

APPENDIX M

PROCEDURES IN OIL AND GAS RECOVERY

GEOPHYSICAL OPERATIONS

Oil and gas geophysical exploration activities include data acquisition by use of ground vehicle or aircraft. Data is acquired to determine if a structure exists which might contain oil or gas. Geophysical exploration does not include core drilling for subsurface geologic information or well drilling for oil and gas. A federal oil and gas lease is not required before conducting geophysical operations. Information from geophysical exploration can lead oil companies or others to request that lands be offered for lease, or assist in the selection of drill sites on existing leases.

Existing road systems are used where available. Roads may be cleared of vegetation and loose rocks to improve access for trucks if that action is allowed by the permit. Blading and road construction for seismic operations are not usually allowed so that environmental impacts are minimized. In areas with rugged terrain or without access roads, and certain seasons of the year, seismic work is conducted by helicopter rather than by ground vehicles. Other geophysical operations that do not cause additional surface disturbance include remote sensing, gravity prospecting, and aeromagnetic surveying.

Procedures and Regulations

Notification Process - Geophysical operations on public lands are reviewed by the BLM. Exploration on public lands requires review and approval following the procedures in 43 CFR Subparts 3150, 3151, and 3154. In the Dillon Field Office, the Field Manager is authorized to approve geophysical operations. The responsibilities of the geophysical operator and the Field Manager during geophysical operations are described below.

Geophysical Operator - The operator is required to file a Notice of Intent to Conduct Oil and Gas Exploration Operations (form 3150-4) for operations on public lands administered by the BLM. Maps (preferably 1:24,000 scale topographic maps) showing the location of the proposed lines and access routes must accompany the Notice of Intent.

When the Notice of Intent is filed, the authorized officer may request a prework conference or field inspection. Special requirements or procedures that are identified by the authorized officer are included in the Terms and Conditions for Notice of Intent to Conduct Geophysical Exploration (form 3150-4 and a copy of the state requirements). Any changes in the original Notice of Intent must be submitted

in writing to the authorized officer. Written approval must be secured before activities proceed.

Bonding of the operator is required. A copy of proof of satisfactory bonding shall accompany the Notice of Intent. Proper bonding may include a \$5,000 individual, \$25,000 statewide, or \$50,000 nationwide geophysical exploration bond. In lieu of an exploration bond, a statewide or nationwide oil and gas drilling bond may be used if it contains a rider for geophysical exploration.

The operator is required to comply with applicable federal, state, and local laws such as Federal Land Policy and Management Act of 1976, the National Historic Preservation Act of 1966, and the Endangered Species Act of 1973, as amended. Operators may be required to submit an archeological evaluation if dirt work is contemplated, or if there is reason to believe that significant cultural resources may be adversely affected.

When geophysical operations have been completed, the operator is required to file a Notice of Completion (form 3150-5) including certification that all terms and conditions of the approved Notice of Intent have been fulfilled. The operator must also submit a map that shows the actual line location, access route, and other survey details.

BLM Field Manager (authorized officer) - The authorized officer is required to contact the operator within five working days after receiving the Notice of Intent to explain the terms of the notice, including the "Terms and Conditions for Notice of Intent to Conduct Geophysical Exploration," current laws, and BLM-administrative requirements. At the time of the prework conference or field inspection, written instructions or orders are given to the operator. The authorized officer is responsible for the examination of resource values to determine appropriate surface protection and reclamation measures. The authorized officer is required to make a final inspection following filing of the Notice of Completion. When reclamation is approved, obligation against the operator's bond is released. The BLM has 30 days after receipt of the Notice of Completion to notify the operator whether the reclamation is satisfactory or if additional reclamation work is needed. Bonding liability will automatically terminate within 90 days after receipt of the Notice of Completion unless the authorized officer notifies the operator of the need for additional reclamation work.

State Standards - Geophysical operators register with the state through the County Clerk and Recorder's office. State regulations include requirements for shothole locations, drilling techniques, plugging techniques, and reclamation.

Mitigation - When a geophysical Notice of Intent is received, restrictions may be placed on the application to protect resource values or to mitigate impacts. Many of these requirements may be the same as the oil and gas lease stipulations adopted in the RMP. Other less restrictive measures may be used when impacts to resource values will be less severe. This is due in part to the temporary nature of geophysical exploration. The decisions concerning the level of protection required are made on a case-by-case basis when a Notice of Intent is received.

LEASING PROCESS

Federal oil and gas leasing authority is found in the 1920 Mineral Leasing Act, as amended, for public lands and the 1947 Acquired Lands Leasing Act, as amended, for acquired lands. Leasing of federal oil and gas is affected by other acts such as National Environmental Policy Act of 1969, the Wilderness Act of 1964, National Historic Preservation Act of 1966, the Endangered Species Act of 1973, Federal Land Policy and Management Act of 1976, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987.

Regulations governing federal oil and gas leasing are contained in 43 CFR Part 3100 with additional requirements and clarification found in Onshore Operating Orders and Washington office manuals, handbooks and instruction memorandums.

The lease grants the right to explore, extract, remove, and dispose of oil and gas deposits that may be found in the leased lands. The lessee may exercise the rights conveyed by the lease subject to the lease terms and attached stipulations, if any.

Lease rights may be subject to lease stipulations and permit approval requirements. Stipulations and permit requirements describe how lease rights are modified. Lease constraints or requirements may also be applied to applications for permit to drill on existing leases provided the constraints or requirements are within the authority reserved by the terms and conditions of the lease. The stipulations and conditions of approval must be in accordance with laws, regulations, and lease terms. The lease stipulations and permit conditions of approval allow for management of federal oil and gas resources in concert with other resources and land uses.

The BLM planning process is the mechanism used to evaluate and determine where and how federal oil and gas resources will be made available for leasing. In areas where oil and gas development may conflict with other resources, the areas may be closed to leasing. Areas where oil and gas development could coexist with other land uses or resources will be open to leasing. Leases in these areas will be issued with standard lease terms or with added stipulations based

upon decisions in the land use document. Added stipulations are a part of the lease only when environmental and planning records demonstrate the necessity for the stipulations (modifications of the lease).

Currently, leases are issued as either competitive leases or noncompetitive leases with 10-year terms. The competitive leases will be sold to the highest qualified bidder at an oral auction. Tracts that receive no bid at the sale are available for the filing of noncompetitive offers for two years following the sale. All offers filed the day after the sale (referred to as day-after-the-sale filings) are considered simultaneously filed. This means that if there is more than one offer filed for a specific parcel the day after the sale, a drawing must be held to determine the priority on multiple offers. Noncompetitive offers filed after that time are on a first-come first-served basis. If there are no offers filed for a parcel for the two-year period after the sale, the lands must be nominated again for competitive leasing. Rental payments for these leases will be \$1.50 per acre for the first 5 years and \$2.00 per acre thereafter until production is established. The royalty rate for leases issued following the 1987 Oil and Gas Leasing Reform Act is 12-1/2 percent. Minimum royalty is the same amount as the rental.

Future interest leases are available for entire or fractional mineral estates that have not reverted to federal ownership. These are minerals that are reserved by the grantor for a specific period of time in warranty deeds to the United States. Any future interest leases may be obtained only through the competitive bidding process and are made effective the date of vesting of the minerals with the United States.

Plan Maintenance

New information may lead to changes in existing resource inventories. New use areas and resource locations may be identified or use areas and resource locations that are no longer valid may be identified. These resources usually cover small areas requiring the same protection or mitigation as identified in this plan. Identification of new areas or removal of old areas that no longer have those resource values will result in the use of the same lease stipulation identified in this plan. These areas will be added to the existing data inventory without a plan amendment. In cases where the changes constitute a change in resource allocation outside the scope of this plan, a plan amendment would be required.

Lease Stipulations

Certain resources in the planning area require protection from impacts associated with oil and gas activities. The specific resource and the method of protection are contained in lease stipulations. Lease stipulations are usually no surface occupancy, controlled surface use, or timing limitation.

A notice may also be included with a lease to provide guidance regarding resources or land uses. While the actual wording of the stipulations may be adjusted at the time of leasing, the protection standards described will be maintained.

Controlled Surface Use

Use or occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constraints that may modify the lease rights. Controlled surface use is used for operating guidance, not as a substitute for the no surface occupancy or timing stipulations.

No Surface Occupancy

Use or occupancy of the land surface for fluid mineral exploration or development is prohibited in order to protect identified resource values. The no surface occupancy stipulation includes stipulations which may have been worded as No Surface Use and Occupancy,” “No Surface Disturbance,” “Conditional No Surface Occupancy,” and “Surface Disturbance or Occupancy Restriction (by location).”

Timing Limitation (Seasonal Restriction)

Prohibits surface use during specified times to protect identified resource values. This stipulation does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.

PERMITTING

The lessee may conduct lease operations after lease issuance. Before beginning construction or drilling a well, the lessee must have an approved Application for Permit to Drill, including requirements for surface and subsurface operations. Many other lease operations, including surface and subsurface, must be approved by a Sundry Notice. When a well is no longer useful, the well is plugged and the surface reclaimed. Well plugging and reclamation operations are approved by a Sundry Notice, although verbal approval for plugging may be given for a well that was drilled but not completed for production. The period of bond liability is terminated after all wells covered by the bond are properly plugged and the surface reclaimed. The lands may then become available for future leasing.

Proposed drilling and associated activities must be approved before beginning operations. The operator must file an Application for Permit to Drill with the BLM Great Falls

Oil and Gas Field Station. A copy of the application will be posted in the Field Station and Dillon Field Office, and if applicable, in the office of the Surface Management Agency for a minimum of 30 days for review by the public. After 30 days, the application can be approved in accordance with (a) lease stipulations, (b) Onshore Oil and Gas Orders, and (c) Onshore Oil and Gas regulations (43 CFR Part 3160) if it is administratively and technically complete.

Evidence of bond coverage for lease operations must be submitted with the application. Bond amount must not be less than a \$10,000.00 lease bond, a \$25,000.00 statewide bond or a \$150,000.00 nationwide bond.

Pre-drill on-site inspections will be conducted for all wells. The inspection makes possible selection of the most feasible well site and access road from environmental, geological, and engineering points of view. Surface use and reclamation requirements are developed during the on-site inspection that is usually conducted within 15 days after receipt of the Notice of Staking or Application for Permit to Drill. For operations proposed on privately-owned surface, if the operator after a good-faith effort is unable to reach an agreement with the private surface owner, the operator must post a bond to cover loss of crops and damages to tangible improvements prior to approval of the Application for Permit to Drill.

Conditions of approval implement the lease stipulations and are part of the permit when environmental and field reviews demonstrate the necessity for operating constraints or requirements. A surface restoration plan is part of an approved permit, either an Application for Permit to Drill or Sundry Notice that includes surface-disturbing activities.

The authorized officer will act on the application in one of two ways:

Approves the application (a) as submitted or (b) with appropriate modifications or conditions of approval; or

Returns the application and (a) advises the lessee or operator of the reasons for disapproval or (b) advises the lessee or operator of the reason why final action has been delayed and the date such final action is expected.

For drilling operations on lands with state or private mineral ownership, the lessee must meet the requirements of the mineral owner and the state regulatory agency. The BLM does not have jurisdiction over nonfederal minerals; however, the BLM has surface management responsibility in situations of BLM surface over nonfederal mineral ownership.

APPLICATION FOR PERMIT TO DRILL

Applications for Permit to Drill are approved for the Dillon Field Office by the supervisor of the Great Falls Oil and Gas Field Station. The approved Application for Permit to Drill includes Conditions of Approval, and Informational Notices that cite the regulatory requirements from the Code of Federal Regulations, Onshore Operating Orders and other guidance.

Conditions of Approval

Conditions of approval are mitigation measures that implement restrictions in light of site-specific conditions. General guidance for conditions of approval is found in the BLM and U.S. Forest Service brochure entitled "Surface Operating Standards for Oil and Gas Exploration and Development" (USDI, BLM 1989c) and BLM Manual 9113 entitled "Roads".

The following mitigation measures may be applied to approved permits as conditions of approval. The listing is not all-inclusive, but presents some possible conditions of approval that may be used in the planning area. The wording of the condition of approval may be modified or additional conditions of approval may be developed to address specific conditions.

1. Surface Conditions:

- a. The access road on the BLM surface will not be bladed unless prior BLM approval is obtained.
- b. The operator will be responsible for weed control on the access road, well location, and pipeline for the life of the well.
- c. The operator will clean the undercarriage of all rigs prior to entering onto the leasehold to reduce the chances for noxious weed infestations.
- d. Topsoil is to be removed and stockpiled. Operator will be required to cover the topsoil pile to prevent the loss of topsoil to wind erosion. Operator must cover the topsoil with a biodegradable mesh fabric that allows water and air to circulate through the topsoil. Operator cannot cover the topsoil with any type of impermeable fabric.
- e. Rehabilitation of upland sites following disturbance would use the plant species listed below for seeding. The species used for rehabilitation would vary depending on the adjacent habitat conditions, site potential, soils and precipitation. Species not in the following list could be added if site conditions

warrant, species availability changes or if there are large acreages are involved.

- f. All permanent structures will be painted the neutral color of Sand Beige (5Y 6/3), Desert Brown (10YR 6/3), Carlsbad Canyon (2.5Y 6/2) or Slate Gray (5Y 6/1) as displayed in the Standard Environmental Color chart (available at the BLM office) or other acceptable color approved by the authorized officer to blend in with the surrounding landscape.
- g. If the well is a dry hole, Operator will be required to fence the entire disturbed area of the location to allow the seedings and vegetation to re-establish. This fencing must be stock tight and must remain in place until the BLM requests otherwise.

2. Downhole Conditions:

- a. Surface casing shall have centralizers on each of the bottom three joints and shall be cemented back to surface.
- b. BOP system shall be consistent with Onshore Oil and Gas Order No. 2, 2M system.
- c. The operator shall obtain verbal approval prior to initiating side-tracking operations. At the time of approval, the operator must identify the proposed azimuth, kick-off point, inclination rate (angle build rate), and the estimated closure or horizontal length to be drilled. All wellbore paths, i.e. different orientations of bottom hole locations, require prior approval.
- d. The operator shall have sufficient weighting materials and loss circulation materials on location in the event of a pressure kick or in the event of loss circulation.

3. Informational Notice:

- a. Approval of this APD does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease, which would entitle the applicant to conduct operations thereon.
- b. The lessee shall comply with applicable laws and regulation; with the lease terms, Onshore Oil and Gas Orders; NTL's; and with other orders and instructions of the authorized officer.
- c. A complete copy of the approved APD must be on the well site and available for reference during the construction and drilling phase.

Rehabilitation Species List			
<i>Common Name</i>	<i>Scientific Name</i>	<i>4 Code</i>	<i>6 Code</i>
12 to 14 inch precipitation zone			
western wheatgrass	<i>Pascopyrum smithii</i>	PASM	PASSMI
bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>	PSSP6	PSESPI
thickspike wheatgrass	<i>Elymus macrourus</i>	ELMA7	ARGDAS
slender wheatgrass	<i>Elymus trachycaulus</i>	ELTR7	ELYTRA
green needlegrass	<i>Nassella viridula</i>	NAVI4	STIVIR
needle and thread	<i>Hesperostipa comata</i>	HECO26	STICOM
blue flax	<i>Linum perenne</i>	LIPE2	LINPER
scarlet globemallow	<i>Sphaeralcea coccinea</i>	SPCO	SPHCOO
Woods' rose	<i>Rosa woodsii</i>	ROWO	ROSWOO
15 to 19 precipitation zone			
basin wildrye	<i>Leymus cinereus</i>	LECI4	LEYCIN
bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>	PSSP6	PSESPI
slender wheatgrass	<i>Elymus trachycaulus</i>	ELTR7	ELYTRA
Idaho fescue	<i>Festuca idahoensis</i>	FEID	FESIDA
sheep fescue	<i>Festuca ovina</i>	FEOV	FESOVI
Sandberg bluegrass	<i>Poa secunda</i>	POSE	POASEC
blue flax	<i>Linum perenne</i>	LIPE2	LINPER
Woods' rose	<i>Rosa woodsii</i>	ROWO	ROSWOO

- d. Any deviation from the terms of this APD requires prior approval.
- e. This drilling permit is valid for either 1 year from the approval date or until lease expiration, whichever occurs first.
- f. Each drilling, producing or abandoned well shall be identified with the operator's name, the lease serial number, the well number, and the surveyed description of the well (either footages or the quarter section, the section, township and range). All markings must be legible, and in a conspicuous place.
- e. Notify this office at least 6 hours prior to plugging for verbal plugging orders.

BLM Representative – Great Falls Field Station
Office Telephone No. (406) 791-7700:

After hours and weekend contacts are:

Petroleum Engineer Technician
Petroleum Engineer
Environmental Specialist
Field Station Supervisor

4. Notification Requirements:

- Notify this office at least 12 hours before beginning dirt work.
- Notify this office verbally at least 6 hours before the well is spudded.
- Notify this office verbally at least 6 hours prior to running/cementing casing.
- Notify this office verbally at least 6 hours prior to conducting BOP tests.

5. Plugging Requirements:

- Prior approval for abandonment must be obtained. Initial approval for abandonment during drilling operations may be verbal but must be followed by written notification on Form 3160-5, in triplicate.
- Upon completion of the approved plugging, the operator will cut the casing off four feet below reclaimed ground level and a 1/4" x 12" x 12" plate (with a 1/8" weep hole) shall be welded onto a fitting to be screwed into a collar either welded or screwed to the production casing. **The standard aboveground dry hole marker in accordance with 43 CFR 3162.6(d) has been waived by the**

_____. Pits must be fenced until dry or pumped and then filled in and recontoured unless otherwise approved by the Field Station Supervisor.

- c. The following minimum information shall be permanently placed on the plate: “Fed” or “Ind” as applicable; “Lease Number, Operator, Well Number, and Location by quarter/quarter, Section, Township, and Range.”

6. Reports and Notifications:

- a. All submitted information not marked “CONFIDENTIAL INFORMATION” is subject to public disclosure in accordance with 43 CFR 3100.4.
- b. Production Startup Notification is required not later than the 5th business day after any well begins production on which royalty is due anywhere on a lease site or allocated to a lease site, or resumes production in the case of a well which has been off production for more than 90 days, the operator shall notify the authorized officer by letter or sundry notice, Form 3160-5, or orally to be followed by a letter or sundry notice, of the date on which such production has begun or resumed.

7. Hazardous Materials:

- a. Operators and their contractors are to ensure all production, use, storage, transport, and disposal of hazardous materials resulting from the proposed project is in accordance with all applicable Federal, State and local laws, regulations and guidelines, existing or hereafter enacted or promulgated that effect the management of hazardous material, as defined in this paragraph. Hazardous material means any substance, pollutant, or contaminant listed as a hazardous substance under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended, 42 USC 9601 et seq., and its regulations (found at 40 CFR 302). The definition of hazardous substances under CERCLA includes “hazardous waste” defined in the Resource Conservation and Recovery Act (RCRA) of 1976, as amended, 42 USC 6901 et seq., and its regulations. The term also includes any extremely hazardous substances defined by 40 CFR 355, and any nuclear or byproduct material defined by the Atomic Energy Act of 1954, as amended, 42 USC 2011 et seq. The term does not include petroleum, including crude oil or any fraction thereof not otherwise listed or designated as a hazardous substance under CERCLA section 101 (14), 42 USC 9601 (14), or natural gas.

- b. Only drilling mud, drilling fluids, cuttings, native soils, cementing materials and/or approved pit solidifying materials will be placed in the reserve or working pits.
- c. Nonexempt wastes will not be mixed with exempt wastes.
- d. No hazardous materials will be used in the drilling and construction of wellsites and access roads. Commercial preparations, which may contain hazardous materials may be used in production operations and will be transported with the project area. These materials will be handled in an appropriate manner to minimize potential for leaks or spills to the environment. Other waste disposal methods and locations should be described on the APD or SN and approved by the BLM prior to disposal.

8. Environmental Obligations and Disposal of Produced Water:

- a. The Operator is required to take all necessary steps to prevent any death of a migratory bird in pits or open vessels associated with the drilling, testing, completion, or production of this well. The death of any migratory bird found in such a pit or open vessel is a violation of the Migratory Bird Treaty Act and is considered a criminal act. Any deaths of migratory birds attributable to pits or open vessels associated with drilling, testing, completing, or production operations must be reported to this office and the United States Fish and Wildlife Service within 24 hours.
- b. The BLM may require that the pit be designed or the open vessel be covered to deter the entry of birds in any facility associated with drilling, testing, completing, or production of this well. Fencing, screening, and netting of pits may be required as a means to deter bird entry. These conditions would most likely be imposed to prevent the entry of migratory birds if oil is left in pits or open vessels after the cessation of drilling or completion operations, if water disposal pits consistently receive oil, or if pits or open vessels are used repeatedly for emergency situations which result in the accumulation of oil.
- c. Voluntary pit fencing, screening, and netting, or sealing vessels is encouraged thus avoiding potential instances that may result in the death of a migratory bird.
- d. With BLM approval, water produced from newly completed wells may be temporarily disposed of

into unlined pits for up to 90 days. During this initial period, application for the permanent disposal method must be made in accordance with Onshore Order No. 7.

9. Paleontological/Cultural Stipulations:

Paleontological and archaeological field checks by BLM personnel or other authorized personnel will occur prior to disturbance as deemed appropriate by the BLM. A BLM-approved archaeologist or paleontologist will conduct monitoring during surface-disturbing activities. Paleontological or cultural resource sites will be avoided or mitigated as necessary prior to disturbance. Any cultural or paleontological resource discovered by an operator or any person working on his/her behalf will be reported immediately to the BLM, and all operations that may further disturb such resources will be suspended until written authorization to proceed is issued by the BLM authorized officer. An evaluation of the discovery will be made by the BLM to determine appropriate actions to prevent the loss of significant resources.

CONSTRUCTION

Construction of the access road and the well site is necessary before drilling operations begin. The extent of surface disturbance necessary for construction depends on the terrain, depth of the well, drill rig size, circulating system, and safety standards.

The depth of the drill test determines the size of the work area necessary, the need for all-weather roads, water requirements, and other needs. The terrain influences the construction problems and the amount of surface area to be disturbed. Reserve pit size may vary because of well depth, drill rig size, or circulating system.

Access roads to well sites in the planning area usually consist of running surfaces 14 to 18 feet wide that are ditched on one or both sides. Many of the roads constructed will follow existing roads or trails. New roads might be necessary because existing roads are not at an acceptable standard. For example, a road may be too steep so that realignment is necessary.

Roads can be permanent or temporary, depending on the success of the well. The initial construction can be for a temporary road; however, it is designed so that it can become permanent if the well produces. Not all temporary roads constructed are immediately rehabilitated when the drilling stops. A temporary road is often used as access to other drill sites. The main roads and temporary roads require graveling to be maintained as all-weather roads. This is especially important in the spring. Access roads may be

required to cross public lands to a well site located on private or state lands. The portion of the access road on public land would require a BLM right-of-way.

Approximately 3-1/2 acres would be impacted by well site construction. The area is cleared of large vegetation, boulders, or debris. Then the topsoil is removed and saved for reclamation. A level area is then constructed for the well site, which includes the reserve pit.

The well pad is constructed by bulldozers and motor scrapers. The well pad is flat (to accommodate the drill rig and support equipment) and large enough to store all the equipment and supplies without restricting safe work areas. The drill rig must be placed on "cut" material rather than on "fill" material to provide a stable foundation for the rig. The degree of cutting and filling depends on terrain; that is, the flatter the site, the less dirt work is required.

Hillside locations are common, and the amount of dirt work varies with the steepness. A typical well pad will require a cut 10 feet deep against the hill and a fill 8 feet high on the outside. It is normal to have more cut than fill to allow for compaction, and any excess material is then stockpiled. Eventually, when the well is plugged and abandoned, excavated material is put back in its original place.

Reserve pits are normally constructed on the well pad. Usually the reserve pit is excavated in "cut" material on the well pad. The reserve pit is designed to hold drill cuttings and used drilling fluids. The size and number of pits depends on the depth of the well, circulating system and anticipated down hole problems, such as excess water flows.

The reserve pit can be lined with a synthetic liner to contain pit contents and reduce pit seepage. Not all reserve pits are lined; however, BLM can require a synthetic liner based upon factors such as soils, pit locations, ground water and drilling mud constituents. The operator can elect to line the reserve pit without that requirement.

An adequate supply of water is required for drilling operations and other uses. The sources of water can be a water well at the drill site or remote sources such as streams, ponds, or wells. The water is transported to the site by truck or pipeline. Pipelines are normally small diameter surface lines. The operator must file for and obtain all necessary permits for water from the state of Montana. On public lands, an operator must have the BLM's permission before surface water can be used.

DRILLING OPERATIONS

As drilling progresses for a vertical well, the hole is drilled; pipe is placed in the hole to maintain the integrity of the hole. The first string of pipe is the conductor pipe, which

stabilizes the hole near the surface. The second string of pipe placed in the hole is for surface casing, which is set deep enough to reach a competent zone below the deepest usable freshwater aquifer.

The surface casing is set and cemented in the hole by pumping cement between the casing and the well bore wall. Surface casing acts as a safety device to protect freshwater zones from drilling fluid contamination. To prevent the well from “blowing-out” in the event the drill bit hits a high-pressure zone, blowout preventers are mounted on top of the surface casing. If high-pressure zones are encountered that cannot be controlled with mud additives, the blowout preventers can be closed to effectively seal the well.

After the surface casing is set, a smaller drill bit that fits inside the surface casing is installed and drilling resumes. Depending on well conditions, additional strings of casing called intermediate casing may be installed and cemented into place. Conditions resulting in the need for intermediate casing include freshwater zones and sloughing formation zones. Casing prevents the flow of freshwater into the wellbore, and conversely prevents drilling fluids from infiltrating porous formations with low internal pressures. Casing also prevents mixing of waters from different formations (interformational mixing) where water within the formations is of differing quality.

All cementing operation plans are reviewed to assure cement is placed at the appropriate depths and a sufficient quantity is utilized to effectively seal all freshwater-bearing formations from contamination by interformational mixing or migration of fluids.

If no oil or gas is encountered, the well is plugged with cement and abandoned in accordance with state and federal requirements. If the well is a producer, casing is set and cemented in place.

Directional drilling may be used where the drill site cannot be located directly over the drilling target. There are limits to both the degree that the wellbore can be deviated from the vertical and the horizontal distance the well can be drilled away from the well site.

Horizontal wells are drilled similarly to directional wells, except that the bottomhole location of the well is not a single point, but rather a lateral horizontal section. They are drilled to increase the recovery oil and gas reserves from vertically fractured reservoirs, or reservoirs with directional permeability.

PRODUCTION AND DEVELOPMENT

Production

Production begins when a well yields oil or gas in commercial quantities. If formation pressure is sufficient to raise oil to the surface, the well is completed as a flowing well. A pumping unit is installed if the formation pressure is not sufficient to bring the oil to the surface.

When the well is completed as a free-flowing well, an assembly of valves and special connections known as a “Christmas tree” (so called because of its many branch-like fittings) is installed on top of the casing to regulate the flow of the well. Later, when the natural pressure declines, the Christmas tree can give way to a simple wellhead arrangement of valves and a pumping unit to lift the oil artificially. Many pumping units are “beam” style pumps that are powered by electric motors or gasoline engines.

Most gas wells produce by natural flow and do not require pumping. Surface use at a flowing well is usually a small area containing a gas well Christmas tree, a dehydrator, a produced water pit, and a meter house. Separators, condensate tanks, and compressors may be included. Some gas wells require continuous water pumping as water entering the well chokes off the gas flow.

Development

Development can take years and include from one or two wells to more than a hundred wells per field. However, the reasonably foreseeable development scenario for this planning document only forecasts two additional wells per field. Roads to producing wells are upgraded to all-weather roads as necessary. Pipelines, electrical transmission lines, separators, dehydrators, sump pits, and compressor stations soon follow. Sometimes oil and gas processing facilities are built in or adjacent to the field.

Further Seismic Testing

More detailed seismic work can be done to achieve better definition of the petroleum reservoir. Diagonal seismic lines can be required to tie the previous seismic work to the discovery well. The discovery well can be used to conduct studies to correct the previous seismic work and provide more accurate subsurface data.

Spacing Requirements

A well spacing pattern must be established before development drilling begins. Information considered in establishment of a spacing pattern includes data from the discovery

well on porosity, permeability, pressure, composition, and depth of formations in the reservoir; well production rates and type (predominantly oil or gas); and the economic effect of the proposed spacing on recovery. The state of Montana establishes well spacing patterns for both exploratory and development wells which the BLM generally adopts. The state specifies the minimum distance from lease lines or government survey lines for bottom hole location of the wellbore depending upon depth of the well. The spacing regulations determine the acres assigned to each well. Spacing unit size is established to provide for the most efficient and economic recovery of oil or gas from a reservoir. Well spacing ranges from 40 acres to 640 acres. Wells deeper than 11,000 feet can be no closer than 1,650 feet to other producing wells below 11,000 feet. Only one producing well per formation is allowed in each 40, 80, 160, 320, and 640-acre unit. Figures A and B show the different spacing patterns for oil and gas wells and the minimum distance from spacing unit boundaries to the well that are generally applied in Montana.

Drilling of Development Wells

The procedures used in drilling development wells are the same as those used for wildcat wells, but usually with less subsurface sampling, testing, and evaluation. The rate at which development wells are drilled in a field depends on factors such as whether the field is developed on a lease basis or unitized basis, the probability of profitable production, the availability of drilling equipment, lease requirements, and the degree to which limits of the field are known.

Some fields go through several development phases, the first resulting from the original discovery and others from later discovery. A field can be considered fully developed and produce for several years, and then a well may be drilled to a deeper or shallower pay zone. Discovery of a new pay zone in an existing field is a “pool” discovery (as distinguished from a new field discovery). A pool discovery may lead to the drilling of additional wells, often from the same drilling pad as existing wells.

Inspections

Geophysical operations and lease operations are inspected to determine compliance with approved permits, to resolve conflicts or correct problems and to determine effectiveness and need of lease stipulations. All inspections are documented. Operators are required to correct problems or violations.

Surface Requirements

Field development activities that cause surface disturbance include access roads, well sites, production facility sites, flow line and utility line routes and waste disposal sites.

Surface uses in a gas field will be less than in an oil field, because gas wells are usually drilled on larger spacing units. The spacing pattern of 640 acres per well, which is common in gas fields, will require only one well per section and might require only 1/2 mile of access roads and pipelines. Production facilities include separation and storage equipment. Separation equipment is required when production includes a combination of oil, gas or water and storage equipment is required for holding liquids prior to sales.

Flow Lines

Oil and gas are transferred from the well to storage facilities through small diameter (<6 inches) flow lines. Flow lines can be on the surface, buried or elevated. Produced water, gas or polymerized liquid is transferred from storage facilities to injection wells for secondary recovery.

Separating, Treating, and Storage

Any water or gas associated with produced oil is separated from the oil before it is placed in storage tanks. The treating facilities are located at a storage tank battery. Low-pressure petroleum that must be pumped from the well is treated in a single separation. High-pressure, flowing petroleum can require several stages or separation, with a pressure reduction accompanying each stage.

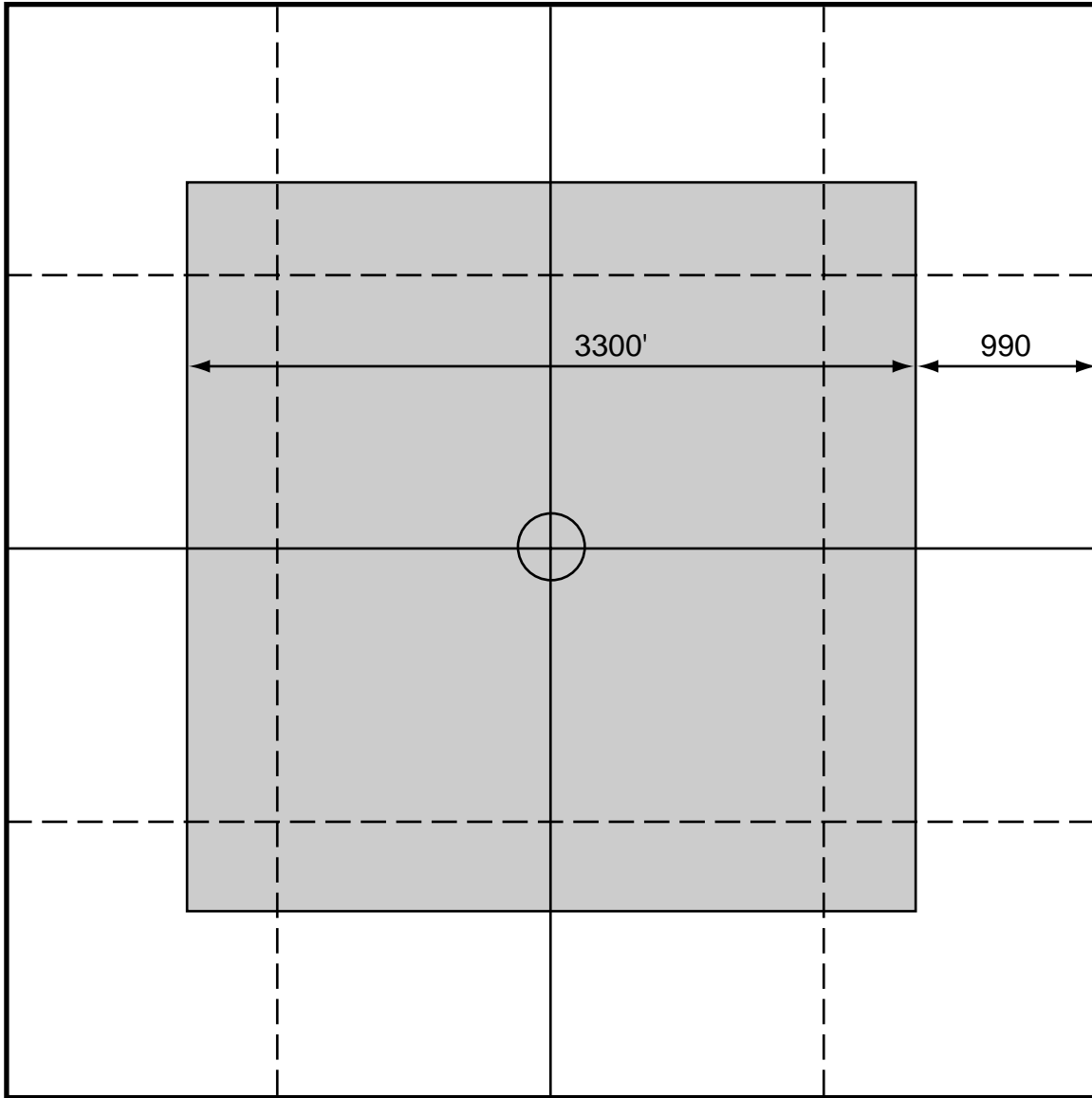
Produced gas is sold when there is sufficient volume, necessary transportation, a market, and it is economical. Generally, if the volume of produced gas is too low for sales, it is used as fuel for well pump engines and heating fuel for the treaters. If the volume of produced gas exceeds fuel requirements on the lease but gas sales are not possible, the gas can be flared or vented into the atmosphere when authorized by permit in accordance with state and federal regulations.

When water is produced with the hydrocarbons, it is separated before the gas is removed. In primary operations, where natural pressures or gravity causes the petroleum in the reservoir to flow to the wellbores, the degree of mixing is high enough to require chemical and heat treatment to separate the oil and water. In secondary production, where water injection or other methods are used to force additional petroleum to the wellbore, the oil and water often are not highly emulsified. In this case, the oil and water can be separated by gravity in a tall settling tank. Produced water can be disposed of by injection into the subsurface, surface evaporation or beneficial purposes such as water for livestock or irrigation.


Produced water from oil and gas operations is normally disposed of by subsurface injection or in surface pits. Regardless of the method of disposal, it must be acceptable to the BLM, in accordance with the requirements of Onshore Oil

Figure A
Gas Well Spacing Section Plat

640 Acre Spacing



SOURCE: Montana Oil & Gas Commission

 Area in which well should be drilled

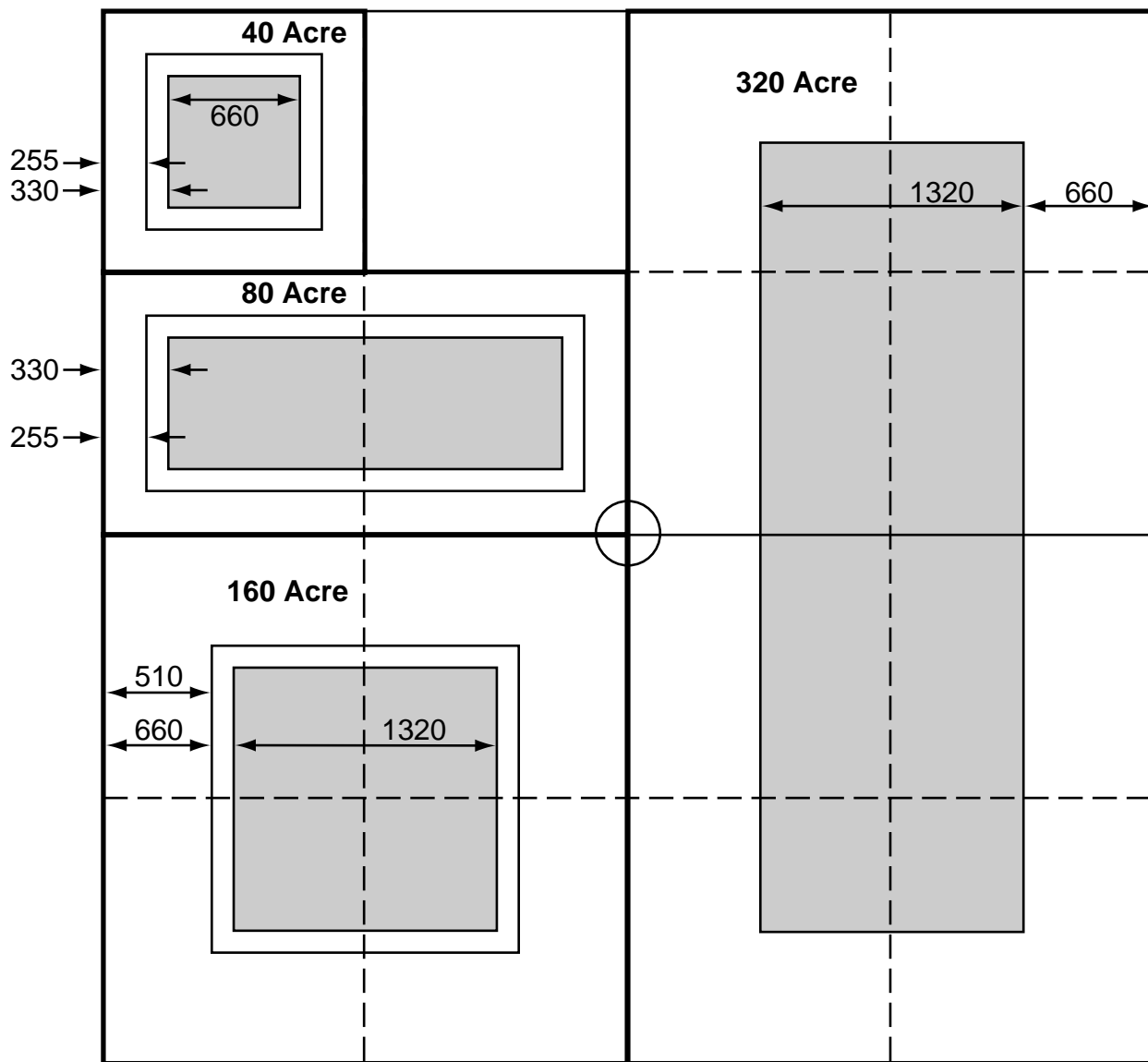
Well
Depth
(feet)

0>


Minimum Well
Distance
(feet)

990

Figure B
Oil Well Spacing Section Plat



SOURCE: Montana Oil & Gas Commission

 Area in which well should be drilled

Well Depth (feet)	Spacing (acre)	Nearest Boundary (feet)	Topographic Tolerance (feet)	Minimum Well Distance (feet)
0-6,000	40 & 80	330	75	255
6,000 - 11,000	160	660	150	510
11,001 - >	320	660	none	none

For the 320 acre spacing (1,650 well tolerance) and the 80 acre spacing the drilling unit will be delineated either N-S or E-W

and Gas Order No. 7, titled “Disposal of Produced Water.” Disposal of produced water by injection wells requires permits from the Montana Board of Oil and Gas Conservation. When produced water is disposed underground, it is introduced or injected under pressure into a subsurface horizon containing water of equal or poorer quality. Produced water may be injected into the producing zone from which it originated to stimulate oil production. Dry holes or depleted wells are commonly converted for saltwater disposal and occasionally new wells are drilled for this purpose.

The law and regulations require that all injection wells be permitted under the Underground Injection Control program. Under the Underground Injection Control approval process, the disposal well must be pressure tested to ensure the integrity of the casing. The disposal zone must also be isolated by use of tubing and mechanical plug called a packer. The packer seals off the inside of the casing and only allows the injected water to enter the disposal zone. The tubing and packer are also pressure tested to ensure their integrity. These pressure tests confirm isolation of the disposal zone from possible usable water zones.

The oil is transported to storage tanks through flow lines after separation from any water or gas. Storage tanks are usually located on the lease either at the producing well or at a central production facility. The number and size of tanks are dependent upon the type and amount of production on the lease.

ABANDONMENT

When drilling wells are unsuccessful or production wells are no longer useful, the well is plugged, equipment is removed from the well site or production facility site, and the site is abandoned. The well bore is secured by placing cement plugs to isolate hydrocarbon-producing formations from contaminating other mineral or water bearing formations. The site and roads are then restored as near as possible to original contours. Topsoil is replaced and the recontoured areas are seeded. Reclamation of access roads and well sites on privately owned surface is completed according to the surface owner’s requirements.

Rehabilitation requirements generally are made a part of the Application for Permit to Drill. Upon completion of abandonment and rehabilitation operations, the lessee or operator notifies the Great Falls Oil and Gas Field Station that the location is ready for inspection. Final abandonment will not be approved until the required surface reclamation work has been completed to the satisfaction of the BLM or surface owner. The period of bond liability for the well site is terminated after approval of final abandonment.

Reclamation of the reserve pit is part of the well site reclamation process. Reserve pit reclamation includes removal

of fluids to a disposal well or commercial pit and burial of solids in the pit. Solids should not be buried until dry and then covered with a minimum of 6 feet of native soil. Any pit liner may be buried in place. Methods such as solidification or dewatering may be used to help dry the solids.

REGULATIONS, LAWS, AND SPECIAL PROCEDURES

Unit and Communitization Agreements

Unit and *communitization* agreements can be formed in the interest of conservation and to allow for the orderly development of oil and gas reserves.

A unit agreement provides for the recovery of oil and gas from the lands as a single consolidated entity without regard to separate lease ownerships. An exploratory unit is used for the discovery and development of the field in an orderly and efficient manner. Paying and nonpaying well determinations are made for each well drilled. If the well is nonpaying as defined by the agreement, the production is allocated on a lease basis. If the well is a paying unit well, a participating area is formed and the production is allocated to all interest owners in the participating area based on surface area.

A secondary unit is formed after the field has been defined and enhanced recovery techniques are being utilized. Secondary recovery techniques include water injection, natural gas injection, or carbon dioxide injection. Injection is initiated to maintain the reservoir pressure to maintain oil production. The agreement provides for the allocation of production among all the interest owners.

A communitization agreement combines two or more leases (federal, state, or fee) that otherwise could not be independently developed in conformity with established well spacing patterns. The leases within the spacing unit share in the costs and benefits of the well drilled in the spacing unit. Therefore, unit and communitization agreements can lessen the amount of damage to the environment and save dollars by eliminating unnecessary wells, roads, pipelines, and lease equipment.

Drainage Provisions

Federal oil and gas leases include a clause that the lessee must protect the leased area from drainage by off-lease wells. The regulations at 43 CFR 3162-2-9(b) state that the lessee/operating rights owner has an obligation to notify the BLM if drainage is occurring. If the lessee/operating rights owner has an interest in the draining well, he must notify the BLM within 60 days after completion of a drill stem, production, pressure analysis, or flow tests of the well. However, if the

lessee/operating rights owner has no interest in the well, he must notify the BLM within 60 days after well completion or first production reports for the draining well are filed with either BLM, State Oil and Gas Commissions, or regulatory agencies and are publicly available. The lessee/operating rights owner must inform BLM of his plan to either protect the lease from the drainage, or demonstrate that a protective well would not be economic. The lessee has the option of drilling a protective well on lease or paying compensatory royalty for the lost oil or gas. The lessee also has the options of submitting data showing that drainage is not occurring or relinquish the portion of the lease subject to drainage after payment of compensatory royalty for drainage that did occur. The objective of the drainage program is to prevent the loss of federal oil and gas due to drainage by requiring the drilling of protective wells and, where appropriate, to assess compensatory royalty for such losses.

Drilling Access With No Surface Occupancy Stipulations on Oil Leases

No surface occupancy stipulations can restrict the development potential of a federal oil and gas lease. The no surface occupancy stipulations can limit the area that can be developed by restricting the amount of surface acreage available for occupancy. No surface occupancy restrictions often do not affect access to oil and gas resources unless there are blocks of contiguous land with no surface occupancy stipulation or the drilling depth is presumed to be shallow. The drilling access area is that area under a no surface occupancy lease or lease parcel that can be accessed by the well bore from a surface location outside of the areas (see Figure C).

Lands near the outer boundary of a lease affected by a no surface occupancy stipulation can theoretically be developed by directional drilling. The BLM cannot assume that a prudent operator would use new technology such as horizontal drilling to access an entire lease area. Although the technology might allow exploration, the expense might make the venture uneconomical. However, BLM can assume that an operator might be willing to directionally drill wells using equipment and drilling techniques that make the venture economical. For a directionally drilled well, a maximum deviation of approximately five degrees is a commonly used rule of thumb for how much a vertical hole can be economically deviated using a standard drilling rig.

A “directional drilling accessibility” concept has been developed for leases affected by no surface occupancy stipulations. Shallow wells in Montana, less than 6,000 feet deep, can be deviated up to 1/8 mile and have the angle of deviation remain reasonably close to five degrees. This will place the bottom hole location in the center of a 40-acre tract.

Because these wells are commonly spaced on a 40-acre basis, all spacing units within 1/4 mile of the outer boundary of the lease can be tested. Wells between 6,000 and 11,000 feet deep can also be deviated up to 1/4 mile. This will place the bottom hole location of the well the maximum allowable distance from the lease line for a well of this depth. Because these wells are spaced on a 160-acre basis, all spacing units within 1/2 mile of the exterior boundary of the lease can be tested.

Wells in Montana, with a total depth greater than 11,000 feet, are normally spaced on a 320-acre basis. These wells can be deviated up to 1/4 mile using the above criteria. Using this distance, all spacing units within 1/2 mile of the outer boundaries of an affected lease can be tested.

Split Estate

Part of the area included in the planning area contains lands known as split estate lands. These are lands where the surface ownership is different from the mineral ownership. Management of federal oil and gas resources on these lands is somewhat different from management on lands where both surface and mineral ownership is federal. On split estate lands where the surface ownership is private, the BLM places necessary restrictions and requirements on its leases and permit approvals and works in cooperation with the surface owner. BLM has established policies for the management of federal oil and gas resources in accordance with federal laws and regulations.

The BLM does not have the legal authority to regulate how private surface is managed. BLM does have the statutory authority to require measures by lessees to avoid or minimize adverse impacts that may result from federally authorized mineral lease activities. These measures, in the form of lease stipulations or permit conditions of approval, are intended to protect or preserve the privately owned resources and prevent adverse impacts to adjoining lands, not to dictate management to the surface owner.

The term split estate can also refer to lands where the surface ownership is federal and the mineral ownership is private. In this situation, BLM is the surface owner, and works in cooperation with the proponent and the state regulatory agency that approves private mineral applications. BLM has responsibilities in this situation under the previously mentioned statutes; however, BLM does not have the authority to approve or disapprove the mineral owner’s actions. The mineral estate owner usually has the right to enter the land and use the surface that is necessary and reasonable for mineral development through either a reserved or an outstanding right contained in the deed.

Figure C
Directional Drilling Accessibility Concept

