ORIGINAL

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
Great Plains Regional Office
115 Fourth Avenue S.E.
Aberdeen, South Dakota 57401

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
DESCRM
MC-208

JAN 2 0 2010

MEMORANDUM

TO: Superintendent, Fort Berthold Agency

FROM: ACTING Regional Director, Great Plains Region

SUBJECT: Environmental Assessment and Finding of No Significant Impact

In compliance with the regulations of the National Environmental Policy Act (NEPA) of 1969, as amended, for the proposed nine Exploratory Oil Wells; Mandaree 02-09H, Mandaree 04-15H, Mandaree 05-16H, Mandaree 06-20H, Mandaree 12-07H, Bear Den 08-21H, Clarks Creek 01-21H, Clarks Creek 03-08H, Riverview 01-32H by EOG Resources, Inc. on the Fort Berthold Reservation, an Environmental Assessment (EA) has been completed and a Finding of No Significant Impact (FONSI) has been issued.

All the necessary requirements of the National Environmental Policy Act have been completed. Attached for your files is a copy of the EA, FONSI and Notice of Availability. The Council on Environmental Quality (CEQ) regulations requires that there be a public notice of availability of the FONSI (1506.6(b)). Please post the attached notice of availability at the agency and tribal buildings for 30 days.

If you have any questions, please call Marilyn Bercier, Regional Environmental Scientist, Division of Environment, Safety and Cultural Resources Management, at (605) 226-7656.

Attachment

cc: Marcus Levings, Chairman, Three Affiliated Tribes (with attachment)
Perry "No Tears" Brady, THPO (with attachment)
Roy Swalling, Bureau of Land Management (with attachment)
Jonathon Shelman, Corps of Engineers (with attachment)

Finding of No Significant Impact

ORIGINAL

EOG Resources, Inc.

Proposed Nine Exploratory Oil Wells:
Mandaree 02-09H
Mandaree 04-15H
Mandaree 05-16H
Mandaree 06-20H
Mandaree 12-07H
Bear Den 08-21H
Clarks Creek 01-21H
Clarks Creek 03-08H
Riverview 01-32H

Fort Berthold Indian Reservation
McKenzie County, North Dakota

The U.S. Bureau of Indian Affairs (BIA) has received a proposal for nine oil/gas wells, access roads and related infrastructure on the Fort Berthold Indian Reservation (Reservation) located in the Section 9, Township (T) 149 North (N), Range (R) 94 West (W), Section 15, T149N, R94W, Section 16, T149N, R94W, Section 20, T149N, R94W, Section 7, T149N, R94W, Section 21, T150N, R94W, Section 21, T151N, R94W, Section 8, T151N, R94W and Section 32, T152N, R94W. Associated federal actions by BIA include determinations of effect regarding cultural resources, approvals of leases, rights-of-way and easements, and a positive recommendation to the Bureau of Land Management regarding the Applications for Permit to Drill.

Potential of the proposed actions to impact the human environment is analyzed in the attached Environmental Assessment (EA), as required by the National Environmental Policy Act. Based on the recently completed EA, I have determined that the proposed projects will not significantly affect the quality of the human environment. No Environmental Impact Statement is required for any portion of the proposed activities.

This determination is based on the following factors:

1. Agency and public involvement was solicited and environmental issues related to the proposal were identified.

2. Protective and prudent measures were designed to minimize impacts to air, water, soil, vegetation, wetlands, wildlife, public safety, water resources, and cultural resources. The remaining potential for impacts was disclosed for both the proposed action and the No Action alternative.

3. Guidance from the U.S. Fish and Wildlife Service has been fully considered regarding wildlife impacts, particularly in regard to threatened or endangered species.

4. The proposed actions are designed to avoid adverse effects to historic, archaeological, cultural and traditional properties, sites and practices. Compliance with the procedures of the National Historic Preservation Act is complete.

5. Environmental justice was fully considered.

6. Cumulative effects to the environment are either mitigated or minimal.

7. No regulatory requirements have been waived or require compensatory mitigation measures.

8. The proposed projects will improve the socio-economic condition of the affected Indian community.

Regional Director

1/20/10
Date

Notice of Availability and Appeal Rights

EOG Resources, Inc.: Nine Exploratory Oil Wells:
Mandaree 02-09H
Mandaree 04-15H
Mandaree 05-16H
Mandaree 06-20H
Mandaree 12-07H
Bear Den 08-21H
Clarks Creek 01-21H
Clarks Creek 03-08H
Riverview 01-32H

The Bureau of Indian Affairs (BIA) is planning to issue administrative approvals related to nine proposed oil and gas wells as shown on the attached map. Construction by EOG Resources, Inc. is expected to begin in 2010.

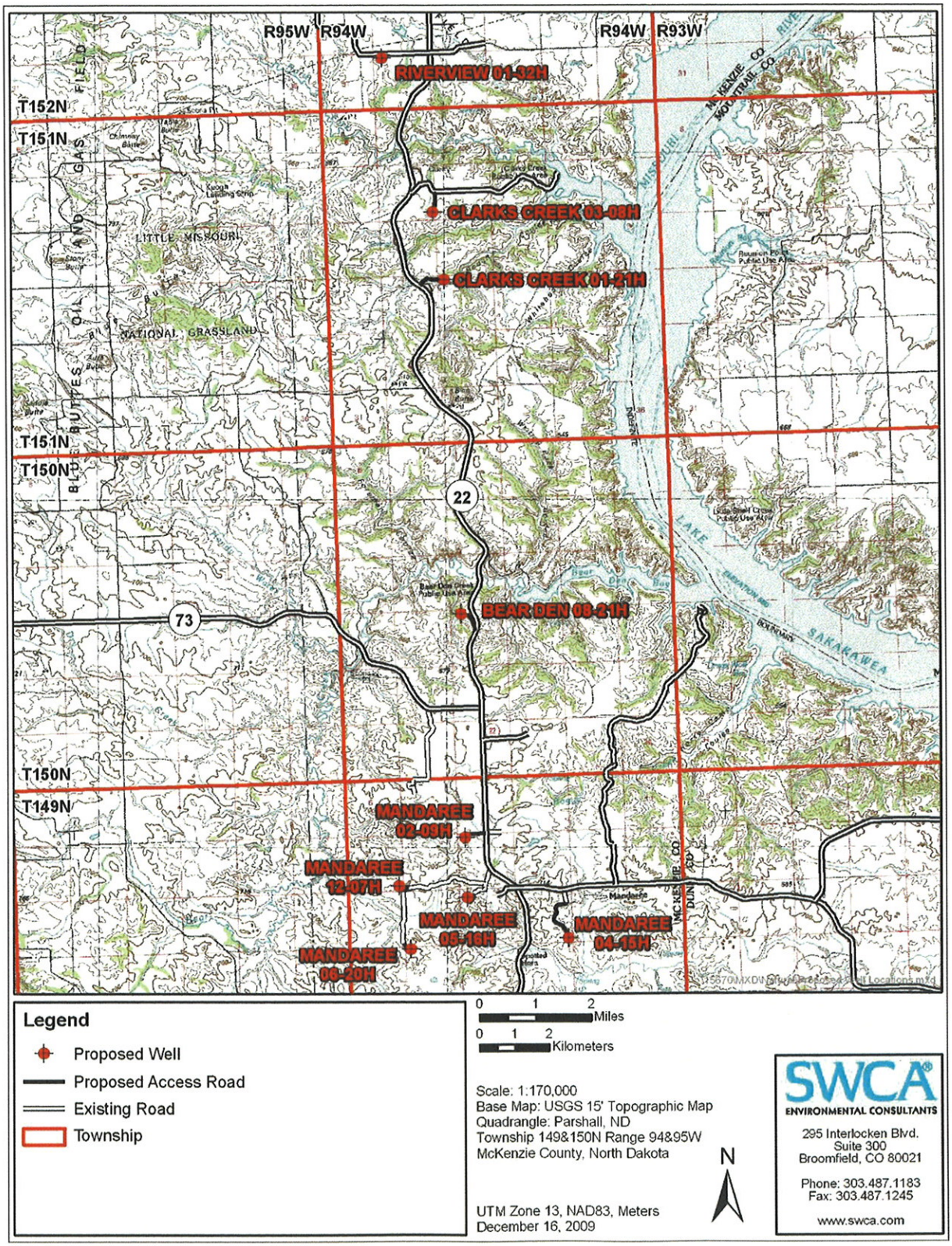
An environmental assessment (EA) determined that proposed activities will not cause significant impacts to the human environment. An environmental impact statement is not required. Contact Howard Bemer, Superintendent at 701-627-4707 for more information and/or copies of the EA and the Finding of No Significant Impact (FONSI).

The FONSI is only a finding on environmental impacts – it is not a decision to proceed with an action and *cannot* be appealed. BIA's decision to proceed with administrative actions *can* be appealed until February 20, 2010, by contacting:

United States Department of the Interior
Office of Hearings and Appeals
Interior Board of Indian Appeals
801 N. Quincy Street, Suite 300, Arlington, Va 22203.

Procedural details are available from the BIA Fort Berthold Agency at 701-627-4707

Project location



ENVIRONMENTAL ASSESSMENT

United States Department of Interior
Bureau of Indian Affairs

Great Plains Regional Office
Aberdeen, South Dakota

Cooperating Agency:

Bureau of Land Management

North Dakota State Office
Dickinson, North Dakota

EOG Resources, Inc.

Nine Exploratory Oil Wells:

Mandaree 02-09H
Mandaree 04-15H
Mandaree 05-16H
Mandaree 06-20H
Mandaree 12-07H
Bear Den 08-21H
Clarks Creek 01-21H
Clarks Creek 03-08H
Riverview 01-32H

Fort Berthold Indian Reservation

January 2010

For information contact:
Bureau of Indian Affairs, Great Plains Regional Office
Division of Environment, Safety and Cultural Resources Management
115 4th Avenue SE, Aberdeen, South Dakota 57401 (605) 226-7656

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1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

EOG Resources, Inc. (EOG) has proposed to drill and complete nine exploratory wells to explore and potentially develop productive subsurface formations underlying oil and gas leases owned by EOG within the Fort Berthold Indian Reservation (Reservation). If successful, EOG would install production facilities at each location and transport commercial quantities of oil to nearby markets. Developments have been proposed on lands held in trust by the United States in McKenzie County, North Dakota. The Bureau of Indian Affairs (BIA) is the surface management agency for the potentially affected tribal lands and individual allotments. The BIA manages surface lands held in title by the tribe and tribal members and subsurface mineral rights associated with the surface ownership. Developments have been proposed in locations that target specific areas located in the Bakken Formation, a known oil reserve. The following proposed well sites, shown in Figure 1, would be located within the Reservation in which the majority of the external boundaries are located above the Bakken Formation.

- Mandaree 02-09H: NW¼ NW¼ of Section 9, Township (T) 149 North (N), Range (R) 94 West (W)
- Mandaree 04-15H: SE¼ SE¼ of Section 15, T149N, R94W
- Mandaree 05-16H: NW¼ NW¼ of Section 16, T149N, R94W
- Mandaree 06-20H: NW¼ NW¼ of Section 20, T149N, R94W
- Mandaree 12-07H: SE¼ SE¼ of Section 7, T149N, R94W
- Bear Den 08-21H: NW¼ NW¼ of Section 21, T150N, R94W
- Clarks Creek 01-21H: NW¼ NW¼ of Section 21, T151N, R94W
- Clarks Creek 03-08H: SE¼ SE¼ of Section 8, T151N, R94W
- Riverview 01-32H: NW¼ NW¼ of Section 32, T152N, R94W

The BIA's general mission is to represent the interests, including the Trust Resources, belonging to members of the Three Affiliated Tribes of the Mandan, Hidatsa, and Arikara (MHA) Nation, as well as individual tribal members. All members of the MHA Nation and individual tribal members would benefit substantially from the development of oil and gas resources on the Reservation. Oil and gas exploration and development is under the authority of the Energy Policy Act of 2005 (42 United States Code [USC] 15801, et seq.), the Federal Onshore Oil and Gas Royalty Management Act of 1982 (30 USC 1701, et seq.), the Indian Mineral Development Act of 1982 (25 USC 2101, et seq.), and the Indian Mineral Leasing Act of 1938 (25 USC 396a, et seq.). The BIA's role in the proposed project includes approving easements, leases, and rights-of-way (ROWs); determining effects of cultural resources; and making recommendations to the Bureau of Land Management (BLM).

The BLM is responsible for the final approval of all Applications for Permit to Drill (APDs) after receiving a recommendation for approval from the BIA. The BLM is also tasked with on-site monitoring of construction and production activities, as well as resolution of any dispute that should arise as a result of any of the aforementioned actions.

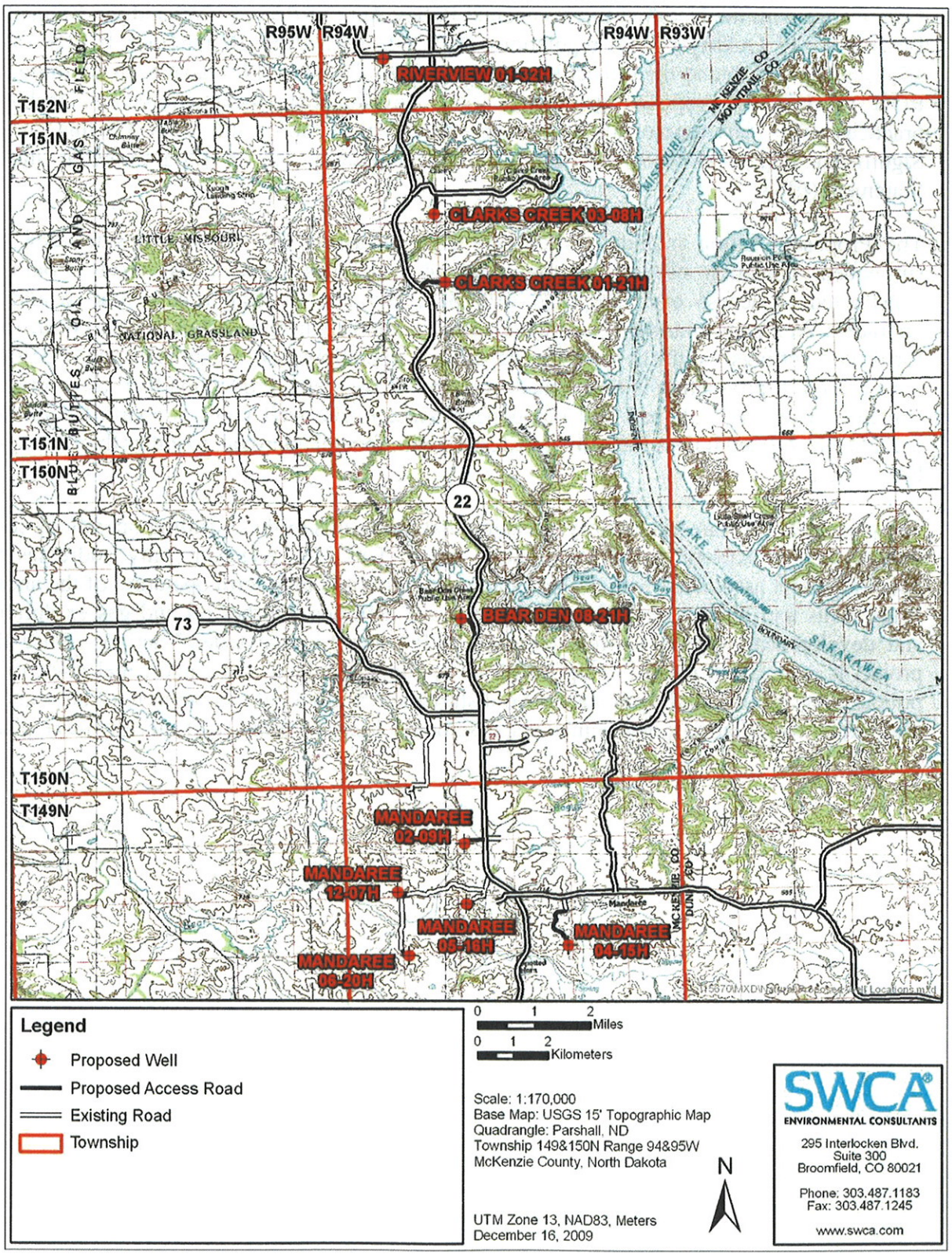

Figure 1. Proposed well locations.

Compliance with the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500–1508) is required due to the project's location on federal lands. APDs have been submitted by EOG to describe proposed procedures (i.e., development, reclamation) and technical practices. This Environmental Assessment (EA) will either result in a Finding of No Significant Impact (FONSI) or result in the preparation of an Environmental Impact Statement (EIS).

The Proposed Action includes various components associated with the construction and subsequent operation of each of the proposed well sites. New access roads would be constructed to access each proposed well pad, and one existing access road would be upgraded. Well pads would be constructed to accommodate drilling activities. Pits constructed for drilled cuttings would be used during drilling operations and reclaimed once operations have ceased. If production is established from any of the wells, production facilities would be constructed on the well pad. All components (i.e., roads, well pads, supporting facilities) would be reclaimed unless formally transferred, with federal approval, to either the BIA or the landowner.

The proposed wells are exploratory, meaning that the results of these drilling operations could initiate further exploration of surrounding areas. This EA, however, only addresses the potential effect associated with the installation and possible long-term operation of the above-listed wells and directly related infrastructure and facilities. Further oil and gas exploration and development would require additional NEPA analysis and federal actions. Once this project is authorized, it must comply with all applicable federal, state, and tribal laws, rules, policies, regulations, and agreements. No disturbance of any kind can begin until all required clearances, consultations, determinations, easements, leases, permits, and surveys are in place.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO ACTION

A No Action Alternative is the only alternative consideration to the Proposed Action. The U.S. Department of the Interior's (USDI's) authority to implement a "no action" alternative is limited. An oil and gas lease grants the lessee the "right and privilege to drill for, extract, remove, and dispose of all oil and gas deposits" in the lease lands, "subject to the terms and conditions incorporated in the lease." If the No Action Alternative is approved, the BIA would not approve APDs or grant ROWs for one or more of the proposed locations, and land would remain in its current state.

2.2 PROPOSED ACTION

This document analyzes the potential impacts of a specific project—nine exploratory horizontal oil wells and their associated facilities on individual allotted surface lands administered in trust by the BIA. The proposed project sites have been chosen by the proponent in consultation with the tribal and BIA resource managers to assist in defining further potential production. The proposed well locations are in the west-central portion of the Reservation in McKenzie County, North Dakota.

The line of production of the horizontal wells passes through fee simple, individual allotted, and tribal subsurface. The Proposed Action would require constructing well pads and upgrading, constructing, and maintaining access roads. Table 1 presents the surface and bottom hole locations and lease numbers of each well site.

The specific pad locations, access road routes, and pipeline routes were determined after pre-on-site inspections by the proponent, the civil surveyor, the environmental consultant, the BIA Environmental Specialist, and the Tribal Historic Preservation Office (THPO) monitor on August 27, September 22, October 13, and November 3, 2009. Resource surveys were conducted at the time of pre-on-site inspections to determine potential impacts to cultural and natural (i.e., biological and physical) resources. The locations were inspected in consideration of topography, location of topsoil/subsoil stockpiles, natural drainage and erosion control, flora, fauna, habitat, historical and cultural resources, and other surface issues. The final locations were determined in consideration of the previously identified issues. Avoidance measures and other protective measures were incorporated into the final project design to minimize impacts to evaluated resources, as appropriate (see Section 2.9). ROW on-site inspections were conducted in October and November 2009; the proposed well pads and access roads were surveyed in August through November 2009. During the inspections, the BIA gathered information needed to develop site-specific mitigation measures that would be incorporated into the final APD.

Table 1. Proposed Well Locations.

Well	Surface Location	Bottom Hole Location	Lease Number
Mandaree 02-09H	NW¼NW¼ Sec 9, T149N, R94W; 359 feet FNL & 763 feet FWL	SW¼SE¼ Sec 9, T149N, R94W; 500 feet FSL & 1,500 feet FEL	14-20-A04-1830
Mandaree 04-15H	SE¼SE¼ Sec 15, T149N, R94W; 446 feet FSL & 364 feet FEL	NE¼NW¼ Sec 15, T149N, R94W; 500 feet FNL & 1,500 feet FWL	14-20-A04-1830
Mandaree 05-16H	NW¼NW¼ Sec 16, T149N, R94W; 750 feet FNL & 760 feet FWL	SW¼SE¼ Sec 16, T149N, R94W; 500 feet FSL & 1,500 feet FEL	14-20-A04-8210
Mandaree 06-20H	NW¼NW¼ Sec 20, T149N, R94W; 197 feet FNL & 538 feet FWL	SW¼SE¼ Sec 20, T149N, R94W; 500 feet FSL & 1,500 feet FEL	14-20-A04-9254
Mandaree 12-07H	SE¼SE¼ Sec 7, T149N, R94W; 539 feet FSL & 325 feet FEL	NE¼NW¼ Sec 7, T149N, R94W; 500 feet FNL & 1,500 feet FWL	14-20-A04-9278
Bear Den 08-21H	NW¼NW¼ Sec 21, T150N, R94W; 325 feet FNL & 1,091 feet FWL	SW¼SE¼ Sec 21, T150N, R94W; 500 feet FSL & 1,500 feet FEL	14-20-A04-8476
Clarks Creek 01-21H	NW¼NW¼ Sec 21, T151N, R94W; 356 feet FNL & 660 feet FWL	SW¼SE¼ Sec 21, T151N, R94W; 500 feet FSL & 1,500 feet FEL	14-20-A04-9908
Clarks Creek 03-08H	SE¼SE¼ Sec 8, T151N, R94W; 774 feet FSL & 200 feet FEL	NE¼NW¼ Sec 8, T151N, R94W; 500 feet FNL & 1,500 feet FWL	14-20-A04-9634
Riverview 1-32H	NW¼NW¼ Sec 32, T152N, R94W; 308 feet FNL & 774 feet FWL	SW¼SE¼ Sec 32, T152N, R94W; 500 feet FSL & 1,500 feet FEL	14-20-A04-9928

FEL = from the east line; FNL = from the north line; FSL = from the south line; FWL = from the west line.

The APD, EA, lease stipulations, and any special actions required by the BIA or BLM would be followed during construction. The proponent would secure all required permits, easements, and approvals following procedures established by the MHA Nation, the BIA, the State of North Dakota, and the BLM, as appropriate, prior to construction and drilling. The proponent would adhere to all applicable federal, state, county, BIA, and tribal regulations while performing all operations associated with the Proposed Action. Surface-disturbing activities would be constructed and maintained to the standards detailed in *Surface Operating Standards for Oil and Gas Exploration and Development, 4th Edition* (Gold Book) (USDI and U.S. Department of Agriculture [USDA] 2007), BLM Manual Section 9113, and according to BIA/tribal specifications. Operations would be in full compliance with laws and regulations that are applicable, including Title 43 CFR 3100; Onshore Oil and Gas Order Nos. 1, 2, 6, and 7; approved operation plans; and Notices of Lessees (NTLs). The proponent would maintain any production facilities for the lives of the wells, which is estimated to be 30 to 50 years.

This EA assumes that details of construction, drilling, completion, and reclamation provided in the APDs, Surface Use Plans (SUPs), and EOG's Safe Practices Manual (2007) are indicative of procedures that would be followed by the proponent and are incorporated by reference. Additional details of construction, drilling, and completion procedures can be found in the APDs and SUPs for each well.

2.3 ACCESS ROADS

Each well would require construction of an all-weather 24-foot-wide running surface, double-lane access road with a 40-foot subgrade. The 24-foot road width is necessary to ensure safe passage of tanker trucks. A 66-foot ROW is requested for each access road. The 66-foot width is necessary to build ditches appropriate to handle large volumes of snow and runoff and is consistent with county and township roads in North Dakota. Up to 25,978 feet (4.9 miles) of new access roads would be required for the nine proposed well locations (see Table 3 in Section 2.10). Of this total, approximately 0.53 mile would be on private (fee) surface, 4.39 miles would be on tribal lands, and 0.75 mile of access road would be upgrading of existing unimproved roads at the Mandaree 05-16H and Clarks Creek 01-21H locations. Estimated surface disturbance for each ROW is presented in Table 3 and Table 4 of Section 2.10.

A minimum of 6 inches of topsoil would be stripped from each access road footprint to provide access to the subsoil, which is better suited for shaping and compaction. The topsoil would be temporarily stored along the sides of a road and subsequently spread on the back slopes in preparation for seeding during interim reclamation. Maximum grade of each new access road would be less than 8%. Surfacing of the well pad and access road would consist of native or commercially obtained materials. Access roads would be crowned and ditched with water turnouts to ensure proper drainage. Water control features would be constructed as necessary to control erosion. All access roads crossing drainages would be constructed as low water crossings. Culverts, consisting of corrugated metal pipes, would be installed along the access roads, as determined during the on-site inspections and shown on the plats that accompany each APD. As directed by the Authorized Officer (AO), EOG would install cattle guards where an access road would cross an existing fence line to maintain control of livestock. Access roads would be surfaced with scoria to an average minimum depth of 4 inches after compaction. Each access road would be maintained to prevent soil erosion and ensure safe conditions during the life of a well. Construction would follow road design standards outlined in the BLM Gold Book (USDI and USDA 2007), and details of road construction are addressed in the APD. A typical cross section is shown in Figure 2. EOG would be responsible for road maintenance and upkeep for the life of the wells, unless a formal road maintenance agreement is in place designating another entity for maintenance. All oil well access roads would be fully reclaimed (see Section 2.8) once the wells are depleted and abandoned, unless the BIA or surface owners assume responsibility for the roads through a formal agreement.

In addition to roads, natural gas gathering lines from these wells would also be installed in the 66-foot ROW. Connections from gathering lines to trunk lines have not been determined at this time. Future tie-ins to trunk lines would be addressed once their locations are known, including conducting cultural and biological resource surveys and obtaining additional ROWs. Additional NEPA analysis would be conducted for additional ROWs for future tie-ins and trunk lines, as necessary, once the alignments have been determined.

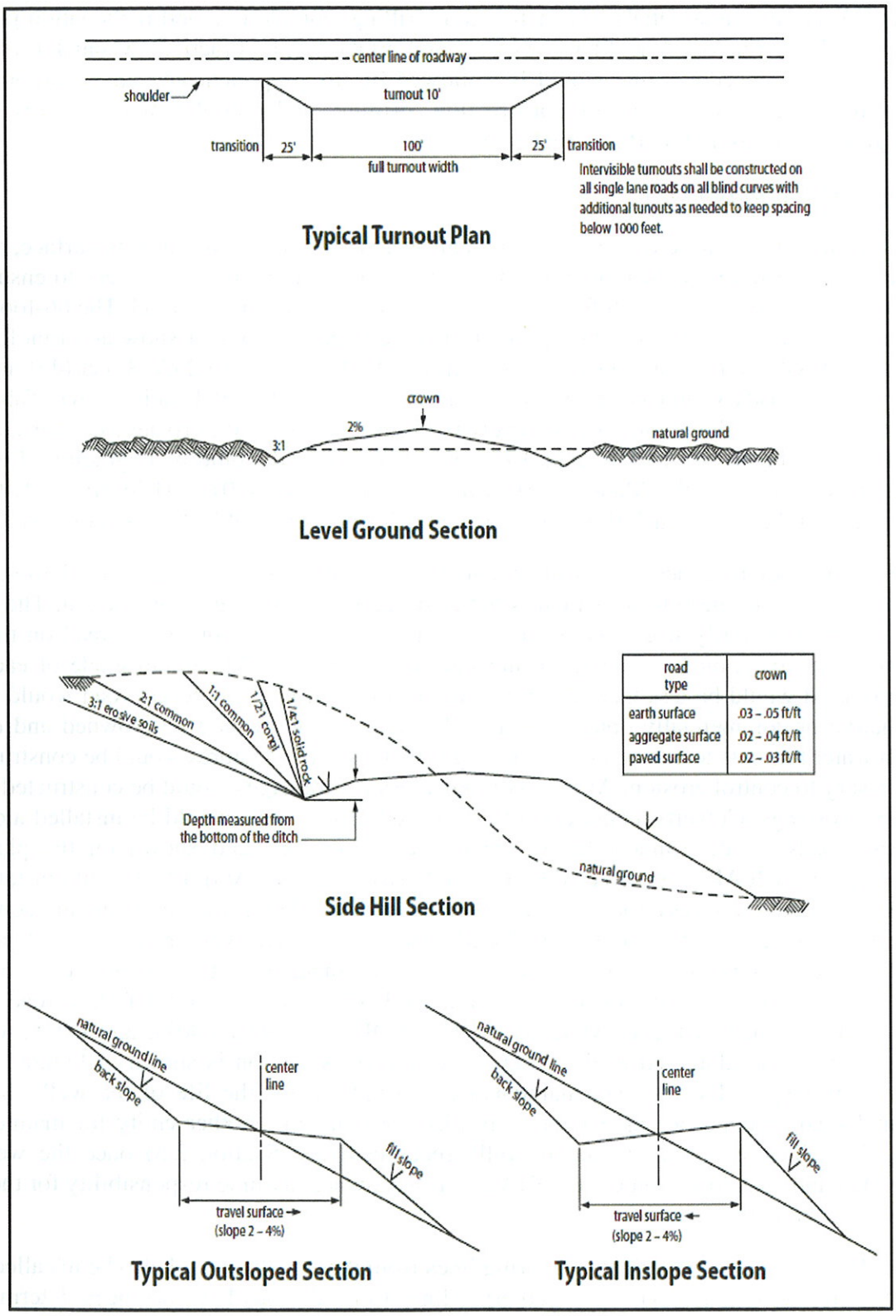

Figure 2. Typical road cross sections (USDI and USDA 2007).

2.4 WELL PADS

Each well would be drilled on a pad measuring approximately 415 by 525 feet, including the area needed for stockpiles, resulting in a surface disturbance of approximately 5 acres for each well pad. In total, approximately 44 acres would be disturbed for well pad construction. See Section 2.10 for well-specific surface disturbance.

Locations would be leveled by balancing cut and fill areas. Subsoil and the rock remaining from the reserve pit cut would be used to construct the location. Topsoil would be stored in a stockpile for use during reclamation. Diversion ditches would be constructed, as needed, along a perimeter of a well pad to prevent runoff from flowing across a well pad.

A temporary reserve pit would be constructed within the disturbed area of each well pad. Each reserve pit would be constructed so as not to leak, break, or allow discharge and in a way that minimizes the accumulation of precipitation runoff into the pit. A reserve pit liner would have permeability less than 10^{-7} centimeters per second and burst strength greater than or equal to 300 pounds per square inch (psi) or puncture strength greater than or equal to 160 psi and grab tensile strength greater than or equal to 150 psi. A liner would be resistant to deterioration by hydrocarbons and would not be installed directly on a rock surface. Where necessary, bedding materials, such as sand or geotextile fiber liner, would be installed to prevent contact with exposed rock.

Prior to drilling, each well pad would be fenced to prevent ingress by livestock or wildlife, and a cattle guard would be installed at the entrance to well pads at the fence line, as determined at pre-construction BIA and BLM on-site meetings.

2.5 DRILLING

For each well, drilling operations would consist of drilling the surface hole, running and cementing surface casing, drilling the production hole, and running and cementing production casing.

The nine proposed wells would be drilled from individual well pads vertically to the Bakken Formation at depths ranging from approximately 10,800 to 11,000 total vertical feet. Then a wellbore (i.e., lateral leg) would be drilled horizontally for approximately 5,000 feet. Appropriately sized pressure control equipment would be used for drilling activities. Water would be hauled by truck to each location from a commercial source, using approximately 1,200 barrels of fresh water to drill each well. Drilling operations would use both freshwater-based mud and oil-based drilling mud. For each well, approximately 1,500 barrels of drilling mud would be recycled for subsequent wells.

Each reserve pit would be fenced on three sides during drilling and completion operations. If necessary, a reserve pit would be temporarily used for the storage of fluids produced during testing operations. Fracture stimulation fluids would be flowed back into a pit for evaporation. The fourth side of the pit would be fenced as soon as the completion rig is moved off a location.

Spills of oil, produced water, or other produced fluids would be cleaned up and disposed of in accordance with appropriate regulations. Sewage would be contained in a portable chemical toilet during drilling. All trash would be stored in a trash cage and hauled to an appropriate landfill during and after drilling and completion operations.

No chemicals subject to reporting under Superfund Amendments and Reauthorization Act (SARA) Title III (hazardous materials) in an amount greater than 10,000 pounds would be used, produced, stored, transported, or disposed of in association with the drilling of these wells. Furthermore, no extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities would be used, produced, stored, transported, or disposed of in association with drilling operations.

2.6 CASING AND CEMENTING

After drilling, downhole geophysical well logs may be run to evaluate a well's production potential. If the evaluation concludes that sufficient hydrocarbons are present and recoverable, then steel production casing would be run and cemented in place in accordance with the well design, as specified in the APD and Conditions of Approval. Evaluation logs may be run subsequent to setting and cementing production casing. The casing and cementing program would be designed to isolate and protect the shallower formations encountered in the well bore and to prohibit pressure communication or fluid migration between zones. Casing and cementing operations would be conducted in full compliance with Onshore Oil and Gas Order No. 2 (43 CFR 3160).

2.7 COMPLETION AND EVALUATION

Completion operations consist of perforating the production casing, stimulating the formation(s) using hydraulic fracturing techniques, flow back of fracturing fluids, flow testing to determine post-fracture productivity, and installation of production equipment.

After production casing is perforated, stimulation would consist of hydraulically fracturing the producing formation. A water/sand slurry would be used with non-toxic chemical additives to ensure the quality of the fracture fluid. Fluid would be pumped down the wellbore through perforations in the casing and into the formation. Pumping pressures would be increased to the point at which fractures radiate outward from the perforations into the formation and the slurry flows rapidly into the fractures. The sand serves as a proppant to keep the created fracture open after the pressure drops, thereby allowing reservoir fluids to move more readily into the well. Hydraulic fracturing is a well understood and commonly employed technology used on potentially productive reservoirs at depths below usable aquifers.

Approximately 25,000 barrels of fresh water would be used for hydraulic fracturing operations for each well. If necessary, a reserve pit would be temporarily used for the storage of fluids produced during testing operations. Reserve pits would be fenced on three sides during drilling and completion operations. Any remaining fluids would be disposed of in accordance to North Dakota Industrial Commission (NDIC) rules and regulations.

2.8 COMMERCIAL PRODUCTION

2.8.1 Production Facilities

Production facilities at each well pad would include a well head and pump jack, a flare pit, a heater-treater, a recirculating pump, and a tank battery. Production facilities would be installed on the disturbed portion of each well pad, a minimum of 25 feet from the toe of the back slope where practical.

Production fluids would be stored on each well pad in tanks. Up to eight 400-barrel oil tanks and one 400-barrel water tank would be located inside of a berm, which would be constructed completely around production facilities that contain fluids (i.e., production tanks, produced water tanks, and/or heater-treater). A berm would consist of impervious compacted subsoil and would hold 110% of the capacity of the largest tank. The proponent would develop and maintain site-specific Spill Prevention, Control, and Countermeasure Plans (SPCCPs) for each production facility.

2.8.2 Production Traffic

Produced water and oil would be transported from the tanks on each location by trucks or until the well can be connected to gathering pipelines. Table 2 presents estimates of truck traffic anticipated to be necessary to haul fluids from each well. Trucks for normal production operations would utilize the existing and proposed access roads. Produced water would be transported to the Wayzetta 100-26 disposal site (located in Section 26, T153N, R90W, Mountrail County, North Dakota) or other approved disposal facility. The proposed wells would typically be visited daily by a pumper, but possibly less frequently. All truck drivers would be required to follow posted load limits, speed limits, and all other traffic laws in accordance with EOG's Safe Practices Manual (2007).

Table 2. Estimated Tanker Truck Traffic.[1, 2]

Time Period	Average Daily Tanker Truck Roundtrips Per Well	Average Daily Tanker Round Trips for 9 Wells
Production Day 1–30	5	45
Production Day 31–60	2	18
Production Day 61–ongoing	1	9

[1] Estimates based on projected production volumes for exploratory wells and are subject to change based on actual production volumes.
[2] Estimates assume all fluids transported via truck from each well.

Natural gas produced in association with the liquid hydrocarbons would initially be flared. A flare pit would be located a minimum of 125 feet from a well head to ensure safe operations. Because the proposed wells are exploratory, projections of the volumes of natural gas that may be produced are not possible at this time. If applicable, the proponent would construct a gas-gathering system at a future time; however, this system is not currently proposed due to the exploratory nature of the Proposed Action. Construction details and timing for a future gas-gathering system would depend on gas production volumes, costs for pipeline installation, commodity prices, and ability to tie into a larger natural gas transportation system. Flaring

operations would be conducted in compliance with applicable regulations and would be in accordance with NTLs and adopted NDIC regulations, which prohibit unrestricted flaring for more than the initial year of operation (North Dakota Century Code [NDCC] 38-08-06.4).

All permanent (on-site six months or longer) aboveground structures constructed or installed, including pumping units, would be painted a flat, non-reflective, earth-tone color, typically Covert Green or Carlsbad Canyon, as determined by the AO. The proponent would control noxious weeds within the exterior boundaries of access roads, well sites, or other applicable facilities by spraying or mechanical removal. Weed control would be conducted in accordance with procedures established by BIA, BLM, state, and county guidelines. Drainage ditches and/or culverts would be maintained for the life of the well to ensure free-flowing conditions.

2.9 CONSTRUCTION DETAILS AT INDIVIDUAL SITES

2.9.1 Mandaree 02-09H

The proposed Mandaree 02-09H well pad (Figure 3) would be located approximately 3 miles northwest of the town of Mandaree in the NW¼ NW¼ of Section 9, T149N, R94W. A new access road approximately 0.38 mile long would be constructed to connect to Highway 22 (Figures 4 and 5). The new road would disturb approximately 3.0 acres, while the proposed 550- by 390-foot well pad would disturb approximately 4.9 acres, bringing the total anticipated new disturbance to 7.9 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,354 feet southeast of the surface hole location in the SW¼ SE¼ of Section 9, T149N, R94W (Figure 5). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

Figure 3. Mandaree 02-09H well pad area, view facing north.

Figure 4. Mandaree 02-09H access road at Highway 22, view facing east.

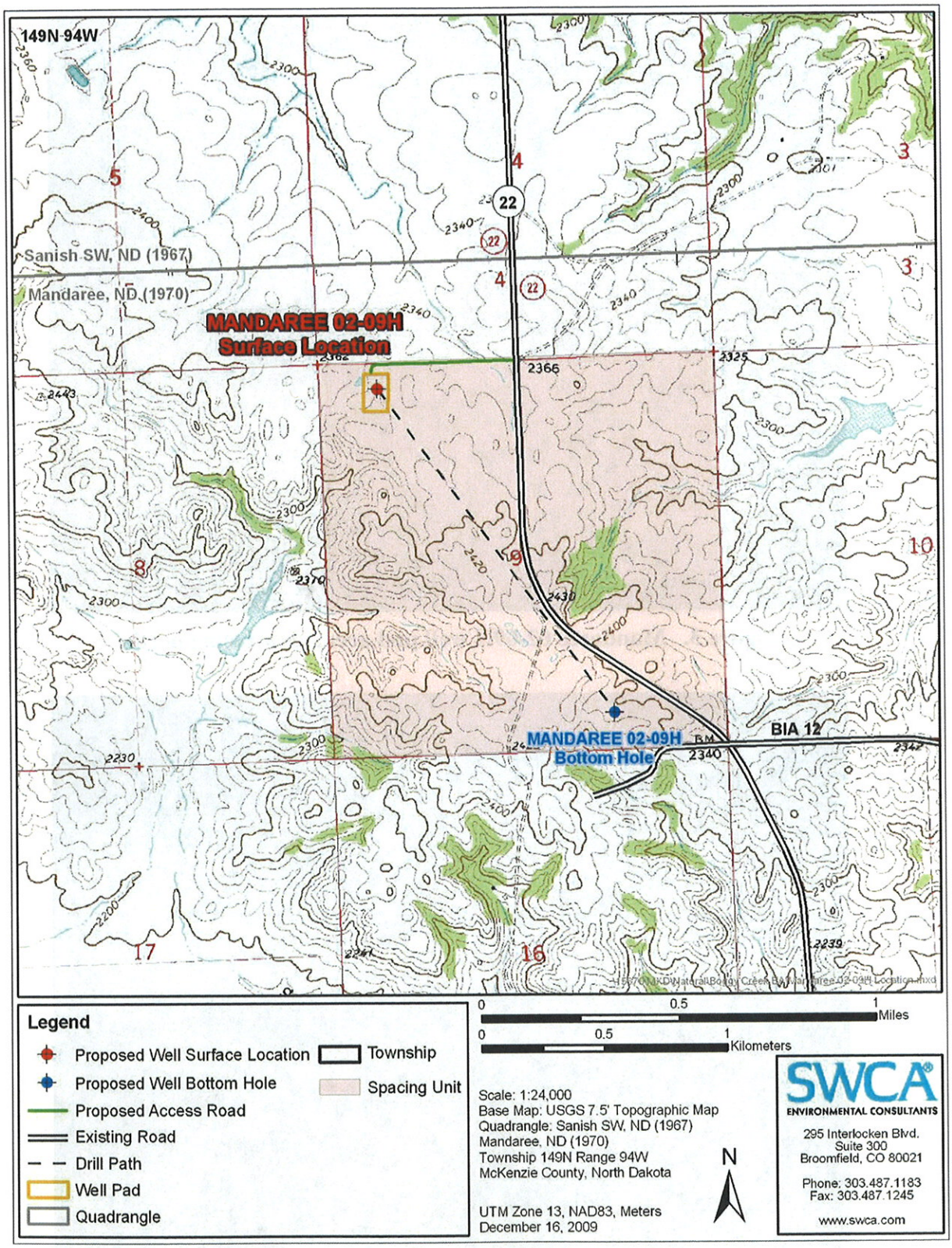

Figure 5. Mandaree 02-09H proposed surface and bottom hole locations.

2.9.2 Mandaree 04-15H

The proposed Mandaree 04-15H well site (Figure 6) would be located approximately 0.5 mile southwest of the town of Mandaree in the SE¼ SE¼ of Section 15, T149N, R94W. An upgrade of an existing unimproved access road approximately 1.1 miles long would connect the well to BIA 12 just west of Mandaree (Figures 7 and 8). The new road would disturb approximately 8.8 acres, while the proposed 550- by 380-foot well pad would disturb approximately 4.8 acres, bringing the total anticipated new disturbance to 13.6 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,500 feet northwest of the surface hole location in the NE¼ NW¼ of Section 15, T149N, R94W (Figure 7). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

Figure 6. Mandaree 04-15H well pad area, view facing west.

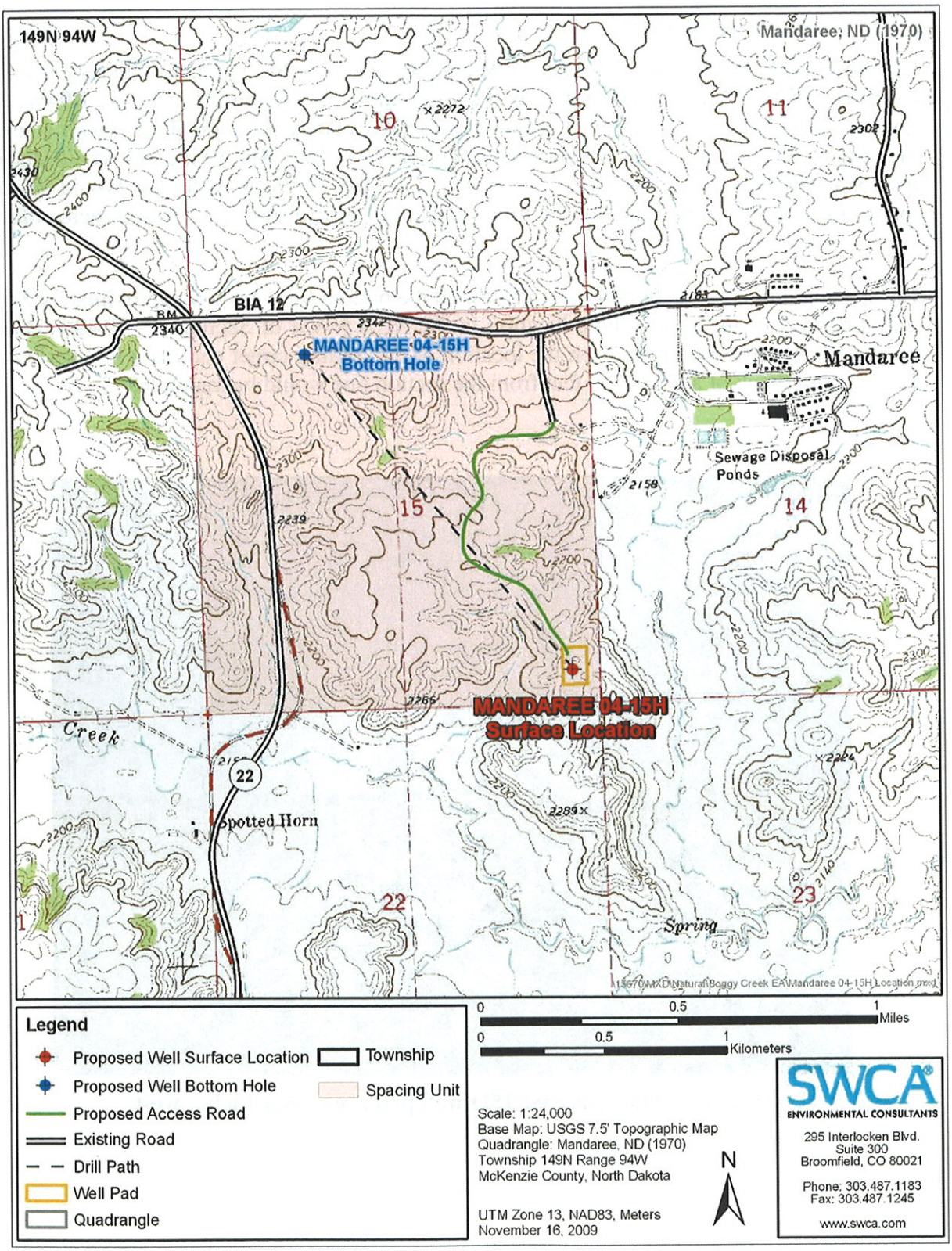

Figure 7. Mandaree 04-15H proposed surface and bottom hole locations.

Figure 8. Mandaree 04-15H access road area, view facing north.

2.9.3 Mandaree 05-16H

The proposed Mandaree 05-16H well site (Figures 9 and 10) would be located approximately 2.5 miles west of the town of Mandaree in the NW¼ NW¼ of Section 16, T149N, R94W. A new access road approximately 0.2 mile long would be constructed to connect the proposed Mandaree 05-16H well site and 0.55 mile of upgraded existing unimproved road with Highway 22 to the northeast (Figure 11). Additionally, 0.15 mile of access road would be rerouted around the well site to allow for continued access. The 0.74 mile of road construction would disturb approximately 5.9 acres, while the proposed 550- by 410-foot well pad would disturb approximately 5.1 acres, bringing the total anticipated new disturbance to 11.0 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,025 feet southeast of the surface hole location in the SW¼ SE¼ of Section 16, T149N, R94W (Figure 11). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

Figure 9. Mandaree 05-16H well pad area, view facing southwest.

Figure 10. Mandaree 05-16H well pad area, view facing south.

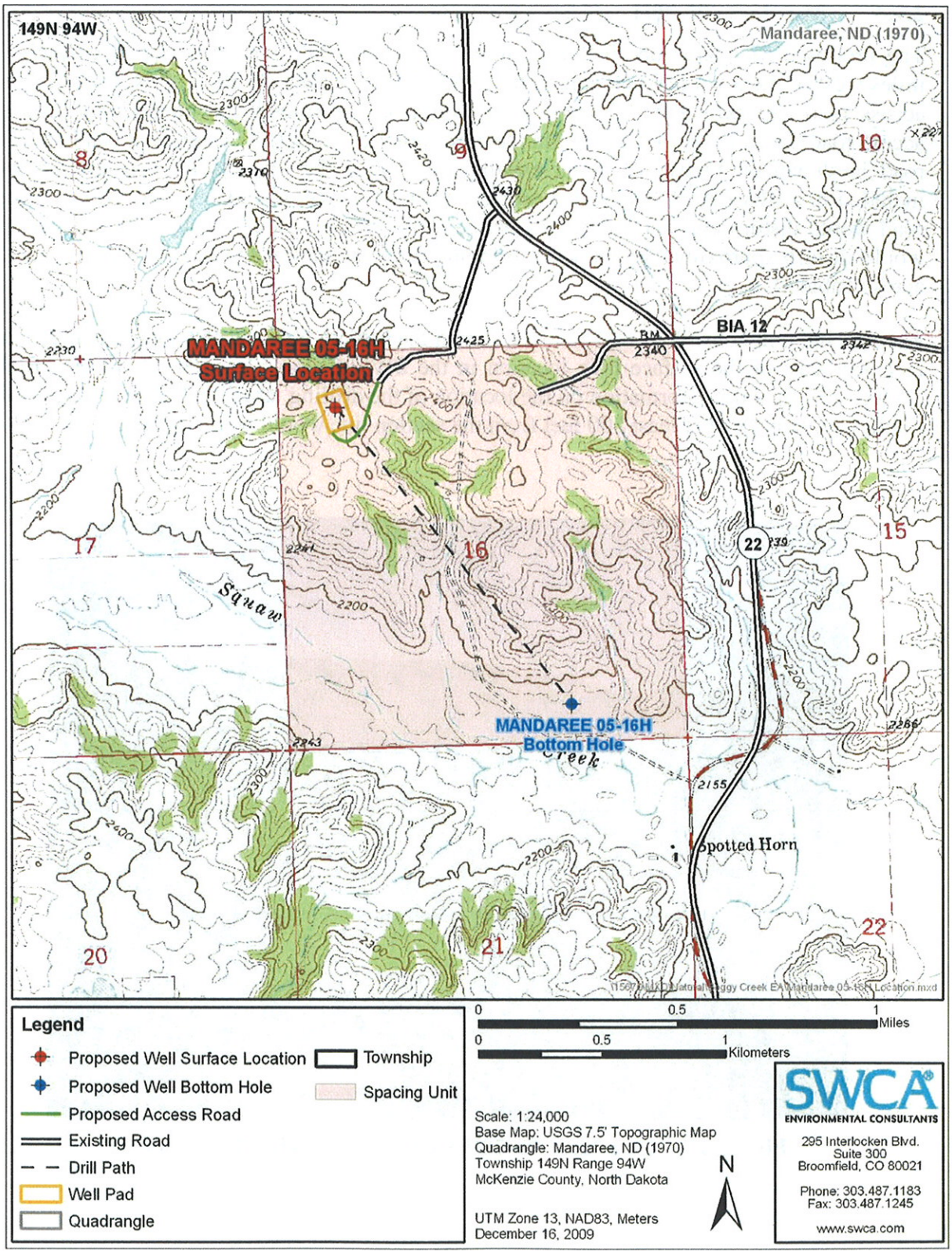

Figure 11. Mandaree 05-16H proposed surface and bottom hole locations.

2.9.4 Mandaree 06-20H

The proposed Mandaree 06-20H well site (Figure 12) would be located approximately 3.0 miles west of the town of Mandaree in the NW¼ NW¼ of Section 20, T149N, R94W. A new access road approximately 1.3 miles long would be constructed to connect to a proposed access road for an EOG well located in the NW corner of Section 17 (Figures 13 and 14). This road is shown on Figure 13 as an existing road since the impacts for construction were included in a BIA EA FONSI issued on December 18th, 2009 (DESCRM MC-208). The new road would disturb approximately 10.4 acres, while the proposed 550- by 420-foot well pad would disturb approximately 5.4 acres, bringing the total anticipated new disturbance to 15.8 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,605 feet southeast of the surface hole location in the SW¼ SE¼ of Section 20, T149N, R94W (Figure 13). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

Figure 12. Mandaree 06-20H well pad area, view facing north.

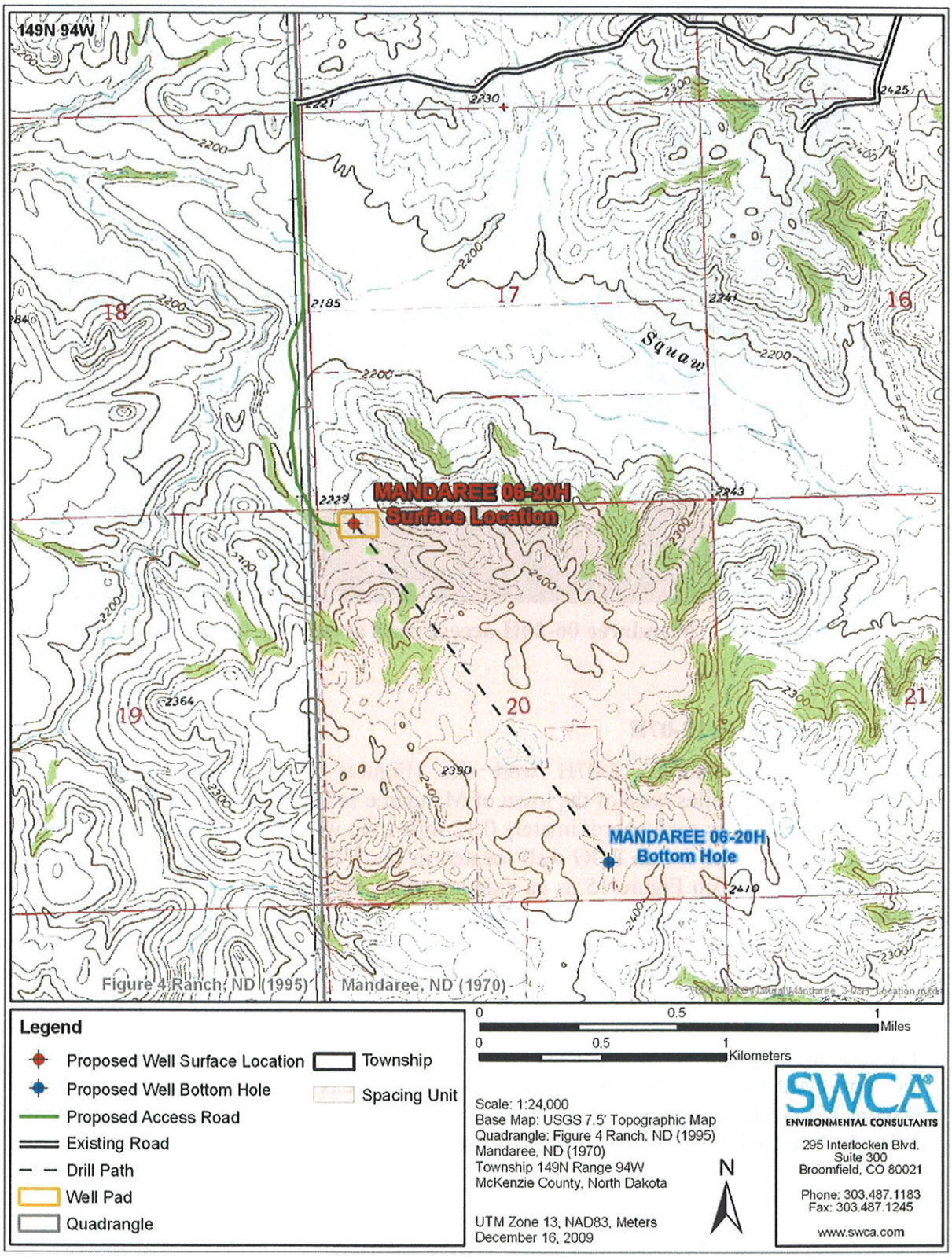

Figure 13. Mandaree 06-20H proposed surface and bottom hole locations.

Figure 14. Mandaree 06-20H access road area, view facing northwest.

2.9.5 Mandaree 12-07H

The proposed Mandaree 12-07H well site (Figures 15 and 16) would be located approximately 3.0 miles west of the town of Mandaree in the SE¼ SE¼ of Section 7, T149N, R94W. A new access road approximately 0.12 mile long would be constructed to connect to a proposed access road for an EOG well located in the NW corner of Section 17 (Figure 15). This road is shown on Figure 15 as an existing road since the impacts for construction were included in a BIA EA FONSI issued on December 18th, 2009 (DESCRM MC-208). The new access road would disturb approximately 1.0 acre, while the proposed 550- by 400-foot well pad would disturb approximately 5.0 acres, bringing the total anticipated new disturbance to 6.0 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,398 feet northwest of the surface hole location in the NE¼ NW¼ of Section 7, T149N, R94W (Figure 15). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

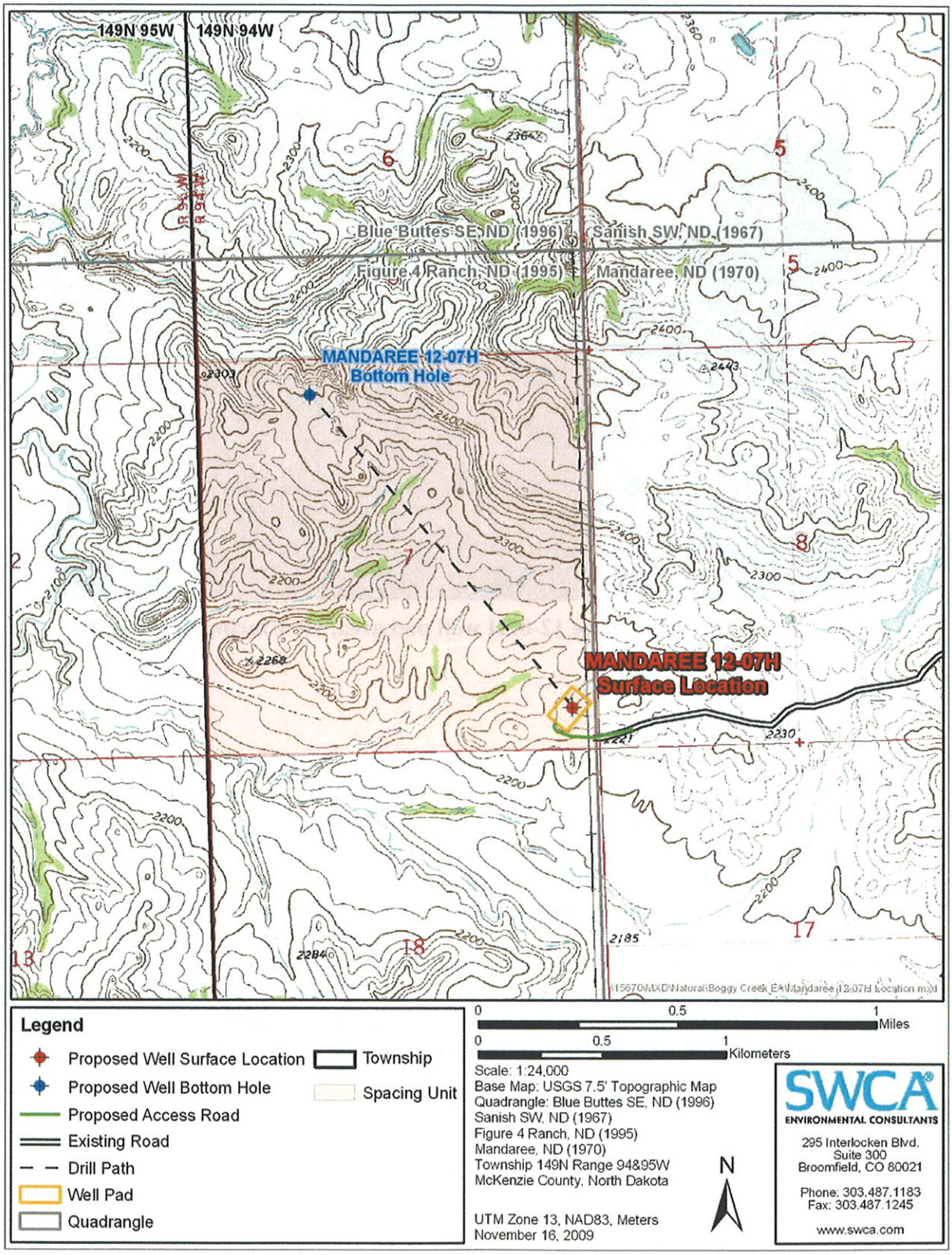

Figure 15. Mandaree 12-07H proposed surface and bottom hole locations.

Figure 16. Mandaree 12-07H well pad area, view facing northwest.

2.9.6 Bear Den 08-21H

The proposed Bear Den 08-21H well site (Figure 17) would be located approximately 7.0 miles northwest of the town of Mandaree in the NW¼ NW¼ of Section 21, T150N, R94W. A new access road approximately 0.38 mile long would be constructed to the southeast of the proposed well site to connect to Highway 22 (Figures 18 and 19). The access road would disturb approximately 3.0 acres, while the proposed 550- by 380-foot well pad would disturb approximately 4.8 acres, bringing the total anticipated new disturbance to 7.8 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,211 feet southeast of the surface hole location in the SW¼ SE¼ of Section 21, T150N, R94W (Figure 19). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

Figure 17. Bear Den 08-21H well pad area, view facing west.

Figure 18. Bear Den 08-21H access road area, view facing east towards Highway 22.

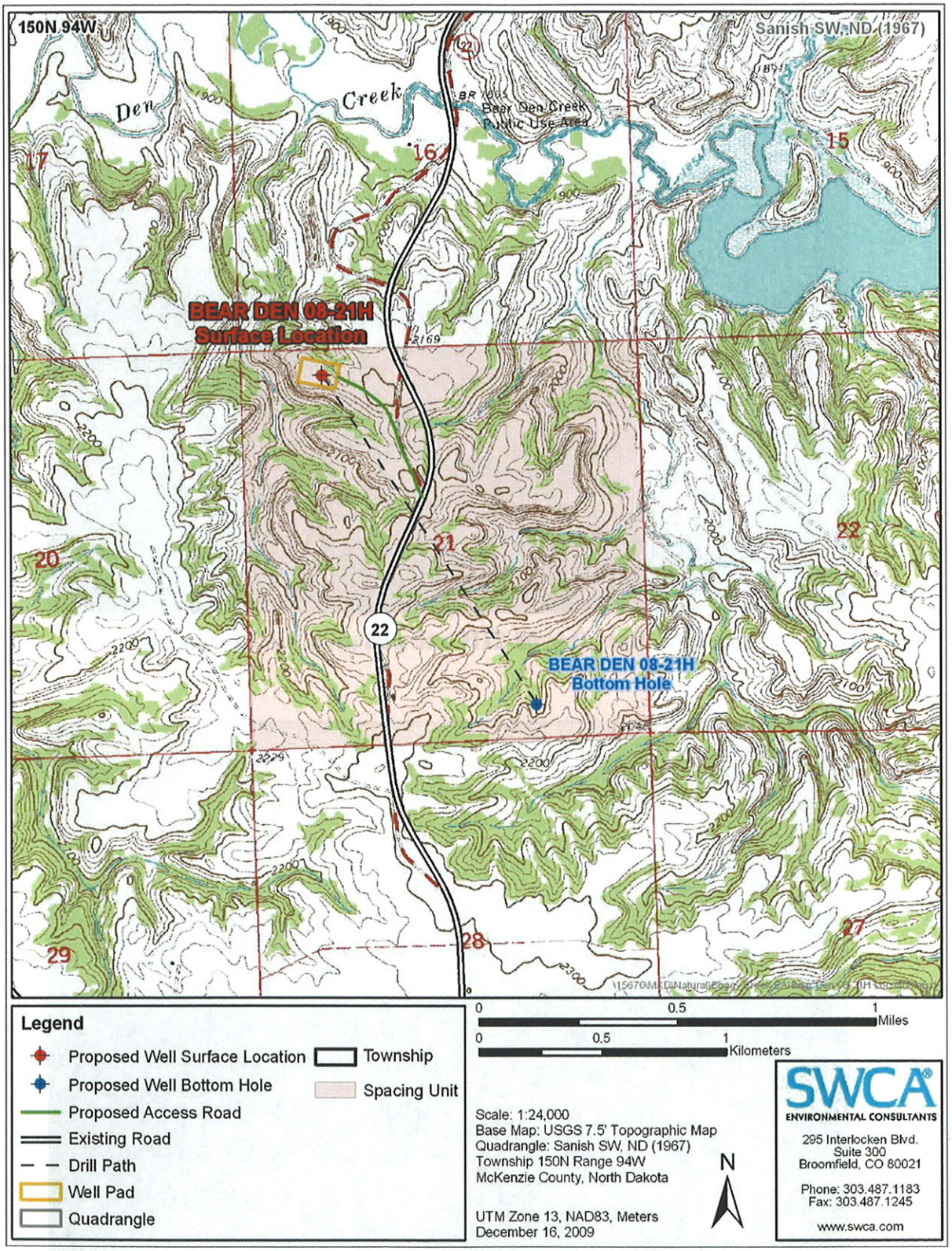

Figure 19. Bear Den 08-21H proposed surface and bottom hole locations.

2.9.7 Clarks Creek 01-21H

The proposed Clarks Creek 01-21H well site (Figure 20) would be located approximately 14.0 miles northwest of the town of Mandaree in the NW¼ NW¼ of Section 21, T151N, R94W. A new access road approximately 0.28 mile long would be constructed to connect to an existing road that connects to Highway 22 to the west (Figures 21 and 22). Approximately 0.2 mile of the existing unimproved road would require upgrading. The total length of the 0.48-mile access road would disturb approximately 3.8 acres, while the proposed 550- by 410-foot well pad would disturb approximately 5.1 acres, bringing the total anticipated new disturbance to 8.9 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,412 feet southeast of the surface hole location in the SW¼ SE¼ of Section 21, T151N, R94W (Figure 21). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

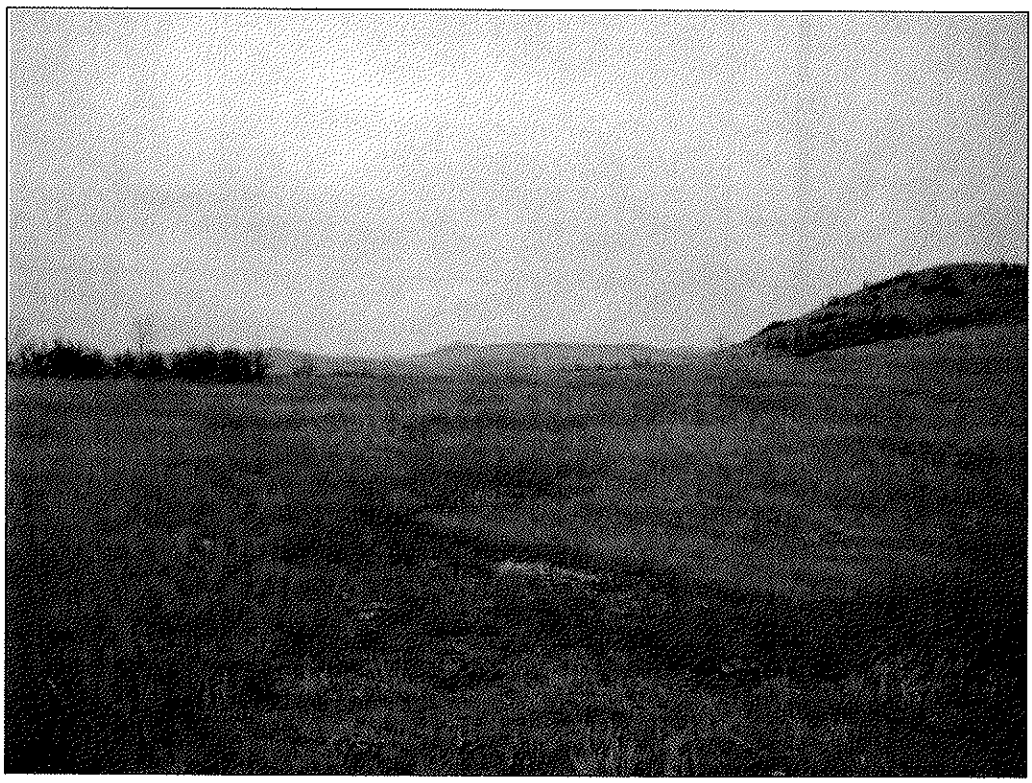

Figure 20. Clarks Creek 01-21H well pad area, view facing south.

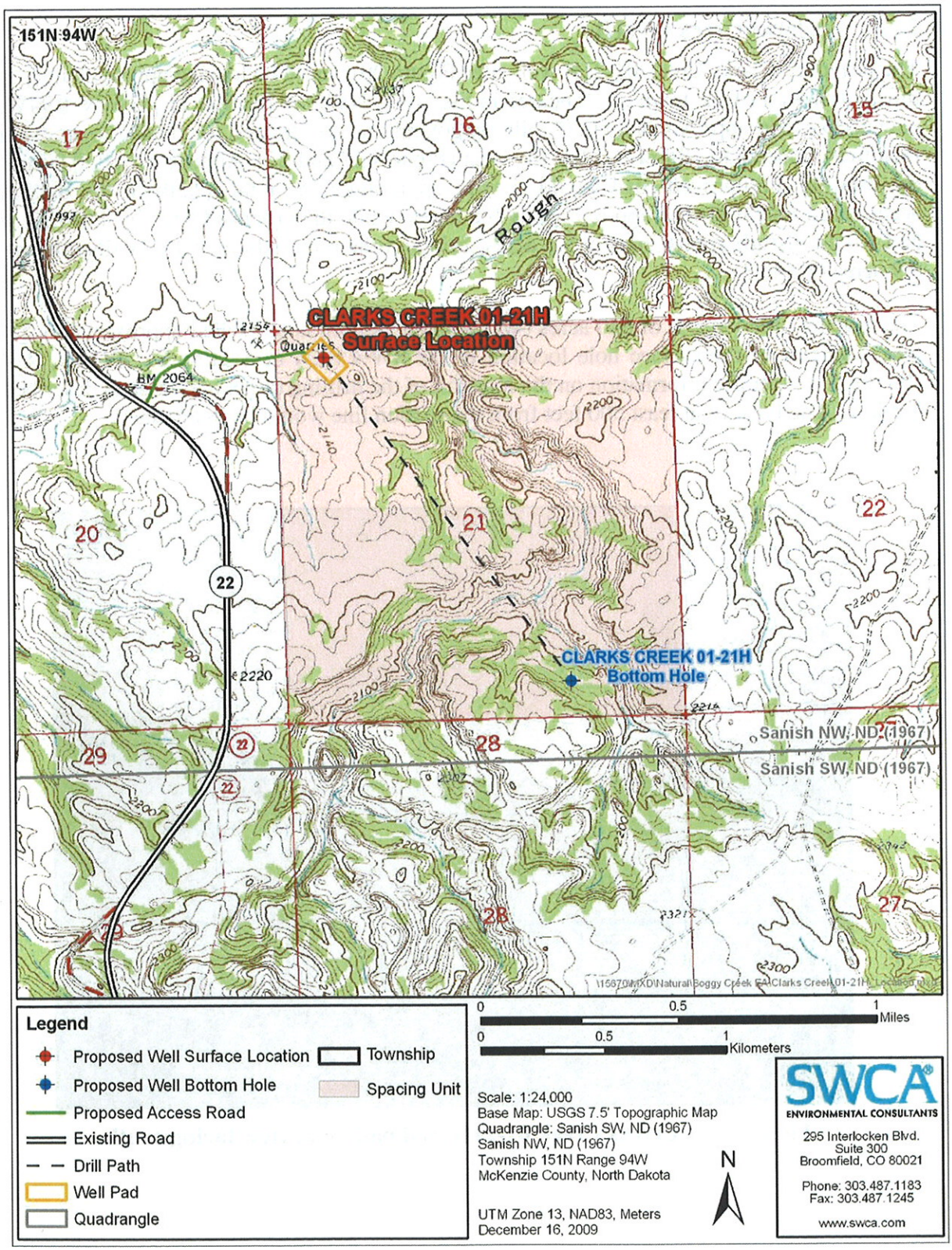

Figure 21. Clarks Creek 01-21H proposed surface and bottom hole locations.

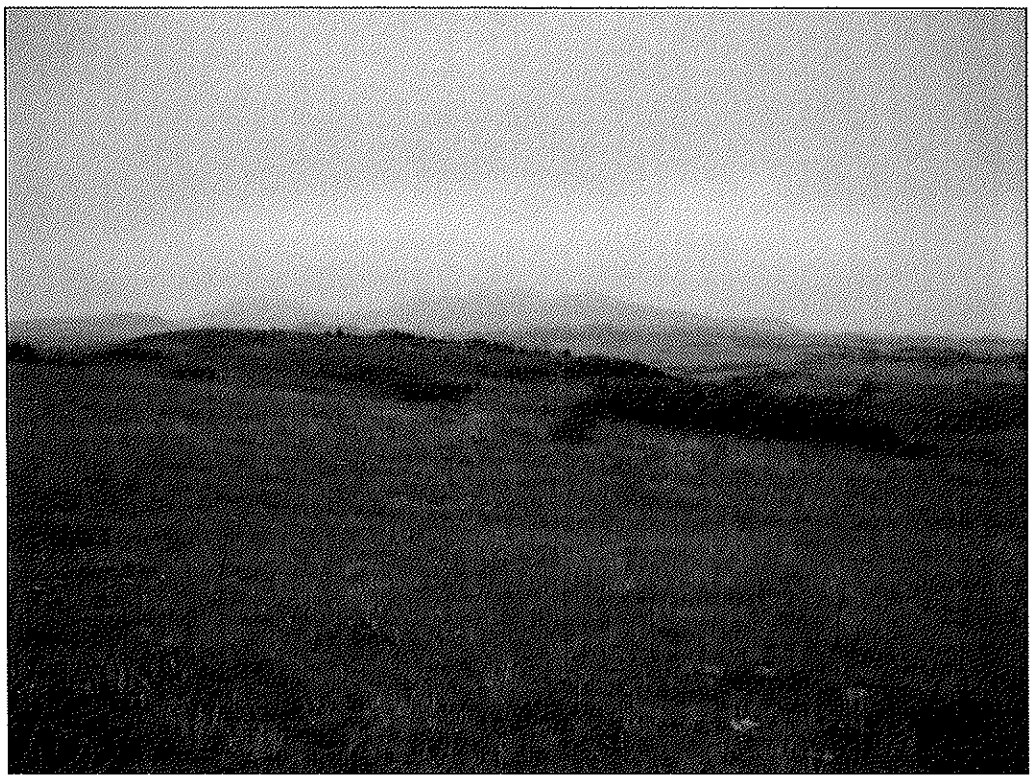

Figure 22. Clarks Creek 01-21H access road area, view facing west.

2.9.8 Clarks Creek 03-08H

The proposed Clarks Creek 03-08H well site (Figures 23 and 24) would be located approximately 15.0 miles northwest of the town of Mandaree in the SE¼ SE¼ of Section 8, T151N, R94W. A new access road approximately 0.33 mile long would be constructed to connect to an existing road that connects to Highway 22 to the west (Figures 24 and 25). The access road construction would disturb approximately 2.6 acres, while the proposed 550- by 360-foot well pad would disturb approximately 4.5 acres, bringing the total anticipated new disturbance to 7.1 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,379 feet northwest of the surface hole location in the NE¼ NW¼ of Section 8, T151N, R94W (Figure 25). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

Figure 23. Clarks Creek 03-08H well pad area, view facing west.

Figure 24. Clarks Creek 03-08H access road area, view facing north.

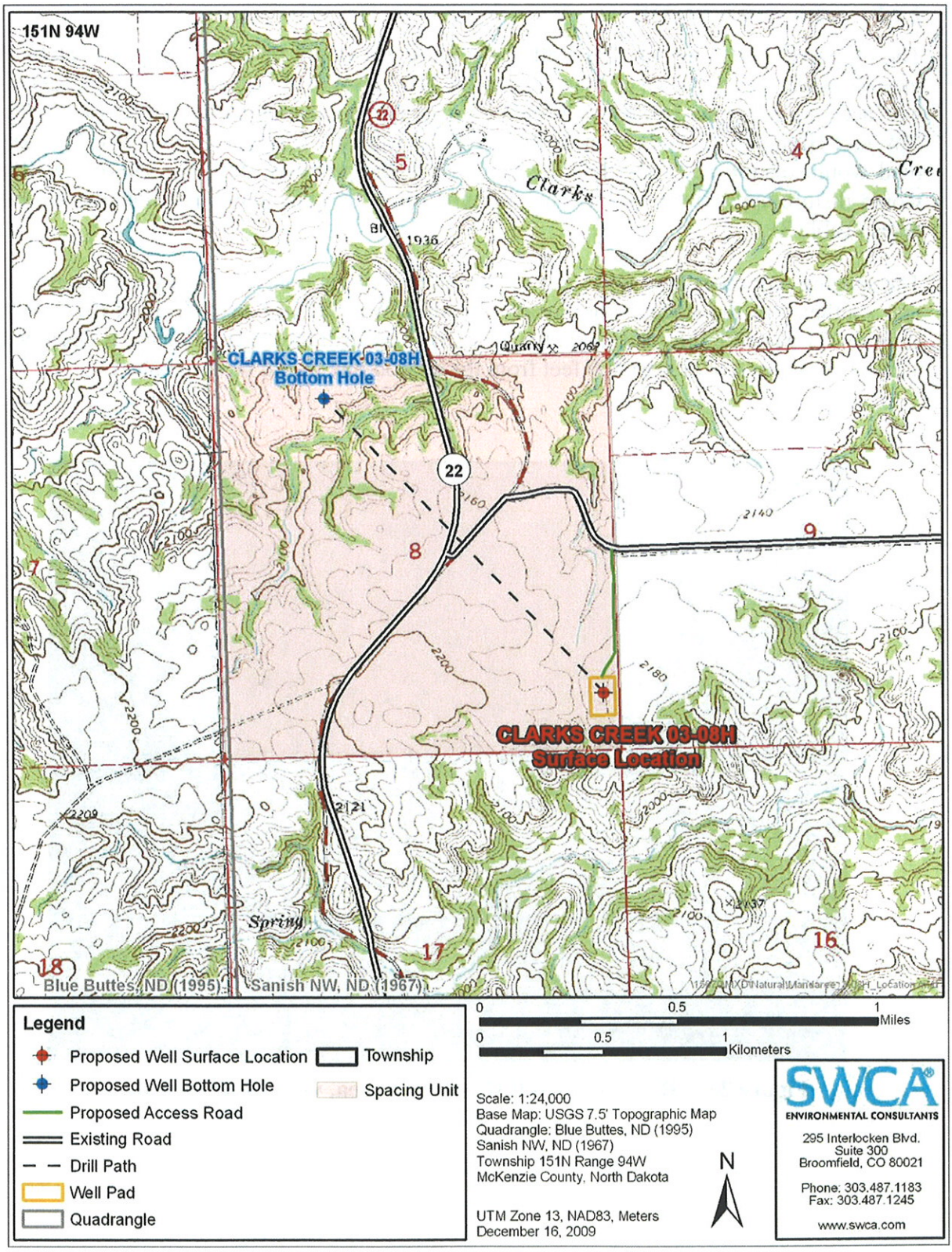

Figure 25. Clarks Creek 03-08H proposed surface and bottom hole locations.

2.9.9 Riverview 01-32H

The proposed Riverview 01-32H well site (Figure 26) would be located approximately 19.0 miles northwest of the town of Mandaree in the NW¼ NW¼ of Section 32, T152N, R94W. A new access road approximately 0.09 mile long would be constructed to connect to 37th Street NW and Highway 22 to the east of the proposed well site (Figures 27 and 28). The access road would disturb approximately 0.7 acre, while the proposed 550- by 350-foot well pad would disturb approximately 4.4 acres, bringing the total anticipated new disturbance to 5.1 acres (Table 3).

The spacing unit consists of 640 acres (+/-) with the bottom hole located approximately 5,357 feet southeast of the surface hole location in the SW¼ SE¼ of Section 32, T152N, R94W (Figure 27). Specific information on the location of the drilling target and lease is described in Table 1. A setback of at least 500 feet from the section line would be maintained.

Figure 26. Riverview 01-32H well pad area, view facing southwest.

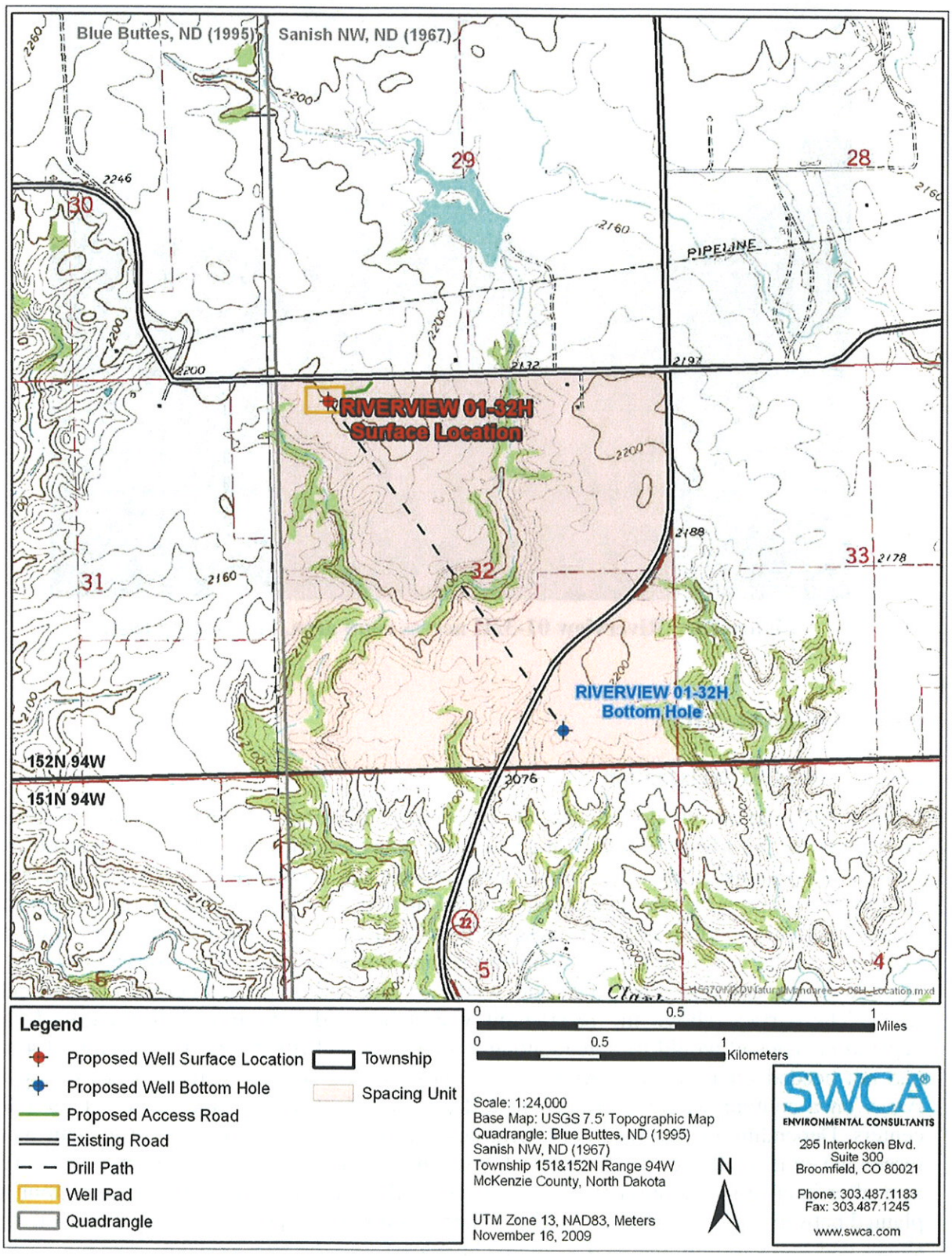

Figure 27. Riverview 01-32H proposed surface and bottom hole locations.

Figure 28. Riverview 01-32H access road area, view facing east.

2.10 RECLAMATION

2.10.1 Interim Reclamation

Interim reclamation would consist of reclaiming all areas not needed for production operations for the life of a well. Rat and mouse holes would be filled and compacted from bottom to top immediately after release of the drilling rig. Immediately after well completion, all equipment and materials unnecessary for production operations would be removed from a location and surrounding area. The reserve pit would be closed and reclaimed no later than October 1 of the year following drilling and completion operations. The reserve pit would be allowed to dry, and a pit liner, if plastic, would be torn and perforated before a reserve pit is filled. The surface above the reserve pit would be seeded to re-establish native/desired vegetation. Topsoil would be spread along a road's cut and fill slopes. The portion of a well pad not needed for production would be recontoured and covered with 6 inches of topsoil. Areas on a contour would be ripped to a depth of 1 foot using ripper teeth set on 1-foot centers. Depending on seasonal considerations and weather conditions, the proponent would reseed the entire drill pad and access road, resulting in a long-term surface disturbance of 0.25 acre after interim reclamation to 2 acres or less. All seed would be drilled on a contour and planted between 0.25 and 0.50 inch deep. Where drilling is not possible, for example, on steep slopes and rocky terrain, the seed would be broadcast, and the area would be raked or chained to cover the seed. Seed types and application rates would be determined by the AO. The remaining well pad would comprise long-term disturbance for the life of the well.

The proponent would control noxious weeds within the exterior boundaries of access roads, well sites, or other applicable facilities by spraying or mechanical removal. Weed control would be conducted in accordance with procedures established by all applicable authorities. Drainage ditches and/or culverts would be maintained to free-flowing conditions.

2.10.2 Final Reclamation

A depleted well bore would be plugged and abandoned in accordance with applicable state or federal regulations. Typically, all surface facilities associated with a well would be removed during final reclamation. Disturbed surfaces would be returned to the approximate original contours of the land prior to reseeding. Cut and fill slopes would be graded to a 3:1 ratio or less. All topsoil would be re-stripped from areas where interim reclamation had been performed and redistributed over the entire location and access road. The entire disturbed area would be scarified to a depth of 12 inches on 8-inch intervals. Water bars would be constructed where grades are less than 8%. The entire disturbed area, including the former access road and well pad, would be reseeded with the specified seed mixture. Exceptions to these reclamation measures might occur if the BIA approves assignment of an access road either to the BIA roads inventory or to concurring surface allottees. Figure 29 shows an example of appropriate reclamation.

The well pad and access road are constructed to the minimum size necessary to safely conduct drilling and completion operations.

The well pad and access road have been recontoured back to the original contour, the topsoil respread, and the site revegetated.

Figure 29. Example of reclamation from the BLM Gold Book (USDI and USDA 2007).

2.11 RESOURCE PROTECTION MEASURES AND COMMITMENTS

The proponent would implement the following general applicant-committed measures during construction, operation, and reclamation of proposed facilities:

1. Construction materials would not be removed from federally administered or tribal lands without approval from the AO.
2. Construction operations would not occur using frozen or saturated soils or during periods when watershed damage would be likely to occur.
3. When conditions warrant, water would be applied during construction operations to EOG's existing and proposed access roads and well pads to minimize soil loss from wind transport.
4. Each well would be drilled as soon as possible after approval of its APD.
5. EOG has incorporated all safety measures in the design, construction, operation, and maintenance procedures for the proposed wells and their facilities. A designated EOG representative would be present on location during all construction operations. Accidents to persons or property would be reported immediately to the AO.
6. EOG is committed to working with the BIA and tribes in future transportation planning efforts. EOG would cooperate with landowner, tribal, and BIA requests for road alignments and sharing of roads. EOG would cooperate with nearby operators on siting and use of shared roads, if known at the time of permitting. Where EOG would share an access road with another operator(s), it would cooperate with the other operator(s) to develop a mutually agreed-upon road maintenance plan, which would incorporate tribal, BIA, and BLM standards.
7. EOG would fence all well pads constructed in crop lands. At such locations, a cattle guard or panel gate would be installed in the access road at the entrance of the well pad, where necessary.
8. EOG would fence each reserve pit in accordance with BIA specifications, specific APDs, and directions specified at pre-construction on-site inspections.
9. EOG would comply with all Tribal Employment Rights Office requirements.

The following well-specific resource protection measures have been applied based on feedback during BIA and BLM on-site visits.

Mandaree 02-09H: None needed.

Mandaree 04-15H: Moved well pad and access road from original location to avoid cultural resources.

Mandaree 05-16H: None needed.

Mandaree 06-20H: None needed.

Mandaree 12-07H: None needed.

Bear Den 08-21H: Will install and maintain proper best management practices (BMPs) to limit erosion of nearby hillsides.

Clarks Creek 01-21H: None needed.

Clarks Creek 03-08H: Will install and maintain proper BMPs to limit sedimentation into adjacent drainage along southeast corner of well pad.

Riverview 01-32H: Will install and maintain proper BMPs to limit sedimentation into adjacent drainage along west side of well pad.

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2.12 TOTAL SURFACE DISTURBANCE

In total, approximately 44.0 acres would be disturbed for well pad construction and 39.2 acres for construction of access roads. Surface disturbance acreage was calculated using the assumption that each well would be a producing well. Of the total ROW disturbance, approximately 4.39 miles of disturbance would be on tribal lands, and 0.53 mile would be on fee (private) lands. Table 3 summarizes the surface disturbance estimates for each proposed well. Table 4 presents additional detail on ROW lengths on private and tribal/allotted lands.

Table 3. Surface Disturbance Details.

Well	Access Road				Well Pad			Total Disturbance (acres)
	Construct / Upgrade	Length (miles)	ROW width (feet)[1]	ROW Disturbance (acres)	Length (feet)	Width (feet)	Well Pad Disturbance (acres)	
Mandaree 02-09H	Construct	0.38	66	3.0	550	390	4.9	7.9
Mandaree 04-15H	Construct	1.1	66	8.8	550	380	4.8	13.6
Mandaree 05-16H	Construct/Upgrade	0.74[2]	66	5.9	550	410	5.1	11.0
Mandaree 06-20H	Construct	1.3	66	10.4	550	420	5.4	15.8
Mandaree 12-07H	Construct	0.12	66	1.0	550	400	5.0	6.0
Bear Den 08-21	Construct	0.38	66	3.0	550	380	4.8	7.8
Clarks Creek 01-21H	Construct/Upgrade	0.48[3]	66	3.8	550	410	5.1	8.9
Clarks Creek 03-08H	Construct	0.33	66	2.6	550	360	4.5	7.1
Riverview 01-32H	Construct	0.09	66	0.7	550	350	4.4	5.1
Total		**4.92**		**39.2**			**44.0**	**83.2**

[1] Although EOG would construct an access road with a 40-foot subgrade, the ROW would be 66 feet.
[2] Of the total 0.74 mile length of access to the Mandaree 05-16H well pad, 0.55 mile is upgrade of an existing unimproved road.
[3] Of the total 0.48 mile length of access to the Clarks Creek 01-21H pad, 0.2 mile is upgrade of an existing unimproved road.

Table 4. Additional ROW Details.

Well	Total ROW Length (miles)	ROW Length on Private (Fee) Surface (miles)	ROW Length on Tribal Land (miles)
Mandaree 02-09H	0.38	0	0.38
Mandaree 04-15H	1.10	0	1.10
Mandaree 05-16H	0.74	0.40	0.34
Mandaree 06-20H	1.30	0.13	1.17
Mandaree 12-07H	0.12	0	0.12
Bear Den 08-21	0.38	0	0.38
Clarks Creek 01-21H	0.48	0	0.48
Clarks Creek 03-08H	0.33	0	0.33
Riverview 01-32H	0.09	0	0.09
Total	**4.92**	**0.53**	**4.39**

2.13 PERSONNEL REQUIREMENTS AND SCHEDULING

The quantification of personnel and vehicles presented in Table 5 are typical average values. Actual personnel and vehicles on location at any particular time may vary.

Table 5. Personnel Requirements and Scheduling.

Activity	Duration of Activity (average days per well)	Daily Personnel (average number per well)	Daily Passenger Vehicle Trips (per well)
Construction	5	6	2
Drilling	30	15	18
Completion/Installation of Facilities	20	10	15
Production	ongoing – life of well	2	2

Two to three pieces of heavy equipment, such as bulldozers and motor graders, would be used to perform the earth-moving operations during construction operations. Duration of drilling operations would likely vary depending on depth and conditions encountered while drilling. The time required for drilling operations includes the time needed to rig up and rig down. EOG anticipates drilling each well sequentially, or as the timing of APD approval allows.

2.14 PREFERRED ALTERNATIVE

The Preferred Alternative is to complete all administrative actions and approvals necessary to authorize or facilitate oil and gas developments at the nine proposed well locations.

3.0 THE AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

The Reservation is the home of the Three Affiliated Tribes of the MHA Nation. Located in west-central North Dakota, the Reservation encompasses more than one million acres, of which almost half are held in trust by the United States for either the MHA Nation or individual allottees. The remainder of the land is owned in fee simple title, sometimes by the MHA Nation or tribal members, but usually by non-Indians. The Reservation occupies portions of six counties, including Dunn, McKenzie, McLean, Mercer, Mountrail, and Ward. In 1945, the Garrison Dam was completed, inundating much of the Reservation. The remaining land was divided into three sections by Lake Sakakawea, an impoundment of the Missouri River upstream of the Garrison Dam.

The proposed wells and access roads are situated geologically within the Williston Basin, where the shallow structure consists of sandstones, silts, and shales dating to the Tertiary period (65 to 2 million years ago), including the Sentinel Butte and Golden Valley formations. The underlying Bakken Formation is a well-known source of hydrocarbons; its middle member is targeted by the proposed project. Although earlier oil and gas exploration activity within the Reservation was limited and commercially unproductive, recent economic changes and technological advances now make accessing oil in the Bakken Formation feasible.

The Reservation is within the northern Great Plains ecoregion, which consists of four physiographic units: 1) the Missouri Coteau Slope north of Lake Sakakawea, 2) the Missouri River trench (not flooded), 3) the Little Missouri River badlands, and 4) the Missouri Plateau south and west of Lake Sakakawea (Williams and Bluemle 1978). Much of the Reservation is on the Missouri Coteau Slope. Elevations of the glaciated, gently rolling landscape ranges from a normal pool elevation of 1,838 feet at Lake Sakakawea to over 2,600 feet on Phaelan's Butte near Mandaree. Annual precipitation on the plateau averages between 15 and 17 inches. Mean temperatures fluctuate between -3 and 21 degrees Fahrenheit (°F) in January and between 55°F and 83°F in July, with 95 to 130 frost-free days each year (Bryce et al. 1998; High Plains Regional Climate Center 2008).

The proposed well sites are in a rural area consisting of mostly grassland, shrubland, and cropland that is currently farmed, idle, or used to graze livestock. The landscape has been previously disturbed by dirt trails and gravel and paved roadways. Seventeen residences, outside of the town of Mandaree, are located within 1 mile of the proposed well sites, but none are closer than 1,513 feet (Table 6).

Table 6. Distance and Direction from Proposed Wells to Nearest Home.

Proposed Well	Feet to Nearest Home	Direction to Nearest Home
Mandaree 02-09H	1,513	East
Mandaree 04-15H	3,114	West
Mandaree 05-16H	2,557	East
Mandaree 06-20H	8,307	Northeast
Mandaree 12-07H	8,887	Northeast
Bear Den 08-21	7,431	South
Clarks Creek 01-21H	7,221	West
Clarks Creek 03-08H	4,619	West
Riverview 01-32H	2,272	West

The broad definition of the human and natural environment under NEPA leads to the consideration of the following elements: air quality, public health and safety, water resources, wetland/riparian habitat, threatened and endangered species, soils, vegetation and invasive species, cultural resources, socioeconomic conditions, and environmental justice. Potential impacts to these elements are analyzed for both the No Action Alternative and the Preferred Alternative. Impacts may be beneficial or detrimental, direct or indirect, and short-term or long-term. This EA also analyzes the potential for cumulative impacts and ultimately makes a determination as to the significance of any impacts. Following discussion of the No Action Alternative below, existing conditions and potential impacts from the proposed project are described.

3.1 THE NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed project would not be constructed, drilled, installed, or operated. Existing conditions would not be impacted for the following critical elements: air quality, public health and safety, water resources, wetland/riparian habitat, threatened and endangered species, soils, vegetation and invasive species, cultural resources, socioeconomic conditions, and environmental justice. There would be no project-related ground disturbance, use of hazardous materials, or trucking of product to collection areas. Surface disturbance, trucking, and other traffic would not change from present levels. Under the No Action Alternative, the MHA Nation, tribal members, and allottees would not have the opportunity to realize potential financial gains resulting from the discovery of resources at these well locations.

3.2 AIR QUALITY

The federal Clean Air Act, as amended in 1990, established National Ambient Air Quality Standards (NAAQS) for criteria pollutants to protect public health and welfare. The Clean Air Act also set standards for other compounds that can cause cancer, regulated emissions that cause acid rain, and required federal permits for large sources. National standards have been established for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead (Pb). These standards were set for pervasive compounds that

are generally emitted by industry or motor vehicles. Standards for each pollutant meet specific public health and welfare criteria; thus, they are called the "criteria pollutants." Some states have adopted more stringent standards for criteria pollutants or have chosen to adopt new standards for other pollutants. For instance, North Dakota has a standard for hydrogen sulfide (H_2S) that the U.S. Environmental Protection Agency (EPA) does not.

The North Dakota Department of Health (NDDH) network of Ambient Air Quality and Monitoring (AAQM) stations includes Watford City in McKenzie County, Dunn Center in Dunn County, and Beulah in Mercer County. These stations are located west, south, and southeast of the proposed well sites, respectively. Criteria pollutants tracked under NAAQS of the Clean Air Act include SO_2, PM, NO_2, and O_3. Two other criteria pollutants—Pb and CO—are not monitored by any of the three stations.

3.2.1 Criteria Pollutants

Sulfur Dioxide (SO_2) – is a colorless gas with a strong, suffocating odor. SO_2 is produced by burning coal, fuel oil, and diesel fuel. SO_2 can trigger constriction of the airways, causing particular difficulties for asthmatics. SO_2 emissions are also a primary cause of acid rain and plant damage.

Particulate Matter (PM) – is a class of compounds that can lodge deep in the lungs causing health problems. PM is regulated under two classes; PM_{10} is the fraction of total PM 10 microns or smaller, and $PM_{2.5}$ is two and a half microns or smaller. PM can range from inorganic wind-blown soil to organic and toxic compounds found in diesel exhaust.

Nitrogen Dioxide (NO_2) – is a reddish-brown gas with an irritating odor. Primary sources include motor vehicles, industrial facilities, and power plants. In the summer months, NO_2 is a major component of photochemical smog. NO_2 is an irritating gas that may constrict airways, especially of asthmatics, and increase the susceptibility to infection in the general population. NO_2 is also involved in ozone smog production.

Ozone (O_3) – is a colorless gas with a pungent, irritating odor and creates a widespread air quality problem in most of the world's industrialized areas. O_3 smog is not emitted directly into the atmosphere but is primarily formed through the reaction of hydrocarbons and nitrogen oxides in the presence of sunlight. The health effects of O_3 can include reduced lung function, aggravated respiratory illness, and irritated eyes, nose, and throat. O_3 can persist for many days after formation and travel several hundred miles.

Carbon Monoxide (CO) – is a colorless, odorless gas that is a byproduct of incomplete combustion. Ambient levels are typically found during periods of stagnant weather, such as on still winter evenings with a strong temperature inversion. CO is readily absorbed into the body from the air. It decreases the capacity of the blood to transport oxygen, leading to health risks for unborn children and people suffering from heart and lung disease.

The federal and state governments have set standards based on set criteria for various air pollutants caused by human activity. Table 7 summarizes federal air quality standards and available air quality data from the three-county study area.

North Dakota has separate state standards for several pollutants that are different from the federal criteria standards. These are:

- SO_2 (parts per million [ppm]) – 0.023 annual arithmetic mean, 0.099 24-hour concentration, and 0.273 one-hour concentration.
- H_2S (ppm) – 10 instantaneous, 0.20 one-hour, 0.10 24-hour, and 0.02 3-month arithmetic mean

All other state criteria pollutant standards are the same as federal as shown in Table 7.

Table 7. National Ambient Air Quality Standards and Data.

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)	NAAQS (ppm)	County	
				Dunn	McKenzie
SO_2	24-hour	365	0.14	0.003 ppm	0.004 ppm
	Annual Mean	80	0.03	0.000 ppm	0.001 ppm
PM_{10}	24-hour	150	–	53 $\mu g/m^3$	45 $\mu g/m^3$
	Annual Mean	50	–	15 $\mu g/m^3$	11$\mu g/m^3$
$PM_{2.5}$	24-hour	35	–	–	–
	Weighted Annual Mean	15	–	–	–
NO_2	Annual Mean	100	0.053	0.002 ppm	0.01 ppm
CO	1-hour	40,000	35	–	–
	8-hour	10,000	9	–	–
Pb	3-month	1.5	–	–	–
O_3	1-hour	240	0.12	0.065 ppm	0.067 ppm
	8-hour	–	0.75	0.060 ppm	0.062 ppm

Source: EPA 2008.
$\mu g/m^3$ = micrograms per cubic meter; ppm = parts per million.

The air pollutant data shown in Table 7 indicate that Dunn and McKenzie counties are below established NAAQS and are therefore designated as attainment areas for all criteria pollutants. North Dakota was one of 13 states that met standards for all federal criteria pollutants in 2008.

The counties addressed in Table 7 are also in full attainment and usually far below established limits (American Lung Association 2006). All of the counties contained within the Reservation can be expected to have similar air quality conditions to McKenzie and Dunn counties.

In addition to these criteria pollutants, there is a class of compounds known to cause health problems called Hazardous Air Pollutants (HAPs). HAPs are usually a localized problem near the emission source and are regulated separately from criteria air pollutants. There are several hundred HAPs recognized by the EPA and the state of North Dakota. Unlike regulations for criteria pollutants, there are no ambient air quality standards for HAPs. Examples of HAPs found in gases released by oil field development and operation include benzene, toluene, xylene, and formaldehyde (BLM 2009). The NDDH typically reviews projects and either requires an applicant to prepare a risk assessment or assign the state engineers to do the work. The state requires that maximum individual cancer risk be calculated using its adopted protocol (the

Determination of Compliance in the state's Air Toxics Policy). For new sources emitting HAPs with known negative health effects, an applicant must demonstrate that the combined impact of new HAP emission does not result in a maximum individual cancer risk greater than $1 \times {}^{10\text{-}5}$ (one in one hundred thousand).

The Clean Air Act and its amendments also established the mandatory federal Prevention of Significant Deterioration (PSD) Class I and Class II designation. Mandatory federal Class I areas include existing wilderness areas larger than 5,000 acres and national parks, monuments, and seashores larger than 6,000 acres. All other locations in the country where ambient air quality is within the NAAQS (including attainment and unclassified areas) are designated as PSD Class II areas. Both classes are protected under the PSD regulations, which limit the incremental amount by which pollution levels are allowed to increase above historical levels. Class I areas are identified for somewhat more stringent protection from air pollution damage than Class II areas, except in specified cases. The Reservation can be considered a Class II attainment airshed, which affords it a lower level of protection from significant deterioration.

It should be noted that the EPA published a notice in the Federal Register on March 27, 2008, that stated the NAAQS for ozone has been lowered to 0.075 ppm (40 CFR Parts 50 and 58). The EPA will issue a separate rule to address monitoring requirements necessary to implement the new standards, and the agency intends to issue a final rule in 2009; the EPA will issue designations of attainment, nonattainment, and unclassifiable areas no later than March 2010.

3.2.2 Project Emissions

The proposed project is similar to other projects installed nearby with the approval of state offices and would result in the temporary and intermittent release of combustion, fugitive, and vented emissions. Combustion emissions include SO_2, ozone precursors called volatile organic compounds (VOCs), greenhouse gases (GHGs), and HAPs. Sources include engine exhaust, dehydrators, and flaring. Fugitive emissions include criteria pollutants, H_2S, VOCs, HAPs, and GHGs. Potential sources of these emissions from the proposed project include evaporation pits, produced water tanks, storage tanks, windblown dust from truck and tanker traffic, and construction activity. However, road dust would be controlled as necessary and other BMPs implemented as necessary to limit emissions to the immediate project area (BLM 2009). Vented emissions include GHGs, VOCs, and HAPs. Primary sources are emergency pressure relief valves and dehydrator vents.

3.2.3 Regulatory Emission Controls

Under the Clean Air Act, federal land management agencies have an affirmative responsibility to help protect air quality. The tribes, federal land managers, and the State of North Dakota can make emission controls part of a lease agreement. The proposed project is similar to other projects installed nearby with state approval. State policy for permitting new oil and gas wells is as follows: any oil or gas well production facility that emits or has the potential to emit 250 tons per year or more of any air contaminant regulated under North Dakota code must comply with state permitting requirements. The discussion outlines requirements for control of emissions from treaters, separators, flares, tanks, and other onsite equipment.

The North Dakota Air Pollution Control Rules (2009) require that the owner/operator submit an oil/gas facility registration form. This form must include an analysis of any gas produced from the well. The following sources must register oil and gas wells with the NDDH:

1. Any oil and gas well that is/was completed or re-completed on or after July 1, 1987, must have a registration form submitted within 90 days of the completion or re-completion of the well.
2. The owner or operator of any oil or gas well shall inform the NDDH of any change to the information contained on the registration form for a particular well. The owner shall submit a new gas analysis if the composition or the volume of the gas produced from the well has changed from the previous analysis and causes an increase of 10 tons per year or more of sulfur compounds.
3. North Dakota rules require that all new sources of H_2S and VOCs be flared or treated in an equally effective manner. Flares must have an auto igniter or pilot light. The stack height of flares would be sufficient to allow dispersion of the flared gas. The gas produced from the Baaken Formation is typically low in H_2S so odors from fugitive gas leaks are not expected to be a problem.
4. Chapter 33-15.03.03 of the state rules specify that fugitive dust emissions greater than 40% opacity cannot leave the project site for more than one six-minute period per hour. This applies to all construction and unpaved road emission sources.

It is anticipated that the implementation of BMPs, in concert with the regulatory emissions controls, would result in no detectable or long-term impacts to air quality or visibility within the airsheds of the Reservation, state, or Theodore Roosevelt National Park. No laws, regulations, or other requirements have been waived; no monitoring of compensatory measures is required.

3.3 PUBLIC HEALTH AND SAFETY

Health and safety concerns include naturally occurring toxic gases, hazardous materials used or generated during installation or production, and hazards posed by heavy truck traffic associated with drilling, completion, and production activities.

H_2S is extremely toxic in concentrations above 500 ppm, but it has not been found in measurable quantities in the Bakken Formation. Before reaching the Bakken, however, drilling would penetrate the Mission Canyon Formation, which is known to contain varying concentrations of H_2S. Contingency plans submitted to the BLM comply fully with relevant portions of Onshore Oil and Gas Order No. 6 to minimize potential for gas leaks during drilling. Emergency response plans protect both the drilling crew and the general public within 1 mile of a well; precautions include automated sampling and monitoring by drilling personnel stationed at each well site.

As listed in Table 6, satellite imagery identified 17 homes, outside of the town of Mandaree, within 1 mile of any proposed well site. The nearest homes are 1,513 feet from Mandaree 02-09H, 2,272 feet from Riverview 01-32H, 2,557 feet from Mandaree 05-16H, and 3,114 feet from Mandaree 04-15H. None of the aforementioned nearby homes is located in the principle downwind direction (northwest), according to 2008 data from the AAQM site at the Dunn Center monitoring site (NDDH 2009). Mandaree 02-09H is located within 0.5 mile of the town of

Mandaree and the other four Mandaree wells are located within 3 miles of the town of Mandaree, but all are in the opposite direction of the principle downwind flow. Release of H_2S at dangerous concentration levels is very unlikely, and no direct impacts from H_2S are anticipated with implementation of standard mitigation measures.

Other potential negative impacts from construction would be largely temporary. Noise, fugitive dust, and traffic hazards would be present for about 55 days during construction, drilling, and well completion, and then diminish sharply during commercial operations. For each of the nine proposed well sites, it is estimated that two passenger vehicle trips would be needed during construction and 15 to 18 trips during drilling and well completion. Any wells that prove productive would require that one small pumper truck visit the pad once a day to check the pump. Bakken wells typically produce both oil and water at a high rate initially. Gas would be flared initially, while oil and produced water would be stored on each well pad in tanks and hauled out by tankers until the well could be connected to gathering pipelines. Up to eight 400-barrel oil tanks and one 400-barrel water tank would be located on the pad inside a berm of impervious compacted subsoil. The berm would be designed to hold 110% of the capacity of the largest tank. The proponent would develop and maintain site-specific SPCCPs for each production facility.

Tanker trips would depend on production, but an estimate of trips per well pad is presented in Table 2. Trucks for normal production operations must use the existing and proposed access roads. Produced water would be transported to the Wayzetta 100-26 disposal site (located in Section 26, T153N, R90W, Mountrail County) or other approved disposal facility. All traffic would be confined to approved routes and conform to established load restrictions and speed limits for state and BIA roadways and haul permits would be acquired as appropriate.

The EPA specifies chemical reporting requirements under Title III of SARA, as amended. No chemicals subject to reporting under SARA Title III (hazardous materials) in an amount greater than 10,000 pounds would be used, produced, stored, transported, or disposed of annually in association with the Proposed Action. Furthermore, no extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities would be used, produced, stored, transported, or disposed of in association with the Proposed Action. All operations, including flaring, would conform to instructions from BIA fire management staff.

A temporary reserve pit would be constructed within the disturbed area of each well pad and constructed so as not to leak, break, or allow discharge and in a way that minimizes the accumulation of precipitation runoff into the pit. A reserve pit liner would have permeability less than 10^{-7} centimeters per second and burst strength greater than or equal to 300 psi or puncture strength greater than or equal to 160 psi and grab tensile strength greater than or equal to 150 psi.

Spills of oil, produced water, or other produced fluids would be cleaned up and disposed of in accordance with appropriate regulations. Sewage would be contained in a portable chemical toilet during drilling. All trash would be stored in a trash cage and hauled to an appropriate landfill during and after drilling and completion operations.

3.4 WATER RESOURCES

3.4.1 Surface Water

The well pads and access roads are located within the Lake Sakakawea and Lower Little Missouri River subbasins (Figures 30 through 32). Table 8 lists the subbasin and watershed in which each well pad and access road is located. The major surface water feature in the project vicinity is Lake Sakakawea, which is located on the Missouri River. No perennial water bodies are located near the proposed wells or access roads. Given the topography of the individual sites over the project area, runoff occurs largely as sheet flow. Figures 30 through 32 show the direction of surface runoff throughout the vicinity. Figures 33 through 37 show the direction of flow for the ephemeral tributaries in the project area. Runoff that concentrates near the proposed well areas would flow to Squaw Creek, Boggy Creek, or Bear Den Creek, which all subsequently flow into Lake Sakakawea.

Table 8. Watersheds within the Project Areas.

Subbasin/HUC	Watershed/HUC	Project Area
Lake Sakakawea/10110101	Bear Den Bay/101101012004	Bear Den 08-21H
	Boggy Creek/101101012101	Mandaree 02-09H (road)
	Upper Bear Den Creek/101101012001	Mandaree 12-07H Mandaree 06-20H
	Clarks Creek/101101011904	Clarks Creek 03-08H Clarks Creek 01-21H
Lower Little Missouri River/10110205	Upper Squaw Creek/101102050607	Mandaree 02-09H (well pad) Mandaree 05-16H Mandaree 04-15H

HUC = Hydrologic Unit Code

The proposed project would be engineered and constructed to minimize the suspended solid (i.e., turbidity) concentration of surface runoff, avoid disruption of drainages, and avoid direct impacts to surface water. On-site inspections considered topography, natural drainage, and erosion control at each proposed location. Any stormwater drainage issues were addressed at that time. For example, it was noted during an on-site inspection that the proposed Bear Den 08-21H well pad is in close proximity to a steep slope leading to the Bear Den Creek drainage. Proper BMPs would be used to avoid any erosion issues at this site. No other drainage issues were found at the other locations. Access roads would be crowned and ditched with water turnouts to ensure proper drainage. Water control features would be constructed as necessary to control erosion. All access roads crossing drainages would be constructed as low water crossings and corrugated metal pipe culverts would be installed along the access roads. Access roads would be maintained to prevent soil erosion and ensure safe conditions during the life of a well.

No surface water would be used for well drilling operations. Produced water would be transported from the tanks on each location by trucks to the Wayzetta 100-26 disposal site or another approved disposal facility. Any chemicals or potentially hazardous materials would be handled in accordance with the operator's SPCCP. Provisions established under this plan would minimize potential impacts to any surface waters associated with an accidental spill.

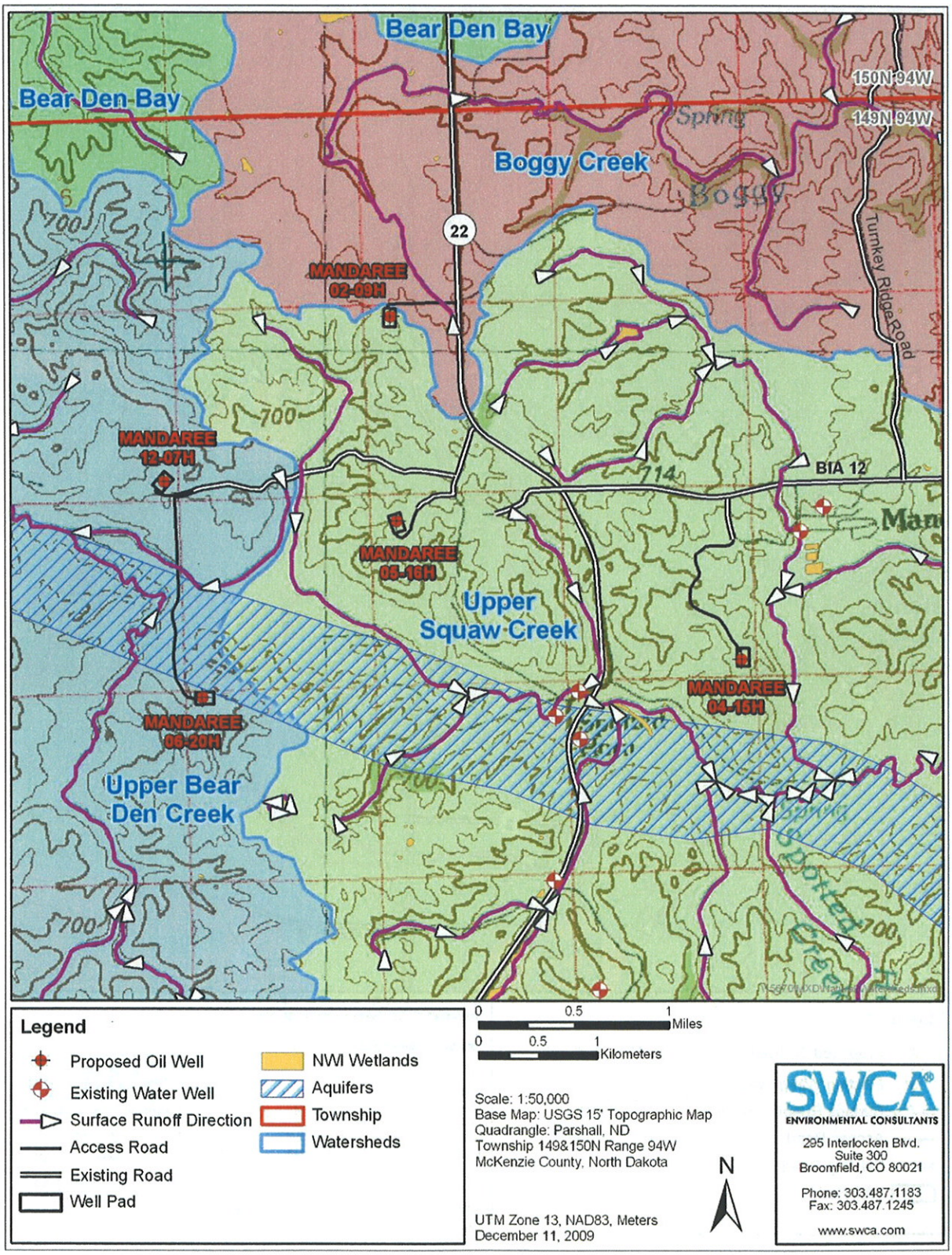

Figure 30. Watersheds, surface runoff direction, and aquifers near the Mandaree wells.

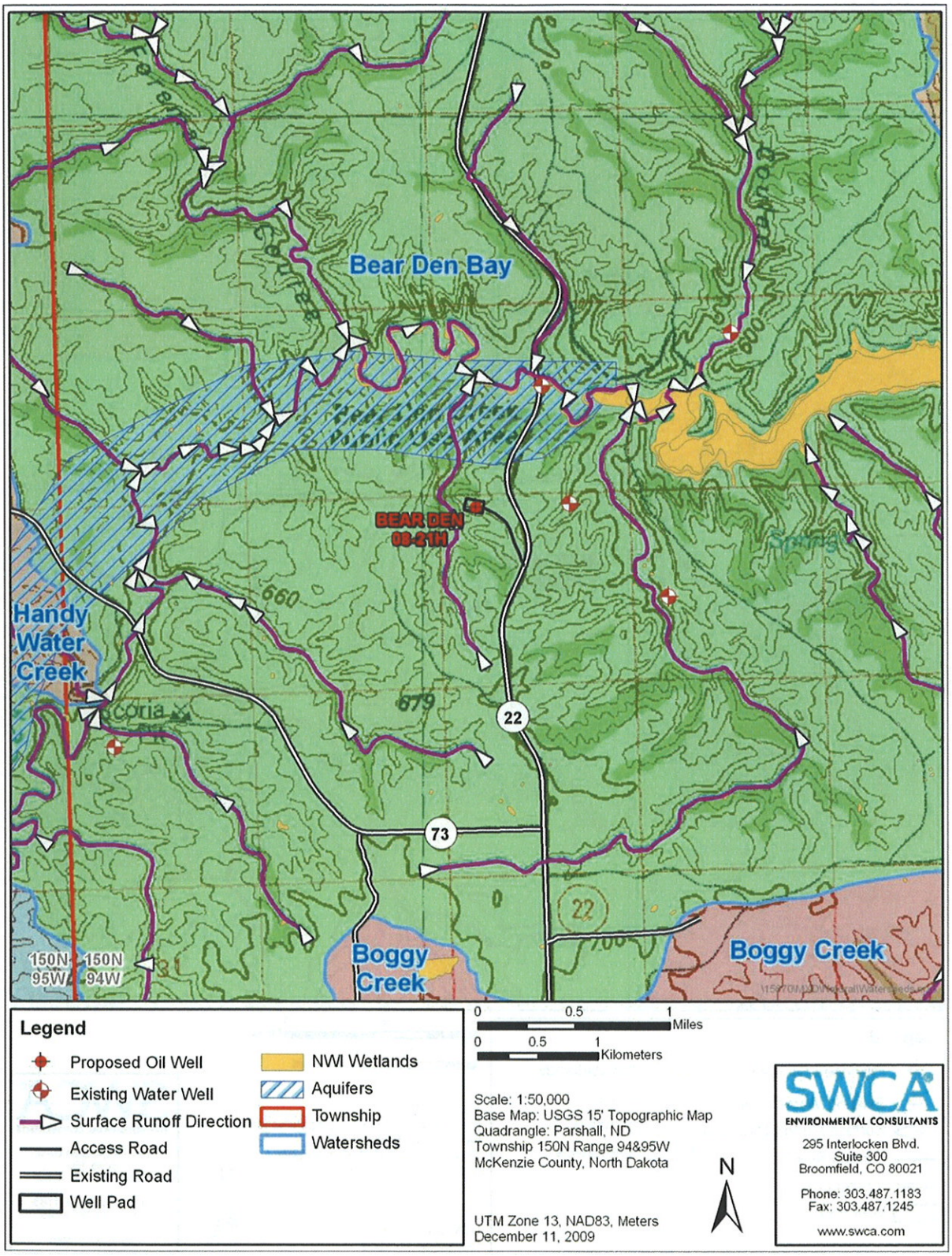

Figure 31. Watersheds, surface runoff direction, and aquifers near the Bear Den well.

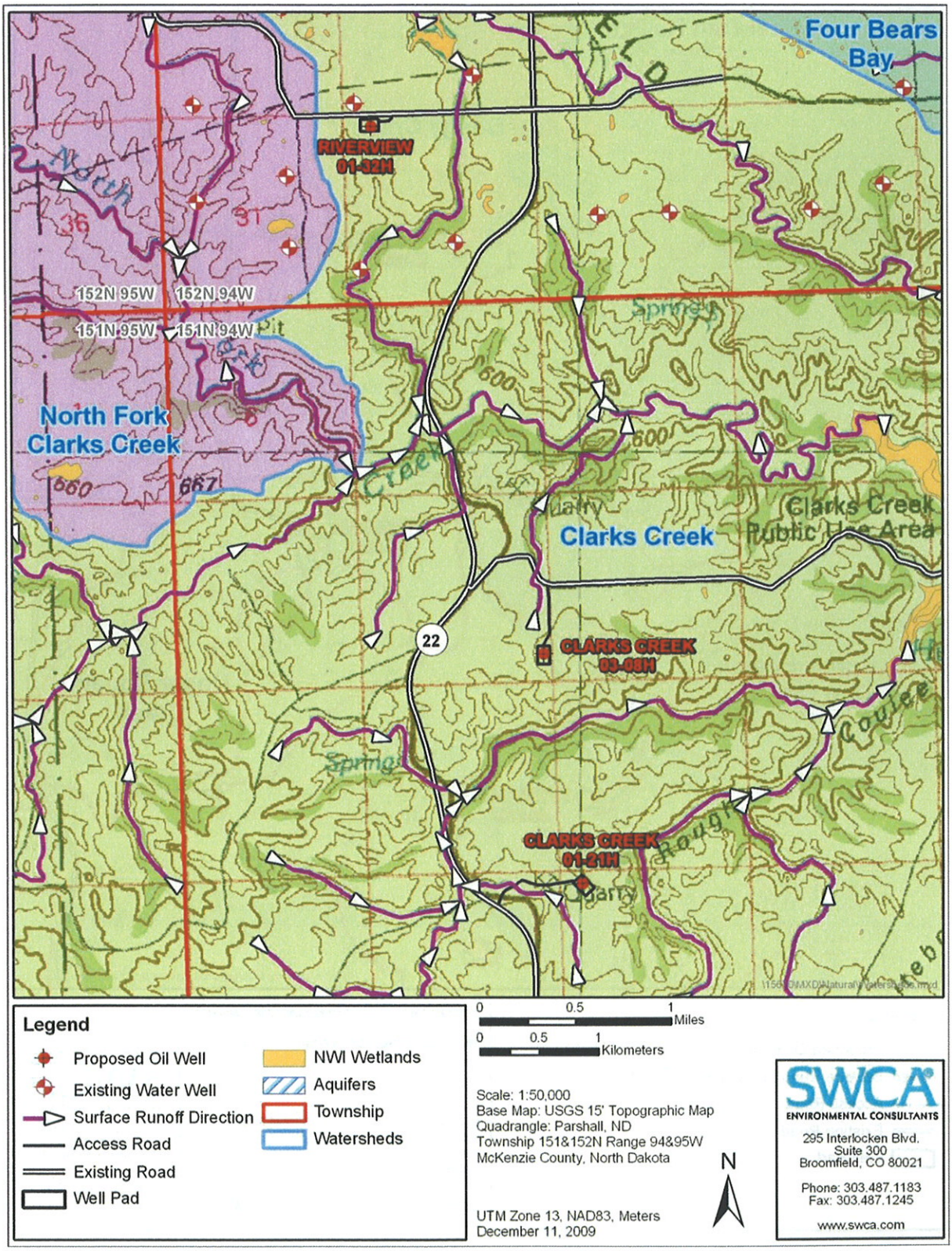

Figure 32. Watersheds, surface runoff direction, and aquifers near the Clarks Creek and Riverview wells.

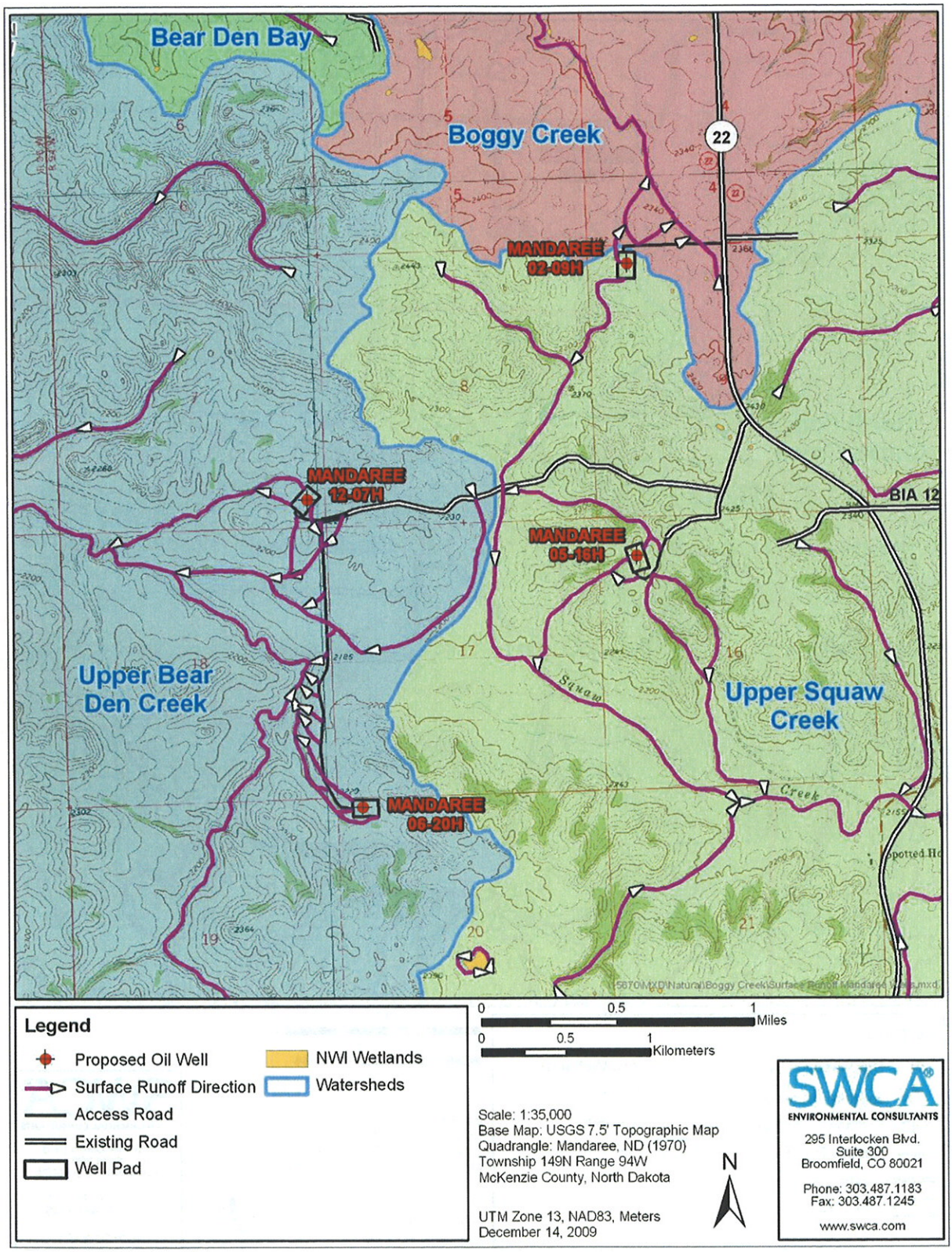

Figure 33. Drainage direction from each of the Mandaree wells.

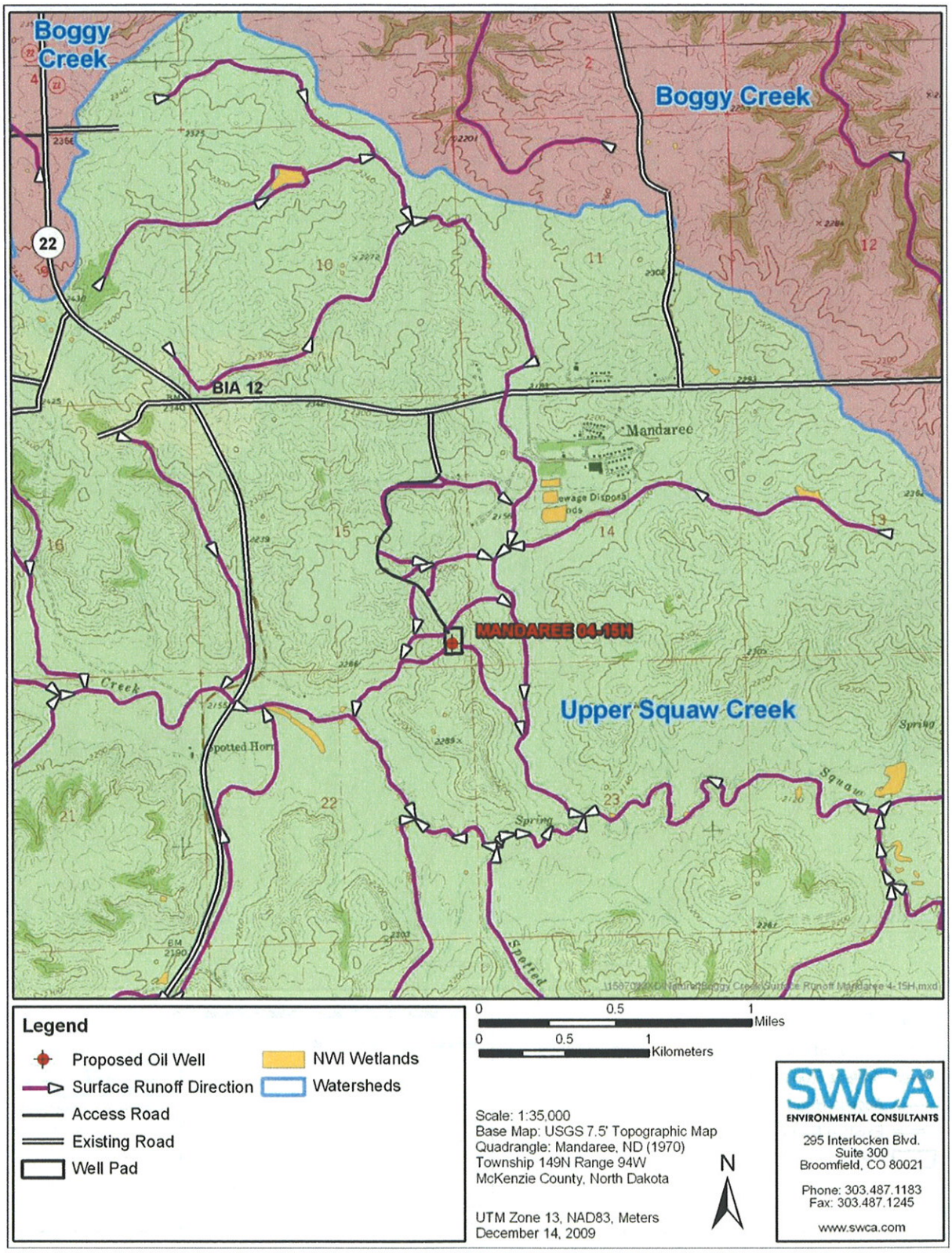

Figure 34. Drainage direction from Mandaree 04-15H.

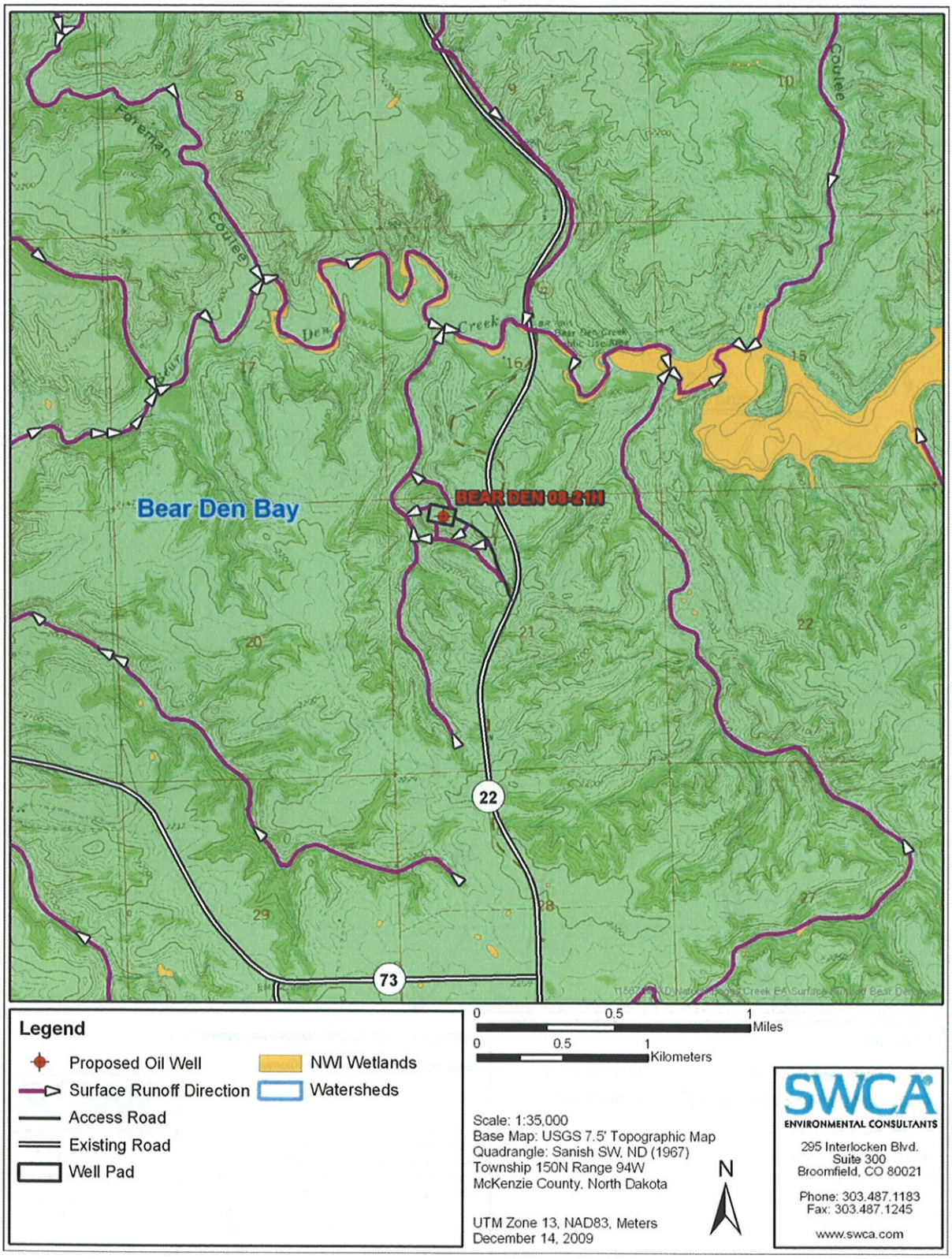

Figure 35. Drainage direction from Bear Den 08-21H.

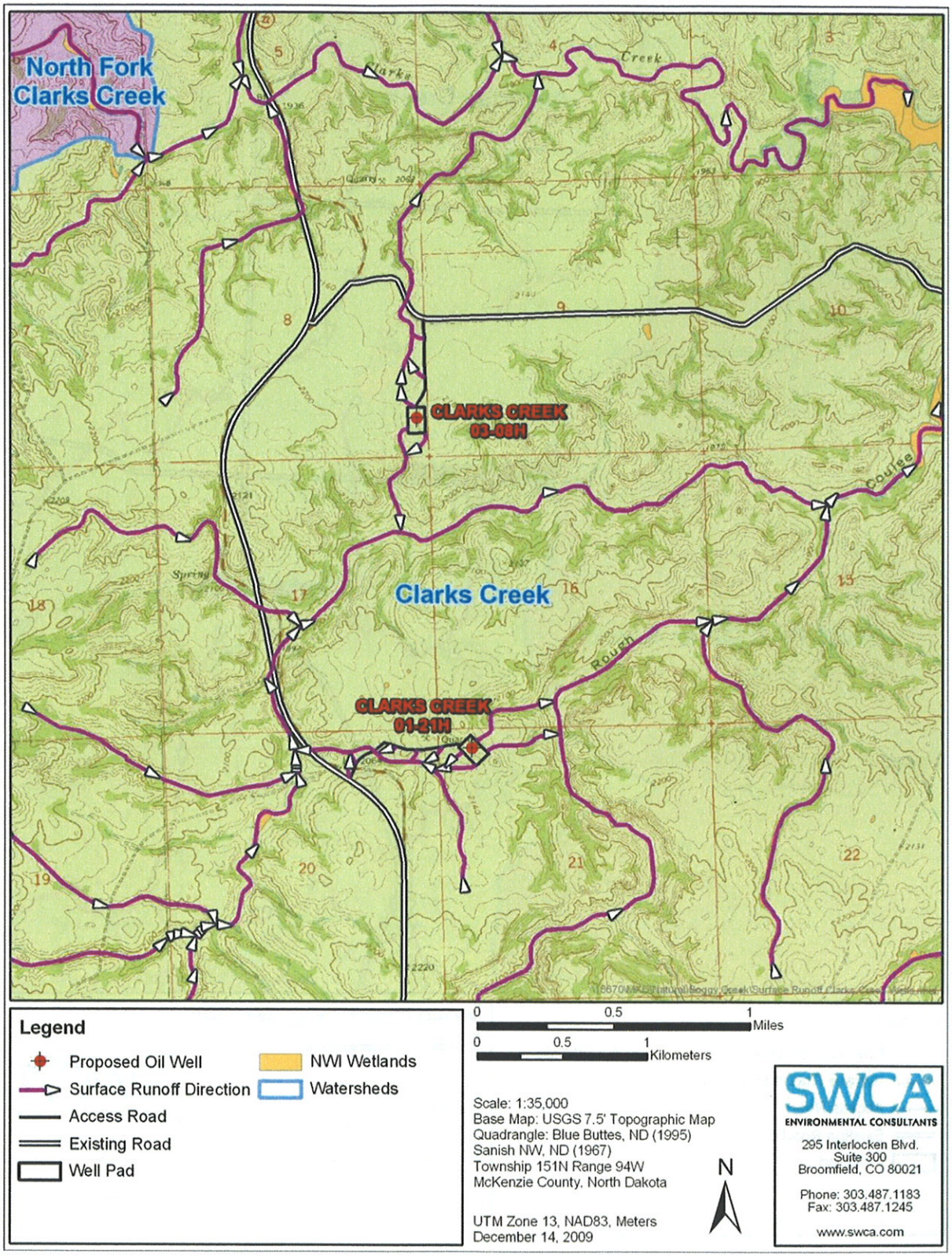

Figure 36. Drainage direction from each of the Clarks Creek wells.

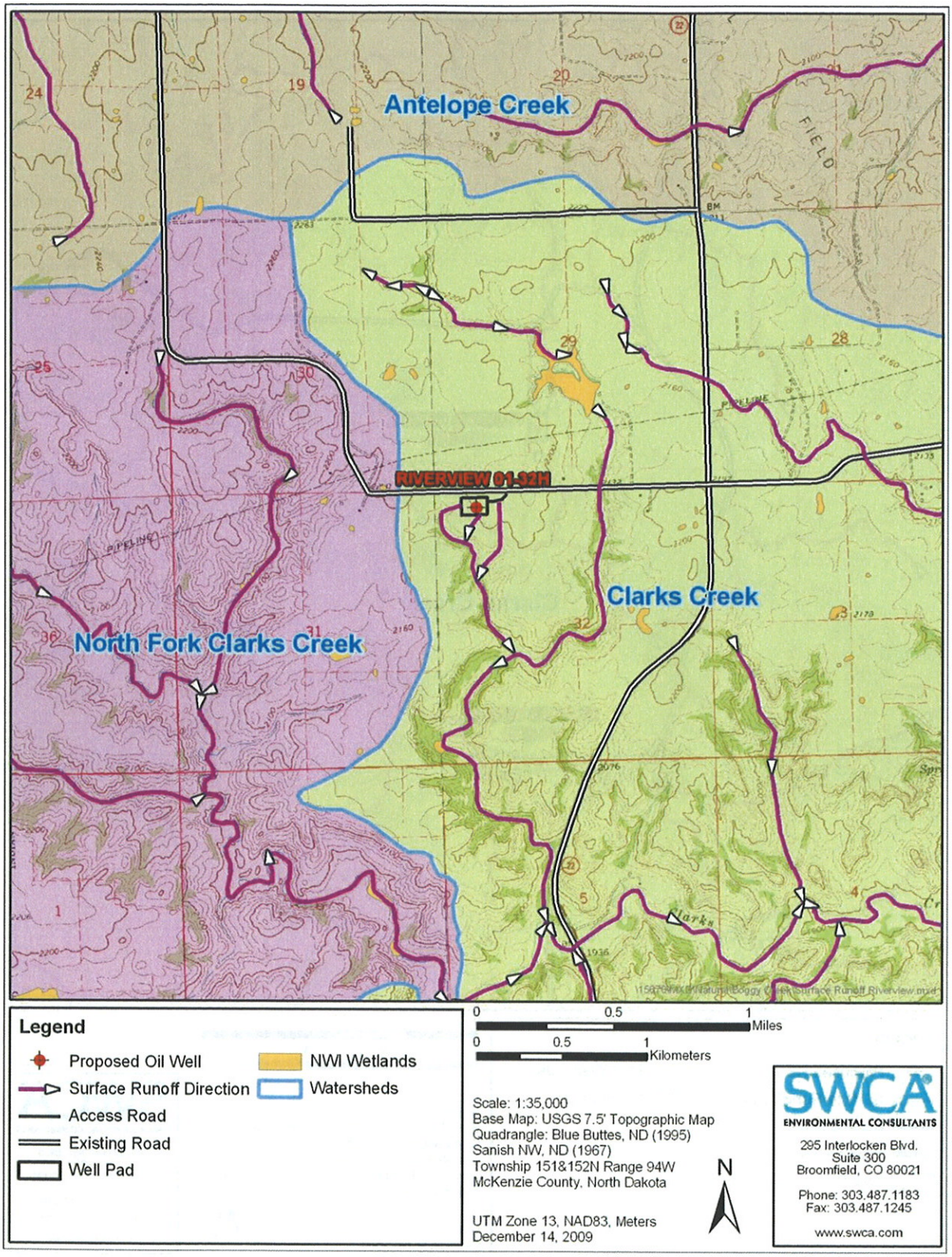

Figure 37. Drainage direction from Riverview 01-32H.

3.4.2 Groundwater

Aquifers in the project area include, from deepest to shallowest, the Cretaceous Fox Hills and Hell Creek formations and the Tertiary Ludlow, Tongue River, and Sentinel Butte formations (Table 9). Several shallow aquifers related to post-glacial outwash composed of till, silt, sand, and gravel are located in McKenzie County. None of these are within the proposed project areas, although the Mandaree 06-20H well is located just outside of the mapped boundary of the aquifer (see Figures 30 through 32). The shallow Sentinel Butte Formation, commonly used for domestic supply in the area, outcrops in Dunn County and meets standards of the NDDH (Croft 1985). Detailed analyses are available from the North Dakota Geological Survey, Bulletin 68, Part III, 1976.

Table 9. Common Aquifers in the Proposed Project Area and Surrounding Region.

Period	Formation		Depth Range (feet)	Thickness (feet)	Lithology	Water-yielding Characteristics
Quaternary	Alluvium		0–40	40	Silt, sand, and gravel	Maximum yield of 50 gal/min to individual wells from sand and gravel deposits.
Tertiary	Fort Union Group	Sentinel Butte	0–670	0–670	Silty, clay, sand, and lignite	5 to 100 gal/min in sandstone. 1 to 200 gal/min in lignite.
		Tongue River	140–750	350–490	Silty, clay, sand, and lignite	Generally less than 100 gal/min in sandstone.
		Cannonball/ Ludlow	500–1,150	550–660	Fine- to medium-grained sandstone, siltstone, and lignite	Generally less than 50 gal/min in sandstone.
Cretaceous	Hell Creek		1,000–1,750	200–300	Claystone, sandstone, and mudstone	5 to 100 gal/min in sandstone.
	Fox Hills		1,100–2,000	200–300	Fine- to medium-grained sandstone and some shale	Generally less than 200 gal/min in sandstone. Some up to 400 gal/min.

Source: Croft (1985) and Klausing (1979).
gal/min = gallons per minute

Review of electronic records of the North Dakota State Water Commission (NDSWC 2009) revealed 70 permitted water wells within an approximate 5-mile boundary of the proposed project areas (Table 10, Figures 30 through 32). The closest known water well is 0.1 mile from the Riverview 01-32H. All other water wells are at least 0.5 mile from proposed drilling. Water quality would be protected by implementing proper BMPs and construction practices. Drilling would proceed in compliance with Onshore Oil and Gas Order No. 2, Drilling Operations (43 CFR 3160).

Water use for the proposed wells includes 1,200 barrels per well for drilling and 25,000 barrels per well for hydraulic fracturing. The fresh water used to drill and complete the wells would be obtained from a permitted commercial source and would be hauled by truck to each location. A reserve pit would be temporarily used for the storage of fluids produced during testing operations. Fracture stimulation fluids would be flowed back into a pit for evaporation.

Implementation of proper hazardous materials management and using appropriate casing and cementing during well completion would prevent cross contamination between aquifers or the introduction of hazardous materials into aquifers. The majority of the identified groundwater wells likely have minimal hydrologic connections due to their respective distance from the project wells.

3.5 WETLANDS, HABITAT, AND WILDLIFE

3.5.1 Wetlands

National Wetland Inventory (NWI) maps maintained by the U.S. Fish and Wildlife Service (USFWS) identify several wetlands areas in the vicinity of the Proposed Action. According to the USFWS NWI database, several palustrine emergent freshwater wetlands and freshwater ponds are located near the 66-foot ROW of the proposed access roads and between 0.25 mile and 0.9 mile from the proposed well sites. In addition, Bear Den 8-21H is near a riverine wetland along Bear Den Creek. Table 11 shows the distance from each well site to the nearest wetland or water body. NWI wetlands are shown on Figures 30 through 37 in the Surface Water section.

A wetland assessment of the project by SWCA Environmental Consultants (SWCA) in September and October 2009 determined that no wetlands or potentially jurisdictional waters of the U.S. would be impacted by any access road ROWs or at any of the well sites. NWI maps show that Mandaree 02-09H is only 203 feet southeast of a mapped wetland; the wetland assessment concluded that the wetland is outside of the proposed well pad disturbance and would not be impacted (USFWS 2009a). Therefore, no riparian or wetland habitats are anticipated to be directly or indirectly impacted by the proposed access roads or wells with implementation of appropriate BMPs for sediment and erosion control measures and the operator's SPCCPs for each production facility. Permitting with the U.S. Army Corps of Engineers (USACE) for the discharge of fill material into potential waters of the U.S., including wetlands, is not anticipated at this time. However, if it is determined that the discharge of fill material in any potential jurisdictional surface water would be required due to changes in the project design or layout, the proponent would coordinate any permitting with the BIA, the USACE, and appropriate state and federal agencies. The proponent would comply with all conditions of permits and authorizations during construction.

Table 10. Existing Water Wells within 5 Miles of the Project Area.

Water Well Number	Owner	Section	Township/Range	Aquifer	Date Drilled	Type	Depth (feet)	Nearest Well	Miles to Nearest Well
15209429CCC	USGS	29	152N/94W	No Obs Well Installed	11/08/51	Test Hole	200	Riverview 01-32H	0.1
15009421ABA	Youngwolf	21	150N/94W	Fort Union	01/01/64	Unknown	380	Bear Den 08-21H	0.5
15209431ACA	USGS	31	152N/94W	No Obs Well Installed	11/08/51	Test Hole	200	Riverview 01-32H	0.5
15209429DCA	USGS	29	152N/94W	No Obs Well Installed	11/08/51	Test Hole	205	Riverview 01-32H	0.6
15209430ADD	USGS	30	152N/94W	No Obs Well Installed	11/12/51	Test Hole	205	Riverview 01-32H	0.7
15009416ACC1	NDSWC	16	150N/94W	No Obs Well Installed	09/11/80	Test Hole	40	Bear Den 08-21H	0.7
15009416ACC2	NDSWC	16	150N/94W	No Obs Well Installed	09/11/80	Test Hole	40	Bear Den 08-21H	0.7
14909414B	Mandaree Well	14	149N/94W	Sentinel Butte-Tongue River	00/00/00	Unknown	no data	Mandaree 04-15H	0.7
15209429ACC	USGS	29	152N/94W	No Obs Well Installed	11/12/51	Test Hole	205	Riverview 01-32H	0.7
15209432DBC	USGS	32	152N/94W	No Obs Well Installed	11/07/51	Test Hole	125	Riverview 01-32H	0.8
15209432CCB	USGS	32	152N/94W	No Obs Well Installed	11/07/51	Test Hole	205	Riverview 01-32H	0.8
15209431DBD	USGS	31	152N/94W	No Obs Well Installed	11/06/51	Test Hole	205	Riverview 01-32H	0.8
15209430ACD	USGS	30	152N/94W	No Obs Well Installed	11/12/51	Test Hole	190	Riverview 01-32H	0.8
14909422BBB	NDSWC	22	149N/94W	No Obs Well Installed	09/09/80	Test Hole	140	Mandaree 04-15H	0.9
14909414BA	Mandaree #3 Well	14	149N/94W	Fox Hills	07/21/70	Unknown	1,750	Mandaree 04-15H	0.9
15209430CCD	USGS	30	152N/94W	No Obs Well Installed	11/08/51	Test Hole	200	Riverview 01-32H	0.9
14909422BCB	NDSWC	22	149N/94W	No Obs Well Installed	09/09/80	Test Hole	80	Mandaree 04-15H	0.9
15209431BCD	USGS	31	152N/94W	No Obs Well Installed	01/07/52	Test Hole	180	Riverview 01-32H	1.0
14909421AAD	NDSWC	21	149N/94W	Undefined	09/09/80	Observation Well - Destroyed	240	Mandaree 04-15H	1.0
15009422CBA	Youngwolf	22	150N/94W	Fort Union	01/01/64	Unknown	327	Bear Den 08-21H	1.1
15209429AAB	USGS	29	152N/94W	No Obs Well Installed	12/11/51	Test Hole	200	Riverview 01-32H	1.2
15209428BBC	USGS	28	152N/94W	No Obs Well Installed	12/11/51	Test Hole	200	Riverview 01-32H	1.3
15209433CAB	USGS	33	152N/94W	No Obs Well Installed	11/06/51	Test Hole	205	Riverview 01-32H	1.3
15209420DDA	USGS	20	152N/94W	No Obs Well Installed	11/06/51	Test Hole	205	Riverview 01-32H	1.5
15209419DBC	USGS	19	152N/94W	No Obs Well Installed	12/11/51	Test Hole	200	Riverview 01-32H	1.5

Water Well Number	Owner	Section	Township/Range	Aquifer	Date Drilled	Type	Depth (feet)	Nearest Well	Miles to Nearest Well
14909428AAA1	USGS	28	149N/94W	Tongue River	06/10/92	Observation Well	320	Mandaree 04-15H	1.5
14909428AAA2	USGS	28	149N/94W	Sentinel Butte-Tongue River	06/10/92	Observation Well	120	Mandaree 04-15H	1.5
15209428BAB	USGS	28	152N/94W	No Obs Well Installed	10/31/51	Test Hole	355	Riverview 01-32H	1.5
15009415ABC	N. Fox	15	150N/94W	Fort Union	01/01/62	Unknown	414	Bear Den 08-21H	1.6
15209433DBA	USGS	33	152N/94W	No Obs Well Installed	11/06/51	Test Hole	205	Riverview 01-32H	1.6
15209420ACC	USGS	20	152N/94W	No Obs Well Installed	11/08/51	Test Hole	200	Riverview 01-32H	1.7
15209419ACC	USGS	19	152N/94W	No Obs Well Installed	12/10/51	Test Hole	200	Riverview 01-32H	1.7
14909430CAC	T. Loneflight	30	149N/94W	Fort Union	00/00/00	Unknown	no data	Mandaree 06-20H	1.8
15209428ABA	USGS	28	152N/94W	No Obs Well Installed	01/07/52	Test Hole	185	Riverview 01-32H	1.8
15209421BCC	USGS	21	152N/94W	No Obs Well Installed	11/05/51	Test Hole	205	Riverview 01-32H	1.9
15209421CAD	USGS	21	152N/94W	No Obs Well Installed	12/12/52	Test Hole	200	Riverview 01-32H	1.9
14909427CB	G. Wolf	27	149N/94W	Undefined	05/19/73	Domestic Well	36	Mandaree 04-15H	1.9
15209421DBC	USGS	21	152N/94W	No Obs Well Installed	12/13/51	Test Hole	200	Riverview 01-32H	2.0
15209421DDB	USGS	21	152N/94W	No Obs Well Installed	12/12/51	Test Hole	200	Riverview 01-32H	2.1
15209427BBB	USGS	27	152N/94W	No Obs Well Installed	10/30/51	Test Hole	255	Riverview 01-32H	2.2
15009430B	no data	30	150N/94W	Surface Water	00/00/00	Surface Water Sample Site	no data	Bear Den 08-21H	2.3
15209421DAA	USGS	21	152N/94W	No Obs Well Installed	11/12/51	Test Hole	120	Riverview 01-32H	2.3
15209434CAA	USGS	34	152N/94W	No Obs Well Installed	11/06/51	Test Hole	200	Riverview 01-32H	2.4
15209434ADC	USGS	34	152N/94W	No Obs Well Installed	11/07/51	Test Hole	200	Riverview 01-32H	2.7
15209427DDD	USGS	27	152N/94W	No Obs Well Installed	11/07/51	Test Hole	205	Riverview 01-32H	2.8
15209427AAB	USGS	27	152N/94W	No Obs Well Installed	10/30/51	Test Hole	255	Riverview 01-32H	2.8
15109536ABA	J. Hall	36	151N/95W	Undefined	05/22/73	Domestic Well	40	Clarks Creek 01-21H	3.1
15109536BBA	NDSWC	36	151N/95W	Tongue River-Ludlow	05/28/82	Observation Well - Plugged	1,280	Clarks Creek 01-21H	3.5

Water Well Number	Owner	Section	Township/Range	Aquifer	Date Drilled	Type	Depth (feet)	Nearest Well	Miles to Nearest Well
15009514DCB	C. Berwald	14	150N/95W	Fort Union	12/13/72	Unknown	35	Bear Den 08-21H	3.6
15109535AAA	NDSWC	35	151N/95W	No Obs Well Installed	12/13/81	Test Hole	240	Clarks Creek 01-21H	3.7
14909308DCC	M. Fox	8	149N/93W	Sentinel Butte-Tongue River	01/01/60	Unknown	no data	Mandaree 04-15H	3.8
14809406DBD	no data	6	148N/94W	Sentinel Butte-Tongue River	00/00/00	Unknown	no data	Mandaree 04-15H	3.8
14909515CBB	NDSWC	15	148N/95W	No Obs Well Installed	09/10/80	Test Hole	120	Mandaree 12-07H	3.9
14909305CDC	no data	5	149N/93W	Sentinel Butte-Tongue River	01/01/61	Unknown	no data	Mandaree 04-15H	3.9
14909516DAD	NDSWC	16	148N/95W	No Obs Well Installed	09/10/80	Test Hole	140	Mandaree 12-07H	4.0
14909309CCD	St. Anthony's Mission	9	149N/93W	Sentinel Butte-Tongue River	01/01/52	Unknown	no data	Mandaree 04-15H	4.4
15209424BBB	NDSWC	24	152N/94W	Tongue River-Ludlow	12/02/81	Observation Well - Plugged	1,040	Riverview 01-32H	4.4
14909509CDD	NDSWC	9	148N/95W	Fox Hills	07/17/84	Observation Well	1,740	Mandaree 12-07H	4.4
15009331ADD	Three Affiliated Tribes	31	150N/93W	Sentinel Butte-Tongue River	01/01/61	Unknown	no data	Mandaree 04-15H	4.6
15209410ABC	B. Skarda	10	152N/94W	Undefined	12/02/72	Unknown	25	Riverview 01-32H	4.6
15109504DBD1	NDSWC	4	151N/95W	Hell Creek	06/29/81	Observation Well - Plugged	1,260	Riverview 01-32H	4.6
15109504DBD2	NDSWC	4	151N/95W	Fox Hills	05/26/83	Observation Well	1,620	Riverview 01-32H	4.6
15209410ABD	B. Skarda	10	152N/94W	Undefined	07/13/76	Domestic Well	120	Riverview 01-32H	4.7
14909321DCC	R Birdbear Spring	21	149N/93W	Surface Water	00/00/00	Surface Water Sample Site	no data	Mandaree 04-15H	4.7

Water Well Number	Owner	Section	Township/Range	Aquifer	Date Drilled	Type	Depth (feet)	Nearest Well	Miles to Nearest Well
15209516ADD	NDSWC	16	152N/95W	Tongue River-Ludlow	11/21/81	Observation Well	1,000	Riverview 01-32H	4.8
14909321DCA	E. Wicker	21	149N/93W	Sentinel Butte-Tongue River	00/00/00	Unknown	no data	Mandaree 04-15H	4.8
14909504CCB	NDSWC	4	148N/95W	No Obs Well Installed	09/10/80	Test Hole	128	Mandaree 12-07H	4.9
14809512DCC2	USGS	12	148N/95W	Sentinel Butte-Tongue River	06/23/92	Observation Well	52	Mandaree 06-20H	4.9
14909508ADA	NDSWC	8	148N/95W	Undefined	09/10/80	Observation Well - Plugged	200	Mandaree 12-07H	5.0

USGS = U.S. Geological Survey.
Source: NDSWC (2009).

Table 11. Distance and Direction from Proposed Wells to the Nearest Wetland.

Proposed Well	Wetland Type	Feet to Nearest Wetland	Direction to Nearest Wetland
Mandaree 02-09H	Freshwater Emergent Wetland	203	Northwest
Mandaree 04-15H	Freshwater Emergent Wetland	1,362	South
Mandaree 05-16H	Freshwater Emergent Wetland	2,855	Northeast
Mandaree 06-20H	Freshwater Emergent Wetland	3,515	Southeast
Mandaree 12-07H	Freshwater Pond	3,043	East
Bear Den 08-21H	Riverine	3,220	Northeast
Clarks Creek 01-21H	Freshwater Emergent Wetland	1,877	Northwest
Clarks Creek 03-08H	Freshwater Emergent Wetland	4,669	East
Riverview 01-32H	Freshwater Emergent Wetland	1,775	West

Source: USFWS 2009a.

3.5.2 Wildlife

The habitat at most of the well pads and access roads is mixed prairie grassland used for grazing. This habitat supports grassland birds, ungulates, and small mammals. Clarks Creek 3-08H and Riverview 1-32H are in agriculture fields planted with crops that provide little wildlife habitat, except for species migrating through the area. The wildlife species listed in Table 12 were observed during field visits to the proposed project areas during September and October 2009. As part of the field survey, ecologists recorded all species that were visually observed (i.e., primary observation) as well as various secondary indicators, such as calls, scat, tracks, and animal carcasses. The access road for Mandaree 06-20H travels through a prairie dog (*Cynomys ludovicianus*) town. Although prairie dog towns provide potential habitat for the black-footed ferret, the USFWS has shown the ferret to be extirpated in North Dakota.

Table 12. Wildlife Observed during Field Surveys at the Proposed Project Areas.

Well Name	Common Name	Scientific Name	Observation Type	Land Use/Habitat
Mandaree 02-09H	None	None	None	Pasture/Mixed Grass Prairie
Mandaree 04-15H	Clay-colored sparrow	*Spizella pallida*	Primary	Pasture/Mixed Grass Prairie
	Red-tailed hawk	*Buteo jamaicensis*	Primary	Pasture/Mixed Grass Prairie
Mandaree 05-16H	Clay-colored sparrow	*Spizella pallida*	Primary	Pasture/Mixed Grass Prairie
Mandaree 06-20H	Pronghorn	*Antilocapra americana*	Primary	Pasture/Mixed Grass Prairie
	Northern harrier	*Circus cyaneus*	Primary	Pasture/Mixed Grass Prairie
	Black-tailed prairie dog	*Cynomys ludovicianus*	Primary	Pasture/Mixed Grass Prairie
Mandaree 12-07H	Clay-colored sparrow	*Spizella pallida*	Primary	Pasture/Mixed Grass Prairie
	Black-tailed prairie dog	*Cynomys ludovicianus*	Primary	Pasture/Mixed Grass Prairie
Bear Den 08-21H	Deer mouse	*Peromyscus maniculatus*	Primary	Pasture/Mixed Grass Prairie
Clarks Creek 01-21H	None	None	None	Pasture/Mixed Grass Prairie
Clarks Creek 03-08H	Sharp-tailed grouse	*Tympanuchus phasianellus*	Primary	Agriculture/ Cropland
	Coyote	*Canis latrans*	Secondary	Agriculture/ Cropland
Riverview 01-32H	Northern harrier	*Circus cyaneus*	Primary	Agriculture/ Cropland
	Ring-necked pheasant	*Phasianus colchicus*	Primary	Agriculture/ Cropland
	Partridge	*Perdix* sp.	Primary	Agriculture/ Cropland

The primary impacts to wildlife species would come as a result of the construction of nine well pad areas, including the construction of new access roads and well pads, drilling, potential commercial production, and the vehicular traffic associated with such activities. No impact on listed species is anticipated due to the low likelihood of their occurrence within the proposed project areas. On-site assessments confirmed that no threatened or endangered species would be impacted by the proposed roads or wells. Ground clearing might impact habitat for unlisted species, including small birds, small mammals, and other wildlife species. Proposed project activities may affect raptor and migratory bird species through direct mortality, habitat degradation, and/or displacement of individual birds. No raptor nests or other bird nests were observed in the project area during surveys, but it is anticipated that raptors and birds would use the habitat within the project area intermittently for hunting, foraging, and potentially nesting. Oil present in reserve pit fluids can entrap and kill migratory birds (USFWS 2009a). Any impacts to birds in the project area are regulated in part through the Migratory Bird Treat Act of 1918 (916 USC 703–711). As a standard BMP, EOG fences

and nets all reserve pits for well facilities in North Dakota as recommended by the USFWS to minimize the potential for impacts to raptors and migratory birds. Fragmentation of native prairie habitat can detrimentally affect grouse species; however, due to the ratio of each project area to landscape area, the overall disturbance would be negligible.

Some individuals would be affected by temporary disturbances (noise, traffic, dust, etc.) during construction and drilling but no long-term impacts are anticipated to the persistence wildlife species in the project area. Wildlife inhabiting the area are likely to adapt to changing conditions and continue to persist without significant adverse impact.

Several measures designed to mitigate the impacts to wildlife are described in Sections 2.0 through 2.9 of this EA. The proponent will also comply with any measures indicated in the APDs, SUPs, and EOG's Safe Practices Manual (2007) that may limit or reduce the possible impact to wildlife species in the vicinity of the Proposed Action. These measures will include, but not be limited to, fencing of well pads, fencing and netting of reserve pits, dust suppression, painting of aboveground facilities, noxious weed control, and the use of trash cages for refuse storage. Interim and final reclamation would begin without delay if a well is determined to be unproductive or upon completion of commercial production.

Six wildlife species that are potentially present in McKenzie County are listed by the USFWS as threatened or endangered under the Endangered Species Act (ESA). Listed species in McKenzie County include the black-footed ferret (*Mustela nigripes*), gray wolf (*Canis lupus*), interior least tern (*Sterna anillarum*), piping plover (*Charadrius melodus*), whooping crane (*Grus americana*), and pallid sturgeon (*Scaphirhynchus albus*) (USFWS 2009b). In addition, the Dakota skipper (*Hesperia dacotae*) is a candidate for listing. The bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) are species of special concern to the BIA and the USDI, and are effectively treated the same as listed species. Tribes and states may recognize additional species of concern; such lists are taken under advisement by federal agencies but are not legally binding in the manner of the ESA.

The North Dakota Parks and Recreation Department conducted a review of the North Dakota Natural Heritage biological conservation database for known occurrences of species of concern within a 1-mile radius of the project areas (see attached scoping comments). All recorded occurrences of special-status species in the vicinity were over 10 years old, although this may be due to a lack of survey data for the area. Special-status species are described below.

Black-Footed Ferret (*Mustela nigripes*)
Status: Endangered
Likelihood of impact: No effect

Several isolated populations are known to exist within the United States. However, this species is presumed extirpated from North Dakota because it has not been observed in the wild for more than 20 years. No impacts are anticipated.

Gray Wolf (*Canis lupus*)
Status: Endangered
Likelihood of impact: No effect

The project areas do not contain suitable habitat for occupation or colonization by gray wolves. Due to the distance of known gray wolf populations in Minnesota, Canada, Montana, and Wyoming, transient wolves are not expected to be present. No impacts are anticipated.

Interior Least Tern (*Sterna anillarum*)
Status: Endangered
Likelihood of impact: May affect, but is not likely to adversely affect

The proposed project areas would be located in upland areas that would not provide suitable nesting habitat for the interior least tern. Key habitat includes sparsely vegetated sandbars along rivers, sand and gravel pits, or lake and reservoir shorelines. Interior least tern nests are usually found along the shoreline and islands of Lake Sakakawea, which is over 1 mile from the proposed project areas. Migrating or foraging interior least terns may transition through the project area; however, no adverse impact is expected as a result of construction, production, or reclamation activities.

Piping Plover (*Charadrius melodus*)
Status: Threatened
Likelihood of impact: May affect, but is not likely to adversely affect

The entire shoreline of Lake Sakakawea has been designated critical habitat for piping plover. These birds nest on sparsely vegetated shoreline beaches, peninsulas, and islands composed of sand, gravel, or shale. The nearest critical habitat would be over 1 mile from the proposed project areas. Individual piping plovers may transition across or forage at the proposed project areas during construction, drilling, production, or reclamation activities. However, no impact is anticipated though minor impacts could occur as a result of the aforementioned activities.

Whooping Crane (*Grus americana*)
Status: Endangered
Likelihood of impact: May affect, but is not likely to adversely affect

No viable habitats, including freshwater emergent wetlands, are located within the proposed project areas. The lack of suitable foraging and nesting habitat makes the proposed project areas unsuitable for whooping cranes. No impact is anticipated.

Pallid Sturgeon (*Scaphirhynchus albus*)
Status: Threatened
Likelihood of impact: May affect, but is not likely to adversely affect

According to the North Dakota Natural Heritage biological conservation database, pallid sturgeon was recorded in Bear Den Bay, approximately 1 mile east of Bear Den 08-21H, in 1974. Activities associated with the construction, production, or reclamation of the project areas are not anticipated to adversely affect water quality and subsequently the pallid sturgeon. Pallid sturgeons prefer turbid, main stem river channels. Project areas are all at least 1 mile from Lake Sakakawea, which would reduce the likelihood of adverse affect due to activities. No impact is anticipated.

Dakota Skipper (*Hesperia dacotae*)
Status: Candidate
Likelihood of impact: May affect, but is not likely to adversely affect

According to the North Dakota Natural Heritage biological conservation database, Dakota skipper was recorded in 1997 along Highway 22, approximately 1.5 miles southeast of Mandaree 06-20H and approximately 1.5 miles southwest of Mandaree 04-15H. Project areas are maintained for agricultural use including cultivation and pasture land. Therefore, undisturbed, native prairie areas with a high diversity of wildflowers and grasses were not observed within the proposed project areas. The absence of suitable habitat makes the presence of Dakota skipper unlikely. No impacts are anticipated.

Bald Eagle (*Haliaeetus leucocephalus*)
Status: Delisted in 2007; protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act
Likelihood of impact: May affect, but is not likely to adversely affect

The bald eagle typically perches along lakes or large rivers where it hunts for fish. Project areas are located over 1 mile from Lake Sakakawea and do not contain suitable nesting/perching habitat, concentrated feeding areas, or other necessary habitat. No impacts are anticipated.

Golden Eagle (*Aquila chrysaetos*)
Status: Unlisted Species of Concern; protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act
Likelihood of impact: May affect, but is not likely to adversely affect

The golden eagle prefers habitat characterized by open prairie, plains, and forested areas. Usually, golden eagles can be found in proximity to badland cliffs that provide nesting habitat. None of the proposed project areas contain suitable nesting habitat for golden eagles; however, eagle prey species may be present within and around the project area. No impacts are expected as a result of any activities associated with the construction, production, or reclamation of the project areas.

Tawny Crescent (*Phyciodes batesi*)
Status: Unlisted Species of Concern
Likelihood of impact: May affect, but is not likely to adversely affect

According to the North Dakota Natural Heritage biological conservation database, tawny crescent was recorded along Highway 22, approximately 1 mile east of Riverview 01-32H, in 1991. Project areas are maintained for agricultural use including cultivation and pasture land without a high diversity of wildflowers and grasses. The absence of suitable habitat makes the presence of tawny crescent unlikely. No impacts are anticipated.

Blue Sucker (*Cycleptus elongatus*)
Status: Unlisted Species of Concern
Likelihood of impact: May affect, but is not likely to adversely affect

According to the North Dakota Natural Heritage biological conservation database, blue sucker was recorded in 1965 in Bear Den Bay, approximately 1 mile east of Bear Den 08-21H. Activities associated with the construction, production, or reclamation of the project areas are not anticipated to adversely affect water quality and subsequently the blue sucker. Project areas are all at least 1 mile from Lake Sakakawea, which would reduce the likelihood of adverse affect due to activities. No impact is anticipated.

3.6 SOILS

Soils in the project areas vary depending on the topography, slope orientation, and parent material from which the soil is derived. The proposed project areas are located toward the center of the Williston Basin. The Greenhorn Formation, consisting of thin limestone and dark gray to black organic-rich shale, is found from the surface to a depth of approximately 4,000 feet. The Greenhorn is subdivided into lower and upper intervals of limestone and calcareous shale with a middle interval of shale. Near-surface sediment is of Recent, Pleistocene, or Tertiary age and includes Sauk, Tippecanoe, Kaskaskia, Absaroka, Zuni, and Tejas Sequences. Soils found near the surface in the project area are derived from the parent material of the Greenhorn Formation and subsequent geological sequences.

3.6.1 Natural Resources Conservation Service Soil Data

The Natural Resources Conservation Service (NRCS) has mapped soils in the proposed project area. Soils complexes derived from different soils series that are observed at present on the well pads and access roads, and their respective acreages, are summarized in Table 13. The acreage shown is based on the spatial extent of soil series combinations derived from NRCS data; therefore, the acreage is approximate and used as a best estimate of soil series distribution at each of the proposed project areas. Figures 38 through 42 display the soils composition that surrounds each proposed well pad and associated access road.

Table 13. Percentage of the Project Area Comprised of Specific Soil Types.

Well	Soil	Percent	Disturbance Acres
Mandaree 02-09H			
Well Pad	Williams-Bowbells loams, 3 to 6 percent slopes	100.0	4.95
Total		**100.0**	**4.95**
Access Road	Arnegard loam, 0 to 2 percent slopes	14.4	0.44
Access Road	Williams loam, 6 to 9 percent slopes	26.1	0.79
Access Road	Williams-Bowbells loams, 3 to 6 percent slopes	59.5	1.81
Total		**100.0**	**3.04**
Mandaree 04-15H			
Well Pad	Williams loam, 6 to 9 percent slopes	12.5	0.60
Well Pad	Williams-Bowbells loams, 3 to 6 percent slopes	82.2	3.97
Well Pad	Zahl-Cabba-Maschetah complex, 3 to 70 percent slopes	5.3	0.26
Total		**100.0**	**4.84**
Access Road	Golva silt loam, 2 to 6 percent slopes	21.7	1.90
Access Road	Williams loam, 6 to 9 percent slopes	48.1	4.22
Access Road	Williams-Bowbells loams, 3 to 6 percent slopes	5.5	0.48
Access Road	Zahl-Cabba-Maschetah complex, 3 to 70 percent slopes	24.7	2.17
Total		**100.0**	**8.78**

Mandaree 05-16H			
Well Pad	Beisigl-Flasher-Tally complex, 9 to 50 percent slopes	100.0	5.11
Total		**100.0**	**5.11**
Access Road	Beisigl-Flasher-Tally complex, 9 to 50 percent slopes	100.0	5.92
Total		**100.0**	**5.92**
Mandaree 06-20H			
Well Pad	Dogtooth-Janesburg-Cabba complex, 6 to 30 percent slopes	100.0	5.35
Total		**100.0**	**5.35**
Access Road	Cabba-Chama-Havrelon silt loams, 3 to 70 percent slopes	16.8	1.83
Access Road	Daglum-Belfield complex, 0 to 6 percent slopes	29.7	2.91
Access Road	Dogtooth-Janesburg-Cabba complex, 6 to 30 percent slopes	1.0	0.39
Access Road	Lambert-Slickspots-Rhoades complex, 0 to 9 percent slopes	5.8	0.83
Access Road	Rhoades-Daglum complex, 0 to 6 percent slopes	46.6	4.45
Total		**100.0**	**10.41**
Mandaree 12-07H			
Well Pad	Cabba-Chama-Havrelon silt loams, 3 to 70 percent slopes	100.0	5.00
Well Pad	Lambert-Slickspots-Rhoades complex, 0 to 9 percent slopes	0.0	0.00
Total		**100.0**	**5.01**
Access Road	Cabba-Chama-Havrelon silt loams, 3 to 70 percent slopes	75.5	1.65
Access Road	Lambert-Slickspots-Rhoades complex, 0 to 9 percent slopes	24.5	0.53
Total		**100.0**	**2.18**
Bear Den 08-21H			
Well Pad	Cabba-Badland, outcrop-Arikara complex, 9 to 70 percent slopes	21.3	1.02
Well Pad	Williams-Zahl loams, 6 to 9 percent slopes	78.7	3.78
Total		**100.0**	**4.81**
Access Road	Cabba-Badland, outcrop-Arikara complex, 9 to 70 percent slopes	65.7	2.00
Access Road	Williams-Zahl loams, 6 to 9 percent slopes	34.3	1.04
Total		**100.0**	**3.04**

Clarks Creek 01-21H			
Well Pad	Arikara-Shambo-Cabba loams, 9 to 70 percent slopes	8.3	0.42
Well Pad	Dogtooth-Janesburg-Cabba complex, 6 to 30 percent slopes	91.7	4.63
Total		**100.0**	**5.05**
Access Road	Amor-Cabba loams, 6 to 9 percent slopes	0.2	0.01
Access Road	Cabba-Sen-Chama silt loams, 15 to 70 percent slopes	43.1	1.65
Access Road	Dogtooth-Janesburg-Cabba complex, 6 to 30 percent slopes	56.7	2.17
Total		**100.0**	**3.83**
Clarks Creek 03-08H			
Well Pad	Williams loam, 6 to 9 percent slopes	84.3	3.75
Access Road	Williams loam, 6 to 9 percent slopes	15.7	0.70
Total		**100.0**	**4.45**
Access Road	Williams-Bowbells loams, 3 to 6 percent slopes	92.1	2.45
Access Road	Zahl-Cabba-Arikara complex, 9 to 70 percent slopes	7.9	0.21
Total		**100.0**	**2.66**
Riverview 01-32H			
Well Pad	Noonan-Niobell-Williams loams, 0 to 6 percent slopes	56.8	2.50
Well Pad	Williams-Zahl loams, 6 to 9 percent slopes	43.2	1.90
Total		**100.0**	**4.40**
Access Road	Noonan-Niobell-Williams loams, 0 to 6 percent slopes	100.0	0.75
Total		**100.0**	**0.75**

Source: NRCS 2009
Note: Percentage and acreage totals may not sum exactly due to rounding.

3.6.2 Field-derived Soil Data

Soil data derived from on-site excavated soil pits, including the matrix value, hue, chroma, and color name, are summarized in Table 14. Additionally, redoximorphic features (i.e., reduced/oxidized iron or manganese) deposits and soil texture were noted at each soil pit. A Munsell Soil Color Chart was used to determine the color of soil samples.

The K Factor indicates the soil erodibility of soil particles less than 2 millimeters in size to sheet and rill erosion by water forces. K Values can range from 0.02 (lowest erosion potential) to 0.69 (greatest erosion potential). Another variable which characterizes soils erosive potential and productivity, T, represents the maximum amount of soil loss, measured in tons/acre/year, allowed in order to maintain high levels of crop production.