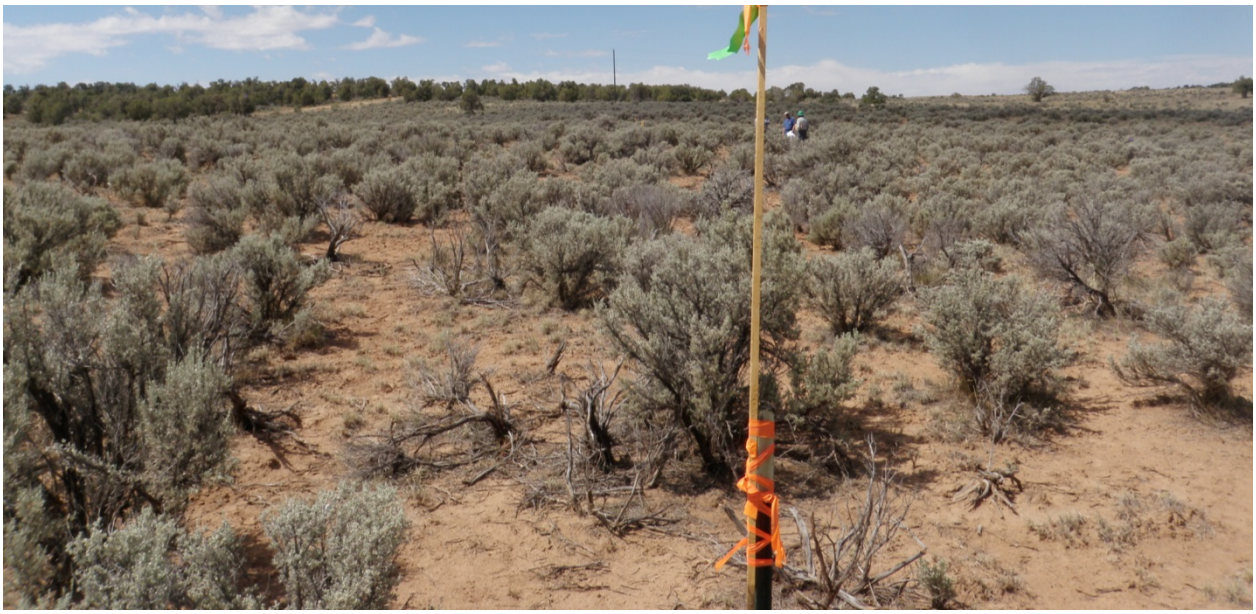

Figure D4. Well head facing south towards the front side of the pad (laydown).

D.1.1. Vegetation Community

A SME biologist, in coordination with BLM and the project proponent, determined the vegetation community within the proposed project area is best described by the **Sagebrush Community** based on observations made during the survey on June 11, 2014.

The sagebrush/grass vegetation community comprises approximately 551,198 acres (approximately 39%) of the Farmington Field Office (FFO) Area. This community is comprised primarily of Wyoming big sage with lesser amounts of basin big sage and minor areas of black sage. This plant community occupies vast areas of relatively open rolling hills to the south of Farmington and numerous mesas and canyon bottoms to the east and north. It is found on all aspects from about 5,000 to 7,200 feet but is most common on southerly and western aspects. Soils vary from clayey to fine sandy loam to loamy in texture with loamy sites being more pervasive. In general, the soils underlying this plant community are moderately deep (20 to 54 inches thick) and well drained. Typical soil series in the FFO area where the sagebrush/grass plant community is found include Penistaja, Buckle, Doak, Blancot and Orlie. The precipitation regime varies from 7 to 14 inches (BLM 2013a).

D.2. Reclamation

D.2.1. Seed Mix

The following seed mix (Table D1) was chosen from the BLM's "seed menu" for the Sagebrush Community (BLM 2013a) during the June 11, 2014 onsite. The seed mix will be that used to re-vegetate the areas not needed for production/operation of the proposed action.

Table D1. Selected Seed Mix and Minimum Application Rate for the Reclamation of the Howell A 3B.

Common Name	Scientific Names	Variety	Season	Form	PLS lbs/acre*
Shrubs					
Fourwing saltbush	*Atriplex canescens*	VNS	Cool	Shrub	2.0
Winterfat	*Krascheninniko via lanata*	VNS	Cool	Shrub	2.0

Grasses					
Indian ricegrass	*Achnatherum hymenoides*	Paloma or Rimrock	Cool	Bunch	4.0
Galleta	*Pleuraphis jamesii*	Viva florets	Warm	Bunch/Sod-forming	3.0
Sand dropseed	*Sporobolus cryptandrus*	VNS	Warm	Bunch	0.5
Siberian wheatgrass	*Agropyron fragile*	Vavilov	Cool	Bunch	3.0
Forbs					
Rocky Mtn. bee plant	*Cleome serrulata*	Local collection or VNS	Cool	Forb	0.25
Blue flax	*Linum lewisii*	Apar	Cool	Forb	0.25
*Based on 60 pure live seeds (PLS) per square foot, drill seeded. Double this rate (120 PLS per square foot) if broadcast or hydro-seeded.					

D.2.2. Reclamation Techniques

No unique soil reclamation techniques, such as the use of soil amendments or sterile cover crops, are planned for the reclamation of the proposed Howell A 3B. See Section 2.1.5 *Design Features* of the Howell A 3B EA for standard reclamation techniques (stockpiling topsoil, mulching, etc.) to be used in the proposed project area. Re-contouring of slopes and ripping of compacted earth should occur prior to replacing topsoil. Replaced topsoil should be raked or harrowed to promote a firm seedbed. Drill seeding should occur perpendicular to the slope to reduce erosion. Seeds should be planted to a depth suitable for the specific species being planted; seeds should not be set too deep. As a compromise, seed mixes with differing planting depths could all be planted at the depth for the shallowest species. Seeding should occur at a time appropriate to the species planted, prior to the growing season of the species. As a compromise, seeds mixes with differing growing seasons could be planted in the late fall or early winter (prior to the ground freezing) provided there is adequate winter moisture.

D.2.3. Challenges

Challenges to successful reclamation may include grazing, rapid run-off, low precipitation, and clayey soils. The proposed action is located within the FFO Pump Mesa Grazing Allotment No. 5055. The grazing authorization for the allotment permits the grazing of up to 300 head of cattle across 28,767 public acres for a period from November 15 through June 10 annually.

D.3. Monitoring and Reporting Requirements

Monitoring and reporting on the success of reclamation efforts will be completed according to FFO Bare Soil Reclamation **Procedure B** as outlined in the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013b). Requirements include:

- Establish monitoring sites after seeding is completed.
- Conduct annual monitoring starting two calendar years after seeding is completed.
- Evaluate monitoring reports.
- Compile and present documentation that percent vegetation cover standards have been attained.
- Request concurrence from the FFO that percent vegetation cover standards have been attained.
- FFO will provide concurrence (or not) that percent vegetation cover standards have been attained.
- Develop remedy plans to correct impacts to revegetation that may prevent the revegetated area from attaining per cent vegetation cover standards.
- Conduct long term monitoring after percent vegetation cover standards have been attained.

D.4. Standards

Requirements for determining if reclamation is successfully completed in the Sagebrush vegetation community are outlined in Table D2. The percent cover standards listed in Table D2 must be attained prior to FFO approval of reclamation, or an exception must be granted from FFO.

Table D2. Reclamation Goal for Foliar Cover for the Howell A 3B.

Functional Group	Percent (%) Foliar Cover	Common Species
Trees/Shrubs/Grasses/Forbs	>35	Utah Juniper-Pinyon pine; big sagebrush, four-wing saltbush, antelope bitterbrush, alkali sacaton, Western wheatgrass, Indian ricegrass, galleta, sand dropseed, scarlet globemallow, wooly Indianwheat , fleabane, Penstemon spp., buckwheat, threadleaf groundsel.
Invasive/undesirables **10% allowed toward meeting standard of 35%.**	≤10	Plants that have the potential to become a dominant species on a site where its presence is a detriment to revegetation efforts or the native plant community. Examples of invasive species include cheatgrass, Russian thistle, kochia.

D.5. Final Abandonment and Relinquishment

Monitoring requirements remain in effect as long as the permit, grant, or authorization remains in force, and until all associated facilities or infrastructure is abandoned by established BLM procedure and a final abandonment notice (FAN) or relinquishment is issued by the FFO. Until such time, the project proponent will follow the Vegetation Reclamation **Procedure B** as detailed in the *Farmington Field Office Bare Soil Reclamation Procedures* (BLM 2013b). The percent cover standards listed in Table D2 must be attained prior to FFO approval of final abandonment/relinquishment, or an exception must be granted from FFO.

D.6. References

BLM. 2013a. Updated Reclamation Goals. Available at: http://www.blm.gov/nm/st/en/fo/Farmington_Field_Office/ffo_planning/surface_use_plan_of/updated_reclamation.html. Accessed February 2013.

BLM.2013b. *Farmington Field Office Bare Soil Reclamation Procedures*. Available at :http://www.blm.gov/pgdata/etc/medialib/blm/nm/field_offices/farmington/farmington_planning/surface_use_plan_of.Par.69026.File.dat/FFO%20Bare%20Soil%20Reclamation%20Procedures%202-1-13.pdf. Accessed February 2013.