OIL
AND
GAS

SURFACE OPERATING STANDARDS FOR OIL AND GAS EXPLORATION AND DEVELOPMENT

"Gold Book"

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United States Department of the Interior
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Forest Service

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INTRODUCTION

Federally owned oil and gas resources are located on lands administered by the Bureau of Land Management (BLM), the USDA Forest Service (FS), other Federal surface management agencies and on lands with non-Federal surface ownership (split estates). Federal oil and gas lease surface operations are managed by the BLM in cooperation with the appropriate surface management agencies or surface owner. On National Forest System lands, the FS has approval authority for the surface use portion of the Federal oil and gas operation.

Purpose of this Guide

The *Surface Operating Standards for Oil and Gas Development* (Gold Book) was developed to assist the operator by providing information on permit approval and conducting environmentally sound oil and gas operations on Federal lands, including exploration, production, and reclamation. This Guide will also prove useful to oil and gas operators conducting operations on Indian lands. Early coordination with the BLM and the appropriate surface management agency or Bureau of Indian Affairs (BIA) office is encouraged as procedures and requirement vary by agency or reservation.

This guide provides operators with general guidance and standards for compliance with agency policies and the operating requirements found in 43 CFR 3000, 36 CFR 228E, Onshore Oil and Gas Orders, and Notices to Lessees (NTL). Refer to agency field offices and websites for more detailed discussions of specific procedures and requirements and for copies of Regulations, Onshore Orders, NTLs, and other agency policies currently in effect.

Every operation authorized under a Federal oil and gas lease should conform to BLM, FS, or other agency standards and reflect relevant, site-specific conditions. Knowledge of BLM Resource Management Plans and FS Land and Resource Management Plans, as well as agency operational standards, procedures, and environmental protection requirements will help operators meet those standards.

Surface Management Agency

The lease will indicate whether the surface management agency is the BLM, FS, or another agency. If this information is not provided in the lease, the lessee should contact the BLM to determine the surface management agency involved.

Maps of Federal Jurisdiction

Maps of the BLM State Offices and Regional Forest Service Offices, address and telephone numbers are shown on page xx.

Development on Split Estates - Privately Owned Surface/Federally Owned Minerals

The operator should contact the private surface owner before entering on private surface to stake a well location and access road or conduct needed cultural or biological surveys.

Each Application for Permit to Drill (APD), Notice of Staking (NOS), or Sundry Notice (SN) to conduct new surface disturbing activities must contain the name, address, and the telephone number of the private surface owner. The BLM will invite the surface owner to participate in the onsite inspection and will take into consideration the needs of the surface owner when reviewing the APD. BLM will offer the same level of surface protection to the surface owner as it provides on Federal surface. BLM will not apply standards or conditions that exceed those that would normally be applied to Federal surface, even when requested by the surface owner. When approving the APD, BLM will apply conditions to the APD that protect adjacent Federal or Indian lands and ensure compliance with laws, regulations, Onshore Orders, and agency policies.

Prior to approval of the APD, (or Sundry Notice to conduct new surface disturbing activities), the operator must certify as part of the complete application that it has made a good faith effort to reach an agreement

with the private surface owner. The BLM will contact the surface owner to confirm the existence of the agreement. If the surface owner and operator fail to reach an agreement, the operator must file a bond (minimum of $1,000) with BLM for the benefit of the surface owner. The BLM will advise the surface owner of appeal rights and will review the value of the bond if the surface owner appeals.

The agreement between the surface owner and the operator is private, and neither the surface owner nor the operator is required to provide the details of the agreement to the BLM or other agencies. However, the APD Surface Use Plan of Operations should contain sufficient detail about any aspects of the agreement necessary to support National Environmental Policy Act (NEPA) documentation and ensure compliance with laws, regulations, Onshore Orders, and agency policies.

The BLM may require cultural resources, threatened and endangered species, or other resource survey information in order to comply with the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), or to complete an environmental analysis under the National Environmental Policy Act. The operator is responsible for making access arrangements with the private surface owner for the purpose of conducting needed surveys.

Filing Plans

Onshore Oil and Gas Order No. 1 describes the procedure for filing either an APD, or a Notice of Staking followed by an APD. Early contact and discussions with the BLM and the surface management agency are highly encouraged and will expedite approval of the APD. This contact should be made prior to the commitment of dates, equipment, access route acquisition, and preparation of the APD.

Each APD must include an 8-point Drilling Plan and a 13-point Surface Use Plan of Operations in accordance with Order No. 1. No surface disturbing operations are allowed without an approved APD. Requests for changes to the approved APD must be submitted to the BLM for prior approval on a Sundry Notice (Form 3160-5).

Environmental Analysis

BLM and the surface management agency, if applicable, are responsible for ensuring compliance with the National Environmental Policy Act. Upon receipt of a complete APD or formal proposal that encompasses multiple wells in a specific area, the BLM, surface management agency, or the agency's or operator's environmental contractor will conduct an environmental analysis and prepare an environmental document in conformance with the requirements of National Environmental Policy Act and the regulations promulgated by the Council on Environmental Quality (CEQ). The BLM and/or surface management agency will issue the decision document(s). The extent of the environmental analysis process and timeframe for issuance of a decision may depend upon the complexity of the proposed action and resulting analysis and the type of documentation required.

Onsite Inspection

A pre-APD approval onsite inspection will be conducted with the operator to further identify site-specific resource protection concerns and requirements. Prior to, or in conjunction with, the onsite inspection, the surface management agency will advise the operator if any special inventories or studies are required, such as for cultural resources or threatened and endangered species.

Interim and Final Reclamation

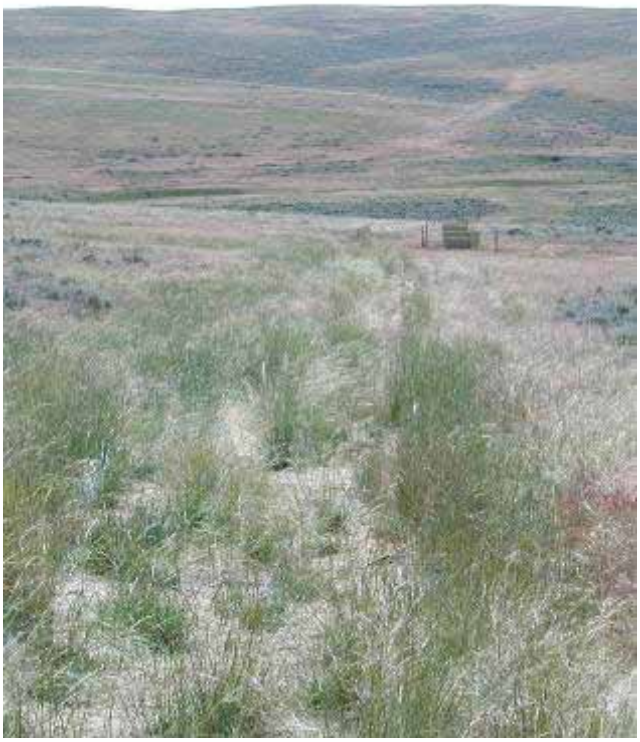
All areas no longer needed for operations are to be reclaimed. Interim reclamation to significantly reduce areas of disturbance will be initiated for active well and facility locations, pipelines, and roads when well completion operations or facility installation operations are concluded. All surface disturbances associated with plugged wells and facility abandonment must be reclaimed after operations have concluded. Final reclamation will not be approved until reclamation work is determined to be successful by the surface owner or the surface management agency.

Best Management Practices

All operations are to be conducted in a manner that minimizes impacts to the environment. Proper

planning and consultation with the surface management agency and the incorporation of environmental Best Management Practices (BMP) into the APD Surface Use Plan will typically result in a more efficient APD and National Environmental Policy Act review process, increased operating efficiency, reduced long-term costs, and reduced final reclamation needs (Photograph 1).

PHOTOGRAPH 1. Best Management Practices in this photograph include: a two-track, primitive road with full interim reclamation of the road and well pad; flowlines and electrical lines buried deep within the access route; remote monitoring to reduce traffic to the well; submersible pump; small well box painted to blend with the background.



Constraints

Constraints may be imposed on the location of access roads, well sites, and facility sites or the timing of geophysical exploration, well drilling, or other operations. Constraints may result from lease stipulations or the surface management agency's review and environmental analysis of the proposed operations. When consultation with the State Historic Preservation Office and/or the U.S. Fish and Wildlife Service (FWS) is required, the time needed for APD review may be extended and may result in additional constraints on operations.

Other Federal, State, or Local Permits or Authorizations

A permit or authorization from the BLM or surface management agency will be required unless otherwise exempted by order or NTL for on-lease uses such as disposal of produced water, sand or gravel use, and gas flaring. Off-lease uses, such as facilities and roads, will require a permit or authorization by the surface management agency. All facilities located on the lease, but owned by parties other than the operator, will also require a permit or authorization from the surface management agency.

BLM approval of an APD does not relieve the operator from obtaining any other authorizations required for drilling or subsequent operations. This includes any requirements of other Federal, Tribal, State, or local authorities.

CHAPTER 1

GEOPHYSICAL OPERATIONS

Introduction

The primary objective of this chapter is to identify the procedures and content necessary for ensuring the efficient review and approval of environmentally sound geophysical exploration. Geophysical operations may be conducted on most Federal lands by bonded geophysical operators, regardless of whether the Federal lands are leased. Prior to conducting operations, the operator must contact the surface management agency. With prior approval, lessees may conduct geophysical operations on their lease as a lease right.

BLM and FS Requirements

Geophysical Operator

An operator is required to file with the BLM or FS authorized officer a "Notice of Intent and Authorization to Conduct Oil and Gas Exploration Operations" (BLM Form 3150-4/FS Form 2800-16) and will be apprised of practices and procedures to be followed prior to commencing operations on BLM or National Forest System lands. The "Notice" shall include site-specific environmental information as well as a map showing the location of the geophysical lines, all access routes, and ancillary facilities. The map should be at a minimum scale of one-half inch equal to one mile; however, a 1:24,000 USGS topographic map is recommended. The party filing the Notice (named on the top of the form) will need a bond for most operations. A copy of the bond or other evidence of satisfactory bonding must accompany the Notice. Holders of statewide or nationwide oil and gas lease bonds may obtain a rider to include coverage of geophysical operations. For geophysical operation methods involving surface disturbance, a cultural resources survey may be necessary. In limited circumstances, endangered species surveys may also be necessary.

The completion and signing of the Notice signifies agreement to comply with the terms and conditions of the Notice and subsequent practices and procedures specified by the authorized officer. A prework field conference is recommended and may be conducted by the surface management agency. Earth moving equipment shall not be used without prior approval. Upon completion of operations, including any required reclamation, the operator is required to file a "Notice of Completion of Oil and Gas Exploration Operations" (BLM Form 3150-5 or FS Form 2800-16a).

PHOTOGRAPH 2. Vibroseis crawlers. One of many geophysical exploration methods.

Authorized Officer

The authorized officer will contact the operator after the geophysical Notice is filed and apprise the operator of the practices and procedures to be followed. On National Forest System lands, a fee will be assessed for operations on a Federal lease not held by the operator.

The authorized officer will complete a final inspection of the site and notify the operator that the terms and conditions of the Notice have been met or that additional action is required by the operator. Consent to release the bond or terminate liability will not be granted by the surface management agency until the operator has met the terms and conditions of the Notice.

State, Local, or Other Federal Surface Management Agency Requirements

There may be State or local requirements for geophysical operations. It is the operator's responsibility to be aware of and comply with these requirements. The requirements of other Federal surface management agencies may vary. Authorization of the surface management agency is normally required prior to entry on the land.

Split Estate Minerals Administered by the BLM

Where the minerals are Federally owned and the surface is private or State owned, no authorization is necessary from the Federal Government to conduct geophysical operations. Operators must work with the surface owner to obtain access and the State permitting agency for authorization of operations.

CHAPTER 2

PROCEDURAL GUIDELINES FOR OIL AND GAS OPERATIONS

The primary objective of this chapter is to identify the procedures and content necessary for ensuring the efficient review and approval of environmentally sound oil and gas lease development. The summary on the following pages is provided to acquaint the operator with the basic procedures for approval of lease operations.

The operator has two procedural options for securing approval to drill: The Notice of Staking (NOS) option and the Application for Permit to Drill (APD) option. Although timeframes set forth in the regulations are the same for both options, each has individual advantages. The Notice of Staking option, if properly coordinated at the beginning of the action, may expedite final permit approval, particularly for exploratory wells. The APD option may be more efficient for use with in-fill wells in developed fields where the operator and surface management agency have developed a close working relationship and have agreed on a general development plan and standard operating practices for the field.

Initiating the Process

The process of obtaining approval to drill is generally initiated by filing either a Notice of Staking or an APD. The choice of options is typically the operator's, but eventually a complete and acceptable APD must be filed with the BLM. Planning and coordination with the BLM or other surface management agency can be critical to meeting the operator's needs for a smooth and timely permitting process. It is highly recommended that operators coordinate with the surface management agency prior to filing either a Notice of Staking or an APD to discuss the operator's general plans for development. At this planning meeting, the surface management agency will inform the operator of surface management agency procedures and requirements, sensitive areas or seasons that have to be avoided, and other recommendations to aid in timely permit processing.

Approval for a multiple-well, area-wide drilling and development program can also be initiated by submitting a formal proposal that may include a Master Development Plan along with more detailed information about individual wells that would be covered under the plan. Operators should check with the applicable BLM and local surface management agency offices about procedures to follow in such a situation. Procedural guidance provided here is applicable to both single-well and multiple-well projects.

Drilling Application Options

Application for Permit to Drill (APD)

No drilling operations or related surface disturbing activities may be conducted without an approved APD. The APD must be approved by the authorized officer of BLM, in consultation with the surface management agency as appropriate. On National Forest System lands, the FS must approve the Surface Use portion of the APD before BLM can approve the APD. Operators are strongly encouraged to consult with the appropriate surface management agency as early as possible before filing an APD to identify local requirements and potential concerns.

A complete APD consists of a Surface Use Plan of Operations and Drilling Plan, evidence of bond coverage, and other information as may be required by land use plans, environmental analysis, Onshore Orders, Notices to Lessees, regulations, and laws. Onshore Order No. 1 describes the specific informational requirements of the Drilling Plan and Surface Use Plan of Operations. An operator may elect to submit a Master Development Plan addressing two or more APDs that share a common Drilling Plan, Surface Use Plan of Operations, and plans for future development and production. The onsite inspection is held after the filing of the APD, provided the onsite inspection was not held previously under the Notice of Staking option mentioned below.

Approved APDs are valid for 1 year from date of approval, provided lease expiration does not occur during that time. An APD may be extended for up to 1 year at the discretion of the BLM and the surface management agency if a written request is filed before the 1-year expiration date of the APD. After approval of the APD and prior to beginning construction activities, the operator may be required to contact the BLM and surface management agency. Filing an APD initiates the BLM/FS 30-day public notification

period that is required before APD approval. APD form (3160-3) is shown in Form 1.

Notice of Staking (NOS)

By filing an Notice of Staking, the operator is formally requesting an onsite inspection prior to filing an APD. At or shortly after the onsite inspection, the operator is furnished surface use and reclamation requirements for incorporation into the APD. This will aid the operator in filing a complete APD. A Notice of Staking filing also initiates the mandatory BLM/FS 30-day public notification requirement. There is no required form to fill out for a Notice of Staking, but the informational requirements are specific. See Form 2 for an example. When the lands involved are managed by a Federal agency other than the BLM, the Notice of Staking must be filed with that agency ***and*** the BLM.

Surveying and Staking

Regardless of the option selected (Notice of Staking or APD), the well location must be staked and the access roads to be constructed must be flagged ***prior*** to the onsite inspection. Casual use, such as surveying and staking may be initiated without advance approval from BLM or the surface management agency except for lands used for military purposes, Indian lands, or where surface disturbance is likely during the staking process. Operators should notify the surface management agency prior to entry to allow the surface management agency to advise them of sensitive resources that need to be avoided, off-highway vehicle requirements, or difficult, problem conditions. For private or State surface, the operator is responsible for making access arrangements with the surface owner prior to entry.

When an APD is submitted, staking must include the well location, two 200-foot directional reference stakes, the exterior dimensions of the drill pad, reserve pit, cuts and fills, and the outer limits of the area to be disturbed. Off-location facilities must also be staked as well as centerlines of new roads and routes for flowlines and powerlines, with stakes being visible from one to the next (intervisible). In steep terrain or environmentally sensitive areas, cut and fill staking and/or slope staking may be required for the well site, reserve pit, roads, and any ancillary facilities. Because the well, road location, and other associated off-location facilities may change at a Notice of Staking onsite inspection, the operator may request a temporary variance to the full staking requirements for purposes of conducting the Notice of Staking onsite inspection.

Onsite Inspection - Environmental Review – Permit Approval

A pre-APD-approval onsite inspection will normally be conducted within 15 days of BLM's receipt of the Notice of Staking, or an APD if a Notice of Staking was not previously filed. Prior to conducting the onsite inspection, the BLM or surface management agency will determine whether any of the following requirements or features would affect the operational proposal: Land management plan, lease stipulations, level of National Environmental Policy Act analysis required, spacing permitted, cultural survey needs, wildlife clearances, riparian and wetland areas, excessive slopes, landowner consultation, and if a right-of-way (ROW) is needed. The BLM may require cultural resources, threatened and endangered species, or other resource survey information in order to comply with the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), or to complete an environmental analysis under the National Environmental Policy Act. The late submission of survey information and the submission of multiple linear survey reports can delay APD processing. “Best Business Practices,” such as the use of cultural resource “block” surveys, provide the operator with increased flexibility to locate or relocate wells, roads, and utilities so that they avoid cultural resource and other resource impacts and reduce the need to conduct additional surveys that could delay the project. The early submission of cultural resource and other needed survey information to the surface management agency, at or prior to the onsite inspection, will also help ensure efficient environmental review and processing of APDs.

The onsite inspection team will include a BLM/surface management agency representative, the operator or permitting agent, and other affected parties, such as the operator's principal dirtwork contractor and, if known, the drilling contractor. When the inspection is on private surface, the surface owner will be invited by BLM. The purpose of the onsite inspection is to identify site-specific problems and potential environmental impacts associated with the proposal and Best Management Practices for mitigating these impacts.

The BLM, surface management agency, or private contractor will complete the environmental analysis

process in accordance with the requirements of the BLM, surface management agency, National Environmental Policy Act, and the Council on Environmental Quality (CEQ). The BLM and surface management agency will issue the decision documents. APDs on Federal leases will not be approved until after completion of the environmental analysis and the public notification process. Approved permits will be subject to the operator's permit application as modified by the existing lease stipulations, rights-of-way Terms and Conditions, and APD or Sundry Notice (Form 3) Conditions of Approval (COA) developed during the permit review process. An approved APD is valid for 1 year from the date it is approved, or until lease expiration, whichever occurs sooner. If the operator submits a written request prior to the expiration date of the original approval, BLM, in coordination with the surface management agency, may extend the APD for up to 1 additional year.

Lease Stipulation Exceptions, Waivers, and Modifications

Many leases contain stipulations developed during the land use planning process. The land use plan also serves as the primary vehicle for explaining to industry, other agencies, and to the public the circumstances and procedures under which exceptions, waivers, and modifications of lease stipulations may be granted. An operator may request that the authorized officer grant an exception, waiver, or modification to a lease stipulation (43 CFR 3101.1-4). Operator requests should be written and accompanied by the technical information necessary to identify the protected resource and evidence that the resource is no longer present, of concern, or that the conflict can be satisfactorily mitigated by other means. When the drilling operation is proposed on land managed by another surface management agency, the BLM will forward operator requests to the surface management agency for a decision or recommendation. All final decisions will be processed through the BLM.

BLM Rights-of-Way and FS Special Use Authorizations

On BLM-administered lands and National Forest Systems lands, pipelines (upstream from the transfer of custody point), access roads and utilities located on a lease (or within a unitized area) and owned by the lease holder/operator are authorized under an APD or Sundry Notice. On or off lease/unit, pipelines, roads, and utilities owned by someone other than the lease holder/operator require a BLM right-of-way (ROW) or FS Special Use Authorization (SUA). The lease/unit provides APD or Sundry Notice authorization rights only to the lease holder/operator.

On BLM-administered lands, pipelines, access roads and utilities located off the lease or the unitized area require a right-of-way. A pipeline entirely on BLM administered lands, or on lands administered by two or more federal agencies and located downstream of the transfer of custody point, either on or off a lease, also requires a right-of-way from BLM.

On National Forest System lands, access roads and utilities outside the leasehold require a Surface Use Agreement. Pipelines located entirely on National Forest System lands, downstream of the custody of transfer point, also require a Surface Use Agreement.

An APD will be accepted as the application for a BLM right-of-way or FS Special Use Authorization for off-lease facilities owned by the lease holder/operator in lieu of the Application for Transportation and Utility Systems and Facilities on Federal Lands (Standard Form 299). The APD should, therefore, provide details for the entire proposal, including all facilities located off the lease.

At the Notice of Staking or the APD onsite inspection involving rights-of-way on BLM-administered lands, BLM will provide the operator (1) an unsigned Form 2800-14 (Right-of-Way/Temporary Use Permit) containing standard terms and conditions, (2) any special stipulations recommended for environmental protection and (3) a copy of the cost recovery category determination for both processing and monitoring fees. The operator then completes and submits to BLM (1) an APD with a surface use plan; (2) a signed Form 2800-14 with the standard terms and conditions and any adopted special stipulations; and (3) the appropriate cost recovery fees. BLM, after conducting a National Environmental Policy Act analysis for the entire project, returns to the operator of an approved right-of-way (1) an approved APD with surface use plan which may include special stipulations relevant to the right-of-way; and (2) an approved right-of-way grant (Form 2800-14) with standard terms and conditions.

The FS utilizes a similar process as described above to approve APDs and the associated Surface Use

Agreements for pipelines, access roads and utilities located entirely on National Forest System lands, but located off the lease or the unitized area. The Surface Use Agreement may include the APD conditions of approval and any special stipulations resulting from the National Environmental Policy Act analysis.

Other Authorizations

All proposed drilling operations and related surface disturbance activities, as well as any change from an approved APD, must be approved before such activities are conducted. Approval will be in accordance with: (1) lease terms, (2) Conditions of Approval, (3) 43 CFR 3160, (4) Onshore Oil and Gas Orders, and (5) Notices to Lessees. For FS-administered lands, approval must also be in accordance with 36 CFR 228 E. Approval must be obtained from the BLM prior to drilling from private surface into Federal minerals.

The BLM approval of an APD does not relieve the operator from obtaining any other authorizations or approvals required for conducting drilling or related subsequent operations. This includes requirements of other Federal, Tribal, State, or local authorities.

Indian Lands

BLM will process APDs, Master Development Plans, and Sundry Notices on Tribal and allotted oil and gas leases and Indian Mineral Development Act mineral agreements in a manner similar to Federal leases. However, the approval procedures, including environmental and archaeological clearance procedures, may vary between reservations depending on Tribal ordinances. Both the Bureau of Indian Affairs (BIA) and the Tribe have the opportunity to add Conditions of Approval to the APD. For processing such applications, BLM considers the BIA to be the surface management agency for all Indian lands unless a Tribe has contracted the BIA realty function for its lands. Operators are responsible for obtaining any special use or access permits from appropriate BIA and/or tribal offices. BLM is not required to post APDs for minerals subject to Indian leases or agreements for public inspection.

Bonding

Bonding is required (43 CFR 3104, 36 CFR 228 E) for oil and gas lease operations in order to indemnify the United States against losses associated with failure to meet royalty obligations, plugging wells not properly abandoned on a lease, and/or surface reclamation and cleanup on abandoned operations. Bond coverage for operations is to be provided by the operator. The operator may post the bond, or obtain a consent of the surety under an existing lessee's bond or operating rights owner's bond, extending coverage under that existing bond to include such operations. The bond may be a surety or personal bond backed by cash, negotiable securities, Certificate of Deposit, or Letters of Credit in the minimum amount of $10,000. In lieu of a $10,000 lease bond, a bond of not less than $25,000 for statewide operations or $150,000 for nationwide operations may be furnished. When submitting APDs, operators should state which bond they will use. The authorized officer may require additional bonding coverage. Bonded principals may request partial bond releases when portions of the abandonment or final reclamation process are deemed complete by the authorized officer. Prior to and upon the completion of all leasehold abandonment and final reclamation, the operator must notify the authorized officer.

CHAPTER 3
SURFACE USE

The objective of this chapter is to guide the operator in the basic requirements for safe and environmentally sound construction and maintenance of oil and gas-related infrastructure. Construction and maintenance must be performed to standards that ensure the long-term health and productivity of the land.

Well Sites

Site Selection and Design

To the extent permitted by the geologic target, well spacing, and drilling and production technology, the locations selected for well sites, tank batteries, pits, and compressor stations should be planned so as to minimize long-term disruption of the surface resources and existing uses, and to promote successful reclamation. Design and construction techniques and other practices should be employed that would minimize surface disturbance and the associated effects of proposed operations and maintain the reclamation potential of the site. The following guidelines can be used to assist in meeting these objectives and reducing the overall impacts from well sites and other construction areas.

The site layout should be located and staked in the most level area, off narrow ridges, and set back from steep slopes, while taking into consideration the geologic target, economic feasibility, State spacing rules, natural resource concerns, and safety considerations. Well locations constructed on steep slopes cost more to construct, maintain, and reclaim and result in greater resource impacts. Locations on steep slopes that require deep, nearly vertical cuts and steep fill slopes should be avoided or appropriately mitigated. Operations should also be avoided in riparian areas, floodplains, playas, lakeshores, wetlands, and areas subject to severe erosion and mass soil movement. In visually sensitive areas, locations should be selected that provide for vegetative and topographic screening to hide the well location. The well site or production facility location should also be reviewed to determine its effect on the location of the access road. The advantages gained by a good well site or tank battery location should not be negated by the adverse effects of the access road location.

Construction

Construction procedures must conform to the approved Surface Use Plan of Operations. In order to minimize surface disturbance, only construction equipment that is appropriate to the scope and scale of the proposed operation should be used. All surface soil materials (topsoil) are to be removed from the entire cut and fill area and temporarily stockpiled for reuse during interim reclamation. The depth of topsoil to be removed and stockpiled should be determined at the onsite inspection and should be stated either in the proposed Surface Use Plan of Operations or specified in the APD Conditions of Approval. Topsoil should be segregated and stored separately from subsurface materials to avoid mixing during construction, storage, and interim reclamation. Subsurface materials should never be placed on top of topsoil material at any point in the operation. Stockpiles should be located and protected so that wind and water erosion are minimized and reclamation potential is maximized.

Normally, excavation of the cut and fill slopes is guided by information on the slope stakes. Fills should be compacted to minimize the chance of slope failure. If excess cut material exists after fill areas have been brought to grade, the excess material will be stockpiled at approved locations. Snow and frozen soil material is not to be used in construction of fill areas and dikes or berms. To reduce areas of soil disturbance, the surface management agency may allow mowing or brush beating of vegetation for parts of the well location or access road where excavation is not necessary.

The area of the well pad where the drilling rig substructure is located should be level and capable of supporting the rig. The drill rig, tanks, heater-treater, and other production equipment are not to be placed on uncompacted fill material. The area used for mud tanks, generators, mud storage, and fuel tanks should be at a slight slope to provide surface drainage from the work area to the pit. To reduce erosion and soil loss, it may be appropriate to divert run-on water away from the well location with ditches, berms, or waterbars above the cut slopes and to trap well location runoff and sediments on or near the location through the use of sediment fences and/or water retention ponds.

Reserve Pits

Reserve pits should never be constructed in natural watercourses, drainageways, or shallow groundwater. The reserve pit should be located entirely in cut material. The preferred method of reserve pit construction on steeply sloping sites is to locate the pit on the drill pad next to the high wall. The pits are constructed totally in cut at such locations. If this is not possible, at least 50 percent of the reserve pit should be constructed below original ground level to help prevent failure of the pit dike. Fill dikes should be properly compacted in lifts (that is, by rubber-tired construction equipment or sheep's foot roller). The necessary degree of compaction depends on soil texture and moisture content. The pit should be designed to contain all anticipated drilling muds, cuttings, fluids, and precipitation while maintaining at least 2 feet of freeboard.

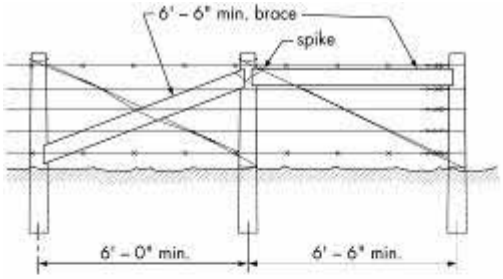
Pits improperly constructed on slopes or poor soil types may leak along the plane between the natural ground level and the fill. There is a significant potential for pit failure in these situations. When constructing dams or dikes for pits or impoundments with fill embankment, a keyway or core trench 10 to 12 feet wide should be excavated to a minimum depth of 2 to 3 feet below the original ground level. The core of the embankment is then constructed with compacted, water-impervious material.

To prevent contamination of ground water and soils or to conserve water, it may be necessary to line reserve pits with an impermeable liner, particularly when it is anticipated pits will contain moderate or high levels of hydrocarbons, chloride, hazardous materials, or the pits are located in areas of shallow groundwater or porous soils over fractured bedrock aquifers. An impermeable liner has a permeability of less than 10^{-7} cm/sec. The liner must be installed so that it will not leak and will be compatible with all substances placed in the pit. Synthetic liners with a minimum thickness of 12 mils and resistance to ultraviolet radiation, weathering, chemicals, punctures, and tearing are most commonly used. Suitable bedding material, such as sand or clay, should be used in areas where the base rock might puncture the liner. Depending on the proposed contents of the pit and sensitivity of the environment, the surface management agency may require leak detection systems, or the use of self-contained mud systems with the drilling fluids, mud, and cuttings being transported to approved disposal areas. Fencing of reserve pits is required to prevent access by persons, wildlife, or livestock. During drilling, the reserve pit must be fenced with a stock-tight fence on three sides and then fenced on the fourth side once drilling has been completed. Refer to Figure 1for fence construction standards. In some situations and locations, netting may be required in order to prevent access and mortality of birds and other animals. The fence should remain in place until pit reclamation begins.

The operator's representative must ensure compliance with all plans and designs. The representative should be designated prior to construction, accessible to the surface management agency authorized officer, and have immediate access to an approved copy of the APD including all maps, drawings, templates, and construction standards and the authority to make changes at the request or order of the surface management agency.

FIGURE 1. RECOMMENDED CONSTRUCTION STANDARDS

FOR RESERVE PIT AND PRODUCTION PIT EXCLOSURE FENCES



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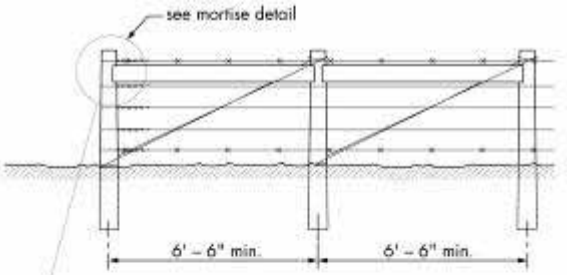

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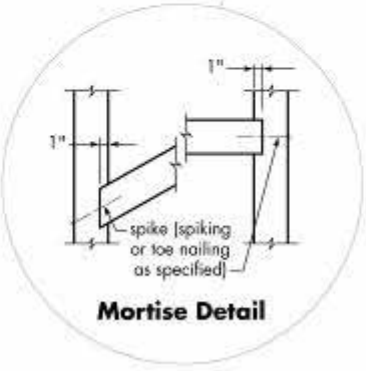
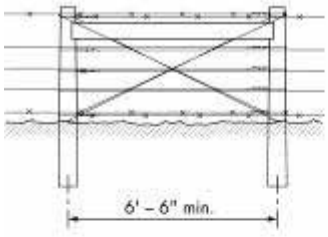
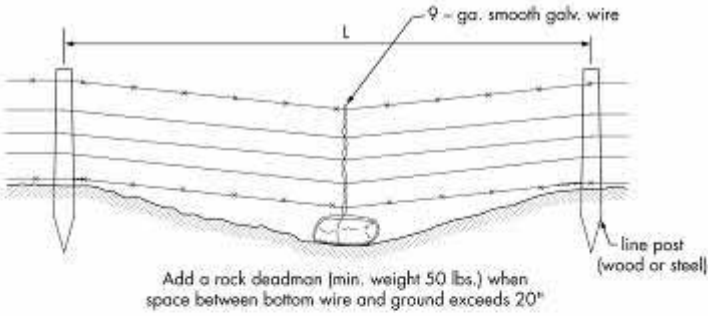


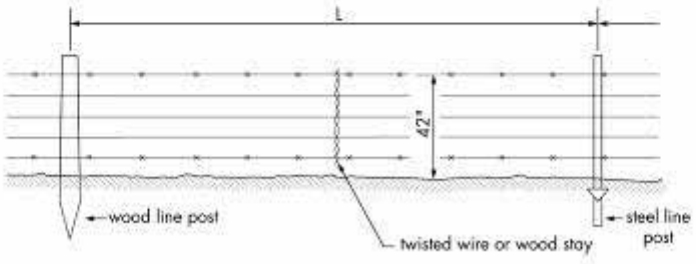
Mortise Detail



Stress Panel



Panel at Minor Depression



Line Panels

Roads and Access Ways

These guidelines have been developed to provide oil and gas operators with BLM and FS policy and standards relative to planning, location, design, construction, maintenance, and operation of roads and access ways on public and National Forest System lands. This chapter provides minimum guidelines. Contact the local BLM or FS office for specific requirements. Figure 2. illustrates commonly used terms in road design, and should be referred to when reviewing this chapter.

To ensure public safety and protection of Federal resources, BLM and FS roads must be designed and constructed to an appropriate standard no higher than necessary to accommodate their intended use. In many cases, the construction of a lower-class road will meet the operator's access needs while minimizing effects on other important resource values.

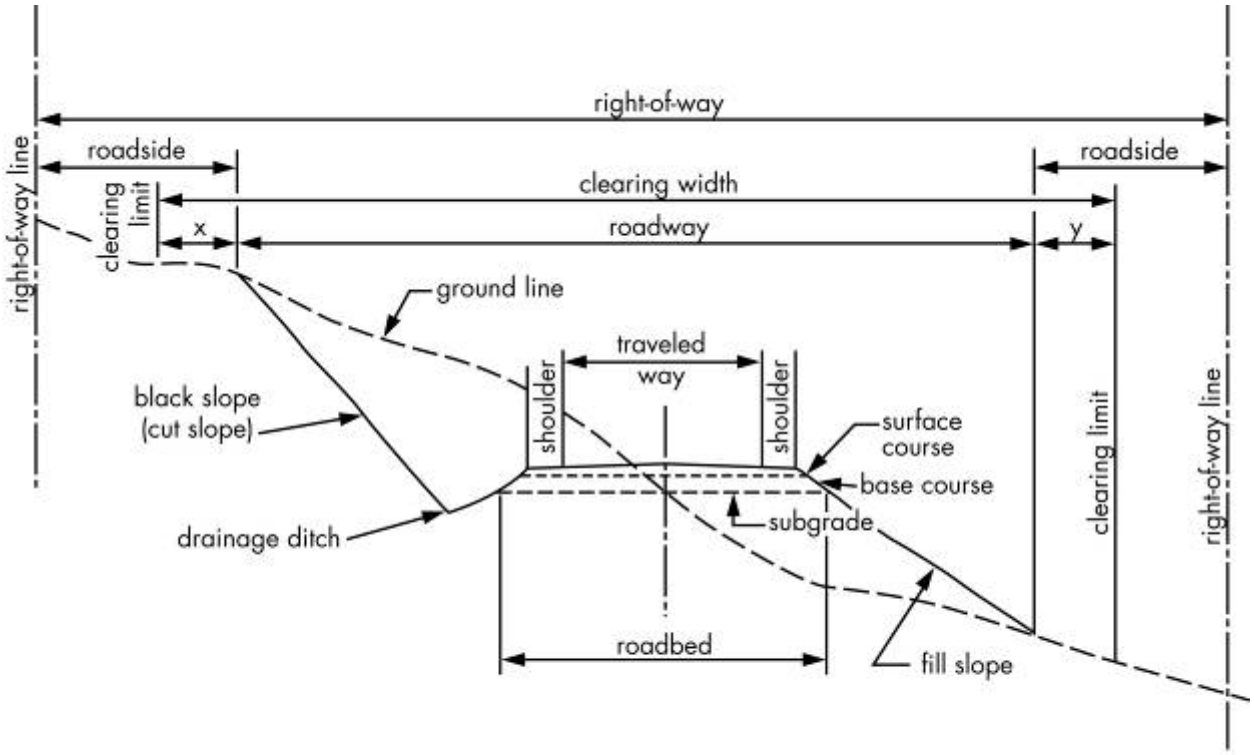
Roads used to access oil and gas locations are typically constructed for the primary purpose of accessing well sites and associated infrastructure. These primary purpose roads are rarely permanent and exist only as long as necessary to complete exploration and production operations. They are authorized with an accompanying reclamation plan and are to be reclaimed after well and field operations are completed.

The authorized officer has the option of determining whether professional engineering design and construction oversight is necessary or whether the road can be constructed by the operator consistent with site-specific standards and approved road design templates. The need for an engineering design and oversight should be based on factors such as topography, soils, hydrology, safety, levels and types of use by the general public, and average daily traffic. For roads constructed without a professional engineering design, the APD package should include: typical cross-section templates; soils-, hydrology-, and topography-dependent drainage design and surfacing design; maximum proposed cut and fill locations; maximum grade and side slopes; and anticipated average daily traffic (ADT). For oil and gas roads on National Forest System lands, a qualified FS engineer reviews all project design drawings, officially attesting to their technical adequacy.

All roads must be designed, constructed, and maintained by the operator in a safe and environmentally sound manner. Oil and gas roads that are not closed to public use (through the use of gates or other traffic control devices) have the potential to serve secondary uses such as providing access for hunters and other recreational users who are not familiar with the road and area. Therefore, design safety is a primary consideration. In addition, roads have the potential to cause environmental harm through erosion, air pollution, stream degradation, habitat alteration, and increased public use of an area. Careful attention to the proposed road location and design can significantly minimize environmental harm. For example, shorter roads constructed on steep slopes may cost more to construct, maintain, and reclaim and can also result in greater environmental impacts than would longer roads constructed along the contours of the land or constructed in flatter terrain. In areas of high environmental sensitivity, special road location, design, construction, and maintenance techniques may be required as well as seasonal vehicular closures to the general public.

It is always a good idea to consult with the surface management agency or private landowner prior to submitting the road design. Helpful design information can also be found on agency websites, such as EM-7100-15 Sign and Poster Guidelines for the FS or the FS Water/Road Interaction Series of publications.

FIGURE 2. ILLUSTRATION OF COMMONLY USED TERMS IN ROAD DESIGN



Note: Shapes and dimensions will vary to fit local conditions
See drawings for typical sections
x and y denote clearing outside of roadway

TRANSPORTATION PLANNING

The goal of transportation planning is to identify and analyze feasible alternatives for access that meet the objectives of the surface management agency, private surface owner, and the needs of the various users of the Federal lands. The planning process considers other resource values, public access needs, safety, and future use of the road, and avoids haphazard or unnecessary development of roads and utility corridors. Transportation planning can prevent unnecessary expenditure of time and money and prevent unnecessary surface disturbance.

It is the policy of the BLM and FS that existing roads will be considered for use as access routes and may be used when they meet agency standards and transportation and environmental objectives. When access involves use of existing agency roads, operators must obtain agency approval and may be required to upgrade and/or contribute to road maintenance. Off-lease, multiple-use roads are typically authorized through a right-of-way grant or joint use agreement in which each user's pro rata share of costs is based upon the anticipated use of the road. On FS lands, use is authorized under a Road Use Permit.

Road location and design criteria are developed and documented during the transportation planning process. New road construction or reconstruction by the operator will comply with BLM/FS standards consistent with the needs of the users. For example, roads open to “public” travel are also subject to the Manual of Uniform Traffic Control Devices and Highway Safety Act standards.

ROAD LOCATION

Road location is the most critical aspect of the engineering and environmental success of a road construction project. Proper road location can significantly reduce or eliminate impacts to cultural, scenic,

biological, and other environmental resources. Operators are strongly encouraged to contact the surface management agency or private surface owner about possible route locations before surveying and staking. This early communication between the operator and the surface management agency or private surface owner can minimize changes made at the onsite inspection and reduce project delays.

When practical, follow the topographic contours in laying out roads. While laying out roads in a point-to-point approach minimizes the length of road, it often increases soil erosion, maintenance costs, long-term loss of vegetation, and visual contrast. Following natural topographic contours preserves natural drainage patterns and usually makes it possible to design a more aesthetically pleasing road with lower construction, maintenance, and reclamation costs and less impact on the environment.

The initial steps in road location include (1) determination of the intended use of the road, planned season of use, type of vehicles to be used, road class, and needs of the private surface owner, (2) examination of the surface management agency's transportation plan, which may already have identified feasible routes for the area, and (3) examination of existing data, including maps and air photos, land use plan decisions, and biological, physical, and cultural conditions of the area. Once these steps have been taken, an experienced route locator should be utilized to determine the route of the proposed travelway. This process is critical to ensuring that the safest and least intrusive route has been chosen.

Geotechnical Factors

The field reconnaissance of alternative routes should provide information on such factors as soil types, construction/reclamation limitations, type of excavation, landslide areas, subgrade conditions indicating the need for surfacing, potential cut slope problems, surface or subsurface water problem areas, suitability of fill material, potential gravel pits or quarries for road aggregate, and potential borrow and waste sites. A good road location analysis may avoid costly problems and identify cost-saving opportunities.

Other Factors

Other factors to consider that are unique to the oil and gas industry include:

1. The potential for encountering sour gas (H_2S): Note the prevailing wind direction and identify a clear escape route from the drill site.

2. The potential for year-round operation: Drill sites and producing locations may require all-weather access and special maintenance considerations for snow removal.

3. The potential for exploratory drilling to result in a producing operation: Select initial road alignments and road classes based on potential for upgrade if the wells are completed for production.

When the road location information is submitted to the surface management agency, the acceptability of the proposed route, and, if applicable, alternative routes, can be evaluated. The preferred road location will be identified by the authorized officer or private surface owner at the onsite inspection.

ROAD DESIGN AND CONSTRUCTION

Construction and Reclamation Considerations

Roads should be designed and constructed to allow for successful interim and eventual final reclamation. Revegetation of road ditches and cut and fill slopes will help stabilize exposed soils and reduce sediment loss, reduce the growth of noxious weeds, reduce maintenance costs, maintain scenic quality and forage, and protect habitat. To ensure successful growth of plants and forbs, topsoil must be salvaged where available during road construction and respread to the greatest degree practical on cut slopes, fill slopes, and borrow ditches prior to seeding. To ensure stability of freshly topsoiled slopes during revegetation, the application of mulch or other sediment control measures may be appropriate.

Construction on saturated or frozen soils results in unstable roads and should always be avoided. Vehicular travel under wet conditions can produce significant rutting of unsurfaced roads resulting in soil loss and safety concerns. If road use is anticipated during saturated soil conditions, the surface management agency may require road surfacing to provide safe vehicle access and to reduce road

damage and sediment loss.

Use of Nonconstructed Roads and Routes

When site conditions are appropriate, the surface management agency may allow the creation or use of "primitive," two-track roads or overland route corridors to meet the driller's or operator's access needs. Primitive roads and route corridors may serve as appropriate access to exploration drilling locations where it is not certain if the well will be productive, or to producing wells where vehicle traffic is infrequent due to the use of off-site production facilities and automated well monitoring. The appropriateness of primitive roads or routes is site/use-specific and is typically based on many factors, such as anticipated dry or frozen soil conditions, flat terrain, low anticipated traffic, or driller's or operator's access needs. Primitive roads or routes necessitate low vehicle speed and are typically limited to four-wheel drive and/or high clearance vehicles. They can consist of existing or new roads with minor or moderate grading; two-track roads created by the operator's direct vehicle use with little or no grading; overland routes within a defined travel corridor leaving no defined roadway beyond crushed vegetation; or any combination along the route. These roads and routes must be used and maintained in a safe and environmentally sound manner and are not intended for use as all-weather access roads. Resource damage must be repaired expeditiously and the road upgraded to an all-weather access road if necessary for safe access or if required by the surface management agency. When used and maintained appropriately, nonconstructed roads and routes have the advantage of reducing construction, maintenance, and reclamation costs and reducing resource impacts. The use of nonconstructed roads must be approved by the surface management agency (Photograph 3).

PHOTOGRAPH 3. A minimum disturbance, primitive, two-track road winds its way to a drilling operation. To further reduce disturbance, most of the well location has not been stripped of vegetation or topsoil.

Constructed Roads

Types of Roads

The surface management agency determines the appropriate road type and associated road design standards based on expected traffic volume and other factors, such as seasonal or year-round use, the design vehicle, soil types, rainfall, topography, construction costs, compatibility with other resource values, and safety. This information is documented during the transportation planning process and onsite meeting. Road types may vary along the same route depending on the operator's or the surface management agency's access or resource protection needs. In some cases, exploration drilling may

warrant a lower design standard or primitive road, mentioned previously, which could be upgraded if the well becomes a producing well.

BLM Resource or FS Local Roads

BLM resource or FS local roads are low-volume, single-lane roads. They normally have a 12 to14 foot travelway with "intervisible turnouts," where approaching drivers have a clear view of the section of road between the two turnouts and can pull off to the side to let the approaching driver pass. They are usually used for dry weather but may be surfaced, drained, and maintained for all-weather use. These roads connect terminal facilities, such as a well site, to collector, local, arterial, or other higher-class roads. They serve low average daily traffic and are located on the basis of the specific resource activity need rather than travel efficiency.

BLM Local or FS Collector Roads

BLM local or FS collector roads may be single- or double-lane with travelways 12 to 24 feet in width and intervisible turnouts. They are normally graded, drained, and surfaced and are capable of carrying highway loads. These roads provide access to large areas and for various uses. They collect traffic from resource or local roads or terminal facilities and are connected to arterial roads or public highways. The location and standard are based on both long-term resource needs and travel efficiency. They may be operated for either constant or intermittent service, depending on land use and resource management objectives for the area being served.

BLM Collector or FS Arterial Roads

BLM Collector or FS Arterial roads are usually double-lane, graded, drained and surfaced, with a 20- to 24-foot travelway. They serve large land areas and are the major access route into development areas with high average daily traffic rates. The locations and standards are often determined by a demand for maximum mobility and travel efficiency rather than a specific resource management service. They usually connect with public highways or other arterials to form an integrated network of primary travel routes and are operated for long-term land and resource management purposes and constant service.

Definitions

Design Criteria. Requirements that govern the selection of elements and standards for a road, such as resource management objectives, road management objectives, safety requirements, and traffic characteristics.

Design Elements. Physical characteristics of a road, such as the ditches, culverts, traveled way clearing limits, curve widening, slopes, and drainage characteristics that, when combined, comprise the planned facility.

Design Standards. Lengths, widths, and depths of design elements, such as 14-foot wide traveled way, 2-foot shoulders, 3/4:1 cut slopes, 3-foot curve widening, and 6 inches of crushed aggregate. The design terms are illustrated in Figure2.

Design Vehicle. The vehicle frequently using the road that determines the minimum standard for a particular design element. No single vehicle controls the standards for all the design elements for a road.

General Design Specifications for Different Types of Roads

BLM Resource and FS Local Roads

1. Basic Design Requirements. The surface management agency will provide requirements specific to proposed oil and gas roads during project planning and/or at the onsite review with consideration of safety, impacts on land and resources, and cost of transportation. Requirements for specific proposals may vary somewhat from those generalized requirements that follow.

a. Design speed specific to oil and gas roads is 15-30 miles per hour. For FS, this should be generally less than 15 miles per hour.

b. Preferred travelway width is 14 feet with turnouts. For FS, this can vary from two parallel vehicle tracks, bladed 12-foot sections with turnouts, or a broader defined overland corridor approved by the surface management agency.

c. Recommended minimum horizontal curve radii determined by the design vehicle and design speed. Where terrain will not allow the proper curve radii, curve widening is necessary. Specifications are available from the surface management agency office.

d. Road gradient has a major effect on the environmental and visual impact of a road, particularly in terms of erosion. The gradient should fit as closely as possible to the natural terrain, considering vehicle operational limitations, soil types, environmental constraints, and traffic service levels. The gradient should not exceed 8 percent except for pitch grades (that is, 300 feet or less in length) in order to minimize environmental effects. In mountainous or dissected terrain, grades greater than 8 percent up to 16 percent may be permissible with prior approval of the surface management agency.

e. The primary purpose of turnouts is to provide user convenience and safety and to maintain user speed. Turnouts are generally naturally occurring, such as additional widths on ridges or other available areas on flat terrain. On roads open to the public, turnouts must be located at 1,000-foot intervals or be intervisible, whichever is less.

f. Drainage control shall be ensured over the entire road through the use of drainage dips, insloping, natural rolling topography, ditch turnouts, or culverts. Ditches and culverts may be required in some situations, depending on grades, soils, and local hydrology. If culverts or drainage crossings are needed, they should be designed for a 25-year or greater storm frequency, without development of a static head at the pipe inlet.

g. Gravel or other surfacing is typically not required, but may be necessary for “soft” road sections, steep grades, highly erosive soils, or where all-weather access is needed.

h. At times, a limited number of oil field vehicles (critical vehicles) larger than the design vehicle may make occasional use of the road. The operator should consider these needs in road design.

2. Field Survey Requirements. These vary with topography, geologic hazard, potential for public and recreational use, or other concerns. Each surface management agency has survey requirements based on design requirements and concerns specific to the area. The surface management agency should be contacted as early as possible to determine the survey requirements. The following general requirements are imposed to control work and produce the desired road:

a. A flagline is established along the construction route. Flags should be placed approximately every 100 feet, or be intervisible, whichever is less.

b. Construction control staking may be required depending on conditions of the site.

c. Culvert installations are located and staked.

3. Design Drawings and Templates.

a. On side slopes of 0-20 percent, where horizontal and vertical alignment can be worked out on the ground, a plan and profile drawing may not be required. Standard templates, drainage dip spacing, culvert locations, and turnout spacing guides would be acceptable.

b. A plan and profile view would be the minimum drawing required on steeper slopes and in areas of environmental concern. This should identify grade, alignment, stationing, turnouts, and culvert locations.

c. Standard templates of road cross-sections and drainage dips are required for all resource, local, and higher-class roads. Figures 2 and 3 illustrate these sections.

d. Additional information may be required in areas of environmental or engineering concern.

4. Construction. The lessee or operator's representative shall ensure compliance with all plans and

designs. The representative should be designated prior to construction and have immediate access to an approved copy of all maps, drawings, templates, and construction standards and authority to order changes prior to initiating dirt work.

The operator must take all necessary precautions for protection of the work and safety of the public during construction of the road. Warning signs must be posted during blasting operations.

a. Clearing and Grubbing: Clearing and grubbing will normally be required on all sections of the road. Exceptions would be allowed in areas of sparse, nonwoody vegetation.

All clearing and grubbing should be confined to a specified clearing width (see Figure 2) which is usually somewhat wider than the limits of actual construction (roadway). Branches of all trees extending over the roadbed should be trimmed to give a clear height of 14 feet above the roadbed surface. All vegetative debris must be disposed of as specified by the surface management agency.

b. Excavation: All soil material and fragmented rock removed in excavation is to be used as directed in the approved plan. Excess cut material shall not be wasted unless specified in the approved plan.

c. Roadbed Construction: Roadbed material should never be placed when the materials or the surface are frozen or too wet for satisfactory compaction. Equipment should be routed over the layers of roadbed material already in place to help avoid uneven compaction anywhere along the travel route. Borrow material shall not be used until material from roadway excavation has been placed in the em-bankments, unless otherwise permitted. Borrow areas used by the operator must be approved prior to the start of excavation.

Roadside ditches should conform to the slope, grade, and shape of the required cross-section with no projections of roots, stumps, rocks, or similar debris. Side ditches must be excavated to a depth of 1-foot minimum below finished road surface. Drainage turnout spacing on these ditches should not exceed 500 feet; slopes greater than 5 percent may require closer spacing of turnout furrows (wing ditches or relief ditches).

BLM Local and FS Collector Roads

1. Basic Design Requirements.

a. Design speed generally 15-50 miles per hour. For FS, this should be 15-25 miles per hour. The selected design speed establishes the minimum sight distance for stopping and passing, and road geometrics such as minimum radius of curvature, the gradient, and type of running surface.

b. Travelway minimum 14 feet (single lane), 24 feet (double lane) with intervisible turnouts as may be required.

c. Recommended minimum horizontal curve radius of 220 feet. Where terrain will not allow 220-foot curve radii, curve widening is necessary. Super-elevation should be considered at speeds greater than 20 miles per hour. Specifications are available from surface management agency engineering offices.

d. Design vertical curves with an appropriate “k” value based on design speed (for example, crest vertical curves, 30 mph k=9; 40 mph k=22; 50 mph k = 45).

e. Maximum grades should not exceed 8 percent. Pitch grades for lengths not to exceed 300 feet may be allowed to exceed 8 percent in some cases.

f. All culverts must be sized in accordance with accepted engineering practices and any special environmental concerns. The minimum size culvert in any installation is 18 inches. Drainage crossings and culverts should be designed for a 25-year or greater storm frequency to allow fish passage in perennial streams where fish are present.

g. Turnouts are required on all single-lane roads. Turnouts must be located at 1000-foot intervals or be intervisible, whichever is less. The length should not be less than 100 feet with additional 50-foot

transitional tapers at each end.

h. Surfacing is required for all-weather access. Aggregate size, type, amount, and application method will be specified by the local office of the surface management agency. Subgrade analysis may be required to determine load-bearing capacities.

2. Field Survey Requirements. Generally, the survey requirements for these roads are similar to those for BLM resource and FS local roads. However, these roads are designed for higher average daily traffic (ADT) rates and greater speeds. Thus, in addition to flagline and culvert survey requirements, an instrument or topographic survey with preliminary center line staking and slope staking is usually required on steep terrain and in areas requiring special engineering. Specific survey requirements are available at the local office of the surface management agency.

3. Design Drawings and Templates.

a. Generally, a plan and profile view would be the required drawings for this road class. This should identify grade, location, stationing, surfacing, turnouts, culvert locations, and drainage dip spacing.

b. Standard templates of the proposed road cross-section(s) (Figures 2 and 3) and drainage dip design are required for these roads.

c. Additional information may be required in areas of environmental or engineering concern.

4. Construction.

a. Drainage dips, construction, and spacing are the same as for BLM resource and FS local roads.

b. Culvert cross-drains should be used in lieu of drainage dips for road grades in excess of 10 percent. Culvert installation is discussed in the Drainage and Drainage Structure Section and is illustrated in Figure 7.

c. Construction standards are the same as given in the BLM Resource and FS Local Roads Section.

BLM Collector and FS Arterial Roads

1. Basic Survey and Design Requirements.

a. Vertical, horizontal, and topographic data, as well as significant features should be plotted on standard plan and profile sheets to a scale of 1 inch = 100 feet horizontal and 1 inch = 20 feet vertical, or as otherwise directed by the surface management agency. The design shall conform to the most current edition of the AASHTO, Guidelines for Geometric Design of Very Low-Volume Local Roads for access roads with an anticipated average daily traffic of less than 400 vehicles.

b. Plot "L" (layout) line along "P" (preliminary) line using the following design standards criteria:

1. Design speed 30 miles per hour or greater unless otherwise directed.

2. Travel width-minimum 20 feet, maximum 24 feet.

3. Minimum horizontal curve radius, 460 feet width unless shorter radii are approved. The curve radius must take into account super-elevation.

4. Design vertical curves with an appropriate “k” value based on design speed.

5. Maximum grade 8 percent (except pitch grades not exceeding 300 feet in length and 10 percent in grade).

6. Mass diagrams and earthwork balancing may be required. Obvious areas of waste or borrow shall be noted on the plan and profile as well as proposed locations of borrow or waste disposal

areas.

7. All culverts should be designed for a minimum 25-year-frequency storm with an allowable head that does not overlap the roadway. However, the minimum acceptable size culvert diameter is 18 inches. Show all culverts planned to accurate vertical scale on plan profile sheets.

8. Slope staking is required.

2. Design Drawings and Templates.

a. Complete plan and profile drawings are required for any BLM collector or FS arterial road (Figure 4 for examples). These identify grade, location, stationing, and all culvert sizes and location (Figure 7 for examples).

b. Standard templates of road cross-sections, drainage design, and culvert location and installation are required (see Figures 3-6 for examples).

c. Mass diagrams and materials investigation and classification may be required.

3. Construction. Except for the specific items provided below, construction standards are given in the BLM Resource/FS Roads or the BLM Local/FS Collector Roads Sections. Construction shall be performed under the direction of a licensed, professional engineer as required by BLM, or a qualified engineer for roads on FS lands.

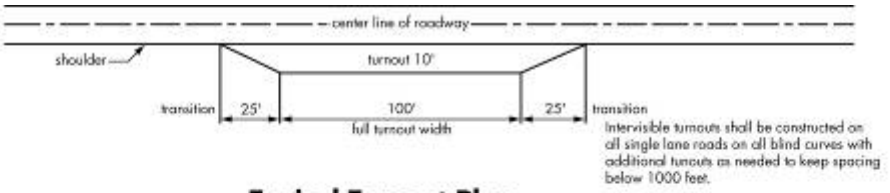
Excavation and fill construction will be performed to secure the greatest practicable degree of roadbed compaction and stability. Roadbed materials shall be placed parallel to the axis of the roadway in even, continuous, approximately horizontal layers not more than 8 inches in thickness. The full cross-section of the fill must be maintained as each successive layer is placed. Place successive layers of material on embankment areas so as to produce the best practical distribution of the material. The materials throughout the roadbed shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, gradation, or compaction from the surrounding material. Ordinarily, stones coarser than a three-inch-square mesh opening should be buried at least 4 inches below the finished surface of the roadway.

The operator should route construction equipment over the layers of roadbed material already in place and distribute the gravel evenly over the entire width of the embankment so as to obtain maximum compaction while placing the material and to avoid uneven compaction anywhere along the travel route.

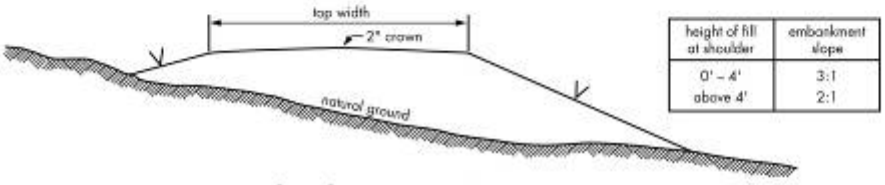
Use excess excavation material, insofar as practical, to improve the road grade line or "flatten" fill slopes. Other waste areas must be approved prior to placement of waste material.

FIGURE 3. CROSS-SECTIONS AND PLANS FOR TYPICAL ROAD SECTIONS.

REPRESENTATIVE OF BLM RESOURCE OR FS LOCAL, AND HIGHER-CLASS ROADS.

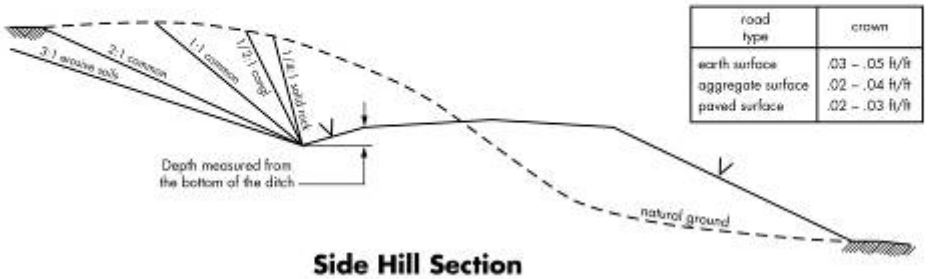


Typical Turnout Plan



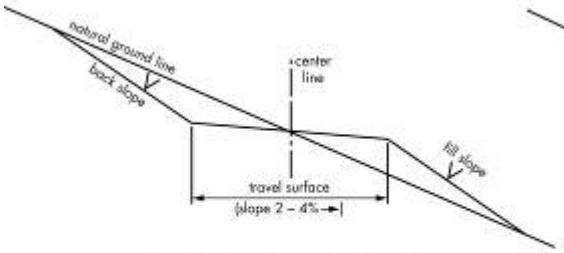
height of fill at shoulder	embankment slope
0' – 4'	3:1
above 4'	2:1

Embankment Section

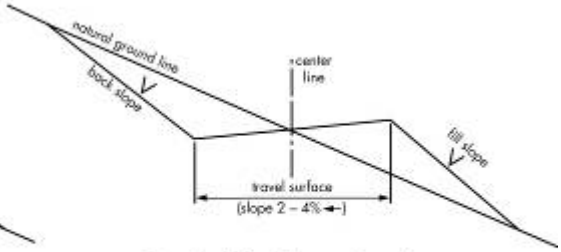


road type	crown
earth surface	.03 – .05 ft/ft
aggregate surface	.02 – .04 ft/ft
paved surface	.02 – .03 ft/ft

Side Hill Section



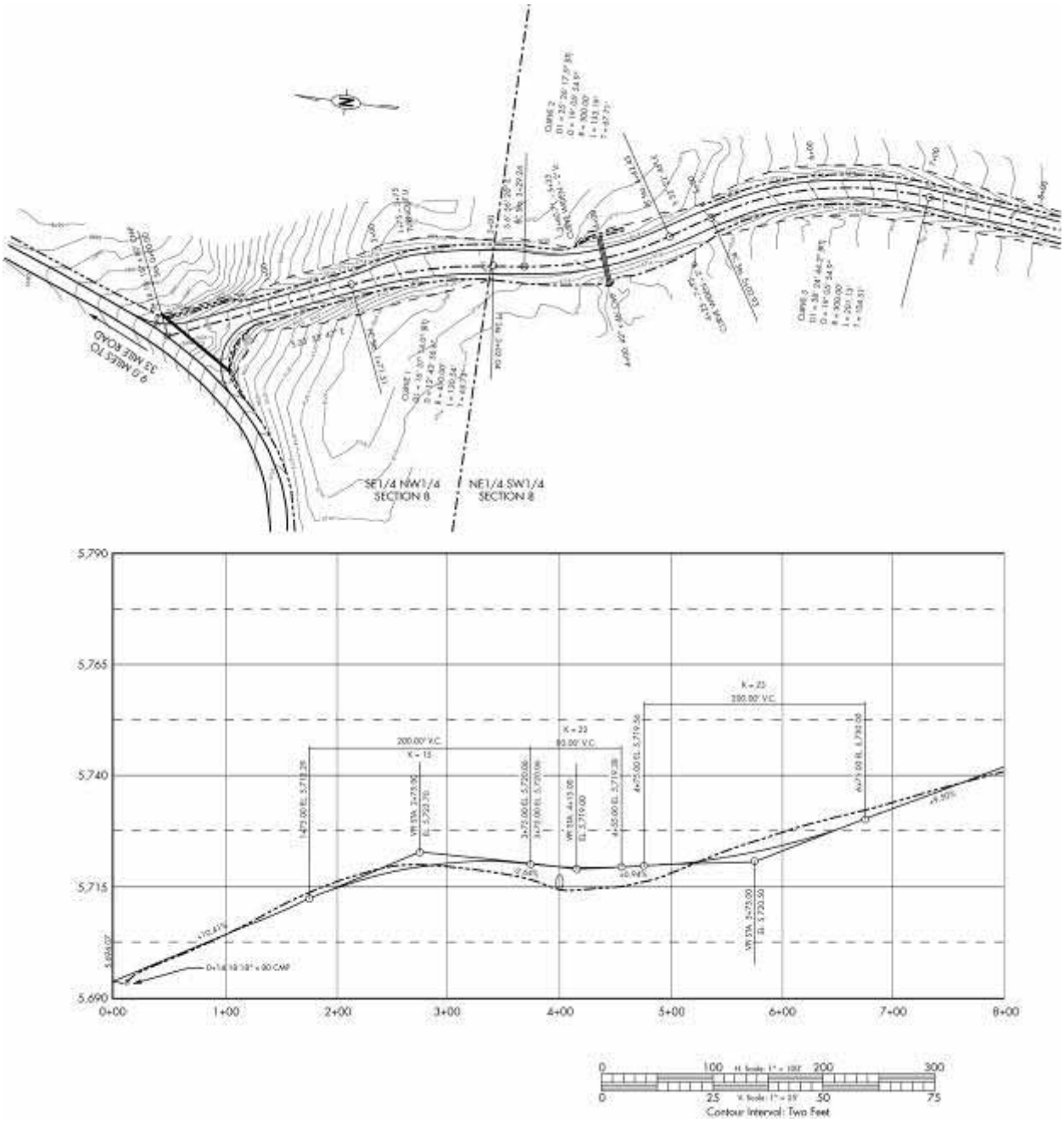
Typical Outsloped Section



Typical Inslope Section

Steps
1. salvage topsoil
2. construct road
3. redistribute topsoil
4. revegetate slopes

FIGURE 4. TYPICAL ROAD PLAN AND PROFILE DRAWING FOR AND OIL AND GAS ROAD



ROAD MAINTENANCE

When required, the operator shall submit a road maintenance plan for all roads that will be constructed or used in conjunction with the drilling program. The maintenance plan will contain provisions for maintaining the traveled way, protection of the roadway features, requirements for road management, and the method to be used in carrying out the maintenance activities. The activities normally required include monitoring, blading, surface replacement, dust abatement, spot repairs, slide removal, ditch cleaning, culvert cleaning, litter cleanup, noxious weed control, and snow removal. When applicable, specific areas shall be identified in the road maintenance plan for disposal of slide material, borrow or quarry sites, stockpiles,

or other uses that are needed for the project.

Key maintenance considerations include regular inspections, reduction of ruts and holes, and maintenance of crowns and outslopes to keep water off the road, replacement of surfacing materials, clearing of sediment blocking ditches and culverts, maintenance of interim reclamation, and noxious weed control. Conduct additional inspections following snowmelt or heavy or prolonged rainfall to look for drainage, erosion, or siltation problems. Blade only when necessary and avoid blading established grass and forb vegetation in ditches and adjacent to the road (See Photograph 4). Ensure that maintenance operators have proper training and understand the surface management agency's road maintenance objectives.

Users may perform their share of road maintenance or may be required to deposit sufficient funds with the surface management agency to provide for their share. If the road has only one permitted user, other than incidental use by others, that user has total responsibility for maintenance.

PHOTOGRAPH 4. Interim Road Reclamation. Reapplying topsoil and the regrowth of vegetation along road borrow ditches reduces the loss of forage, habitat, and sediment; decreases maintenance costs; and helps to maintain scenic quality.

Drainage and Drainage Structures

The proper design and construction of structures for the drainage of water from or through the roadway often contributes the most to the long-term success of the road and structure and minimizes the maintenance and adverse environmental effects, such as erosion and sediment production. Keep the water off the road!

Road Drainage Design. The most economical control measure should be designed to meet resource and road management objectives and constraints. The economic considerations shall include both construction and maintenance costs. The need for drainage structures can be minimized by proper road location. However, adequate drainage is essential for a stable road. A proper drainage system should include the best combination of various design elements, such as ditches, culverts, drainage, dips, crown, in-slope or out-slope, low-water crossings, subsurface drains, and bridges.

1. Surface Drainage. Surface drainage provides for the interception, collection, and removal of water from the surface of roads and slope areas. The design may need to allow for debris passage, mud flows, and water heavily laden with silt, sand, and gravel. Culverts should be designed in accordance

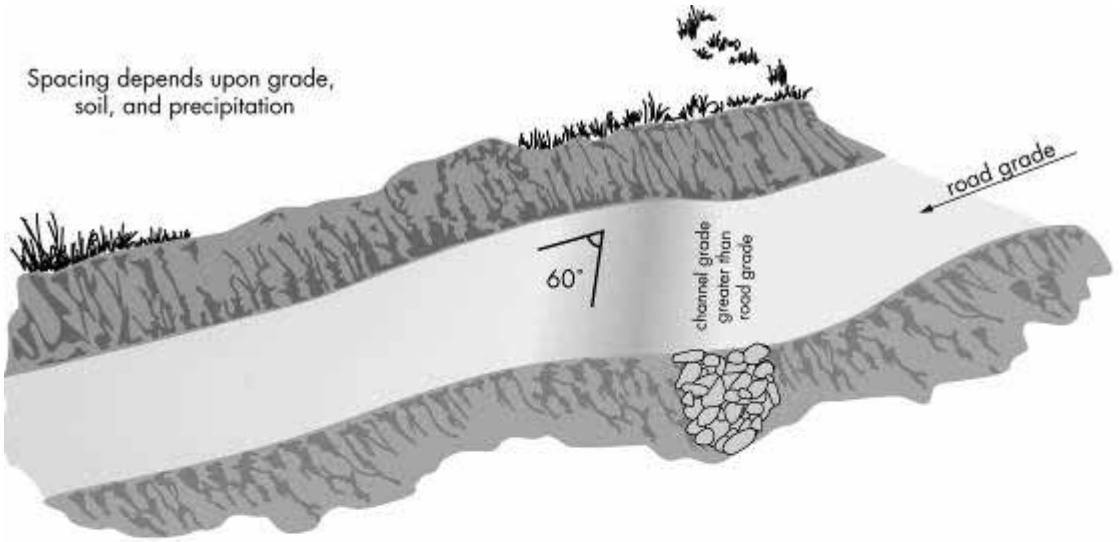
with applicable practices adopted by State and Federal water quality regulators under authority of the Federal Clean Water Act. Culverts should accommodate a 10-year flood without development of a static head and avoid serious velocity damage from a 25-year flood.

2. Subsurface Road Drainage. Subsurface drainage is provided to intercept, collect, and remove groundwater that may flow into the base course and subgrade, lower high water tables, and drain locally saturated deposits or soils.

Drainage Structures. Proper location and design can provide economical and efficient drainage in many cases. However, structural measures are often required to ensure proper and adequate drainage. Some of the most common structures are drainage dips, ditches, culverts, and bridges.

1. Drainage Dips. The primary purpose of a drainage dip is to intercept and remove surface water from the travel-way and shoulders before the combination of water volume and velocity begins to erode the surface materials. Drainage dips should not be confused with water bars, which are normally used for drainage and erosion protection of closed or blocked roads. See Figure 5 for illustration and construction specifications. Spacing of drainage dips depends upon local conditions such as soil material, grade, and topography. The surface management agency should be consulted for spacing instructions.

FIGURE 5. ILLUSTRATION OF TYPICAL DRAINAGE DIP



Road Grade	d	h	a	b
2%	0.6'	0.4'	10'	10'
4%	1.0'	0.8'	14'	14'
6%	1.2'	1.4'	16'	18'
8%	2.0'	2.2'	22'	24'

2. Ditches. The geometric design of ditches must consider the resource objectives for soil, water, and visual quality, maintenance capabilities and associated costs, and construction costs. Ditch grades should be no less than 0.5 percent to provide positive drainage and to avoid siltation. The types of ditches normally used are: drainage, trap, interception, and outlet.

3. Road Crowning. Roads which use crowning and ditching are common and can be used with all road classes. This design provides good drainage of water from the surface of the road. Drainage of the inside ditch and sidehill runoff is essential if the traveled way is to be kept dry and passable during wet weather.

4. Culverts. Culverts are used in two applications: (1) in streams and gullies to allow normal drainage to flow under the traveled way; and (2) to drain inside road ditches. The latter may not be required if drainage dips are used. The location of culverts should be shown on the plan and profile or similar drawings or maps submitted with the APD.

All culverts should be laid on natural ground or at the original elevation of any drainage crossed, except as noted for ditch relief culverts, below. See Figures (Temp. 7) for installation details.

Culverts should have a minimum diameter of 18 inches. The diameter should be determined by the anticipated amount of water that would flow through the culvert. Factors to be considered include the geographic area being drained, soils and slopes in the drainage area, annual precipitation, and likely storm events.

The outlet of all culverts should extend at least 1 foot beyond the toe of any slope. It may be necessary to install rip-rap or other energy dissipater devices at the outlet end of the culvert to prevent soil erosion or trap sediment (Photograph 5).

All culverts used in construction of access roads should be concrete, corrugated metal pipe (CMP) made of steel, or properly bedded and backfilled corrugated plastic pipe. Only undamaged culverts are to be used, and any culvert should be inspected for damage prior to installation. All spots on the pipes where the zinc coating has been injured should be painted with two coats of zinc-rich paint or otherwise repaired as approved by the surface managing agency.

Excavation, bedding and backfilling of culverts should be conducted according to requirements of the surface management agency and good engineering practices. Compliance with applicable Clean Water Act BMPs and requirements for passage of aquatic species is required.

PHOTOGRAPH 5. Properly sized rock rip-rap at culvert outlets helps to reduce water velocity and resulting soil erosion.

a. Ditch Relief Culverts. Ditch relief culverts are installed to periodically relieve the ditch line flow by piping water to the opposite side of the road where the flow can be dispersed away

from the roadway. The spacing of ditch relief culverts is dependent on the road gradient, soil types, and runoff characteristics.

A culvert with an 18-inch diameter is the minimum for ditch relief to prevent failure from debris blockage.

The depth of culvert burial must be sufficient to ensure protection of the culvert barrel for the design life of the culvert. This requires anticipating the amount of material that may be lost due to road use and erosion.

Ditch relief culverts can provide better flow when skewed with an entrance angle of 45 to 60 degrees with the side of the ditch. The culvert gradient should be greater than the approach ditch gradient. This improves the flow hydraulics and reduces siltation and debris plugging the culvert inlet. Culverts placed in natural drainages can also be utilized for ditch relief.

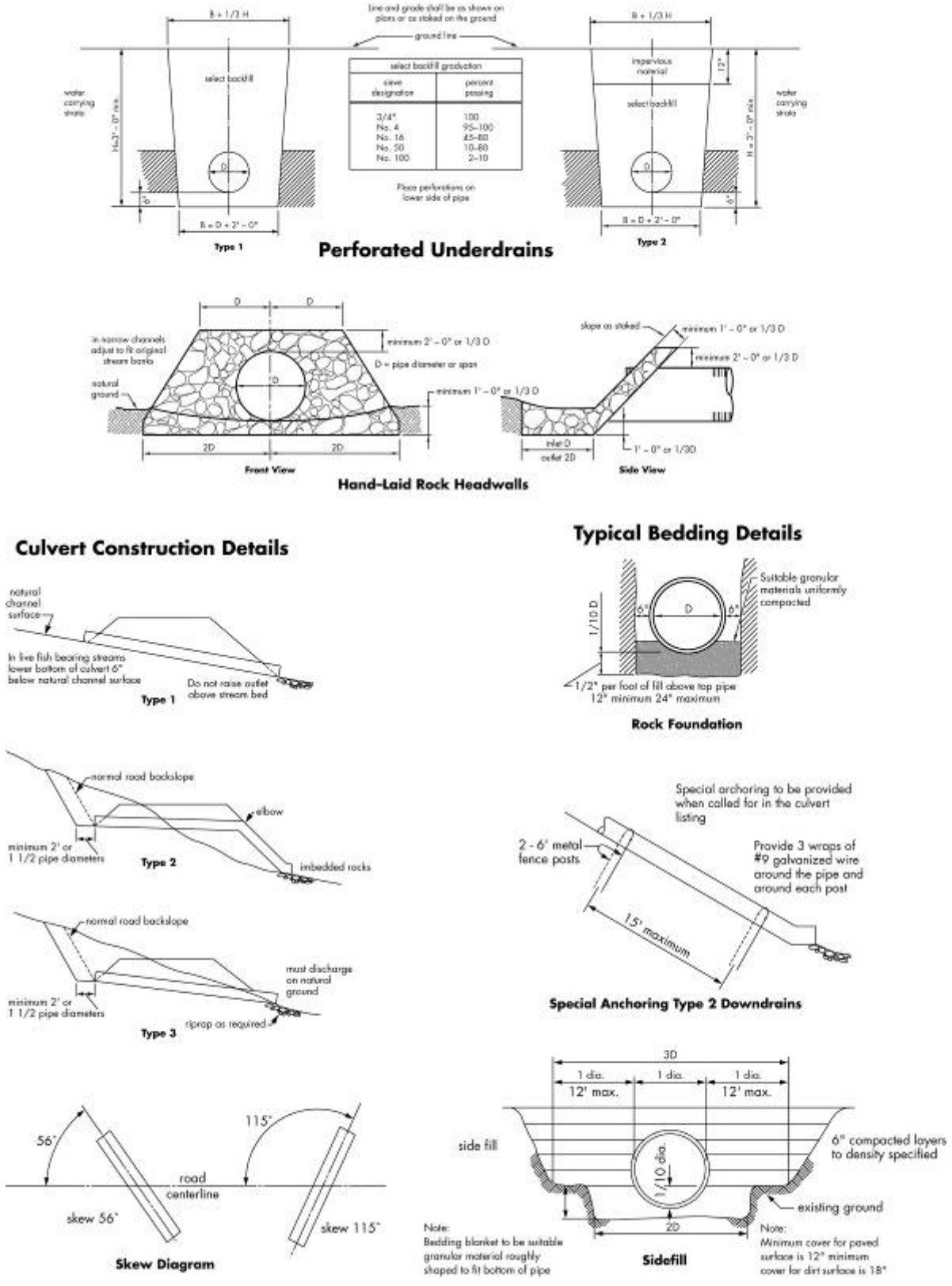
FIGURE 6. CULVERT SPACING

Maximum Recommended Culvert Spacing (ft)

Soil Type	Road Grade 2–4%	Road Grade 5–8%	Road Grade 9–12%
Highly crosive granitic or sandy	240	180	140
Intermediate erosive clay or load	310	260	200
Low erosive shale or gravel	400	325	250

b. Bridges and Major Culverts. Federal Highway Administration regulations and the BLM and FS road Manuals require that on roads open to public travel, all bridges and culverts that in combination span at least 20 feet horizontal distance are subject to the National Bridge Inspection and Reporting Standards. Thus, BLM and FS manuals require that all such facilities have engineering approval at Regional or State Offices. Operators are encouraged to prepare applications requiring major culverts or bridges in sufficient time to allow for agency engineering evaluations. Construction of some stream crossings may require a Section 404, Corps of Engineers permit, in addition to the approval of the surface management agency.

FIGURE 7. DIAGRAMS FOR PROPER CULVERT INSTALLATION



5. Wetland Crossings. Wetlands are especially sensitive areas and should be avoided, if possible. Generally, these areas require crossings prevent unnatural fluctuations in water level. Marshy and swampy terrain may contain bodies of water with no discernible current. The design of culverts for roads crossing these locations requires unique considerations. Construction of some wetland crossings may require a Section 404, Corps of Engineers permit, in addition to the approval of the surface management agency.

The culvert should be designed with a flat grade so water can flow either way and maintain its natural water level on both sides. The culvert may become partially blocked by aquatic growth and should be installed with the flow line below the standing water level at its lowest elevation. Special attention must be given to the selection of culvert materials that will resist corrosion.

6. Low-Water Crossings. Roads may cross small drainages and intermittent streams where culverts and bridges are unnecessary. The crossing can be effectively accomplished by dipping the road down to the bed of the drainage. Site-specific designs and the construction of gravel, rip-rap, or concrete bottoms may be required in some situations. In no case should the drainage be filled so that water will be impounded. Low-water crossings that are not surfaced should not be used in wet conditions.

7. Subdrainage. If water is not removed from the subgrade or pavement structure, it may create instability, reduce load-bearing capacity, increase possible damage from frost action, and create a safety hazard by freezing on the road surface.

Perforated pipe drains and associated filter fabric or aggregate filters may be used when necessary to provide subdrainage. Other methods may be approved by the authorized officer.

Subdrainage systems may effectively reduce final road costs by decreasing the depth of base course needed, thereby reducing subgrade widths. This, in turn, results in less clearing and excavation. Maintenance savings may also be realized as the result of a more stable subgrade.

The solutions to subdrainage problems can be expensive. Road management techniques, such as reducing traffic loads or removing traffic until a subgrade dries out, may be considered as an alternative.

PIPELINES AND FLOWLINES

Construction. Steep hillsides and water courses should be avoided in the location of pipelines and flowlines. Flowline routes should take advantage of road corridors wherever practicable to minimize surface disturbance and provide better leak detection and access for repair operations. Consider maintenance needs and safety when burying power and pipelines in or immediately adjacent to the road.

When clearing is necessary, the width disturbed should be kept to a minimum. Topsoil material should be stockpiled to the side of the routes where cuts and fills or other surface disturbance occur during pipeline construction. Topsoil material should be segregated and should not be mixed or covered with subsurface material. Bladed materials should be placed back into the cleared route upon completion of construction and returned back to the original contour before reapplying topsoil.

Pipelines and flowlines should be tested for leaks before backfilling trenches. Pipeline trenches should be compacted during backfilling. After construction, cut-and-fill slopes must be regraded to conform to the adjacent terrain and reclaimed. Pipeline rights-of-way should be maintained in order to correct backfill settling and prevent erosion.

Pipeline construction should not block, dam, or change the natural course of any drainage. Suspended pipelines should provide adequate clearance for high flow events, floating debris, wildlife, or livestock. Pipelines buried across stream crossings should be buried below the scouring depth.

CHAPTER 4

DRILLING AND PRODUCTION OPERATIONS

General Operating Standards and Objectives

Onshore oil and gas lease operations are subject to applicable laws, regulations, lease terms, the Application for Permit to Drill (APD), APD Conditions of Approval, Onshore Oil and Gas Orders, Notices to Lessees, written orders, and instructions of the authorized officer. These include, but are not limited to, conducting operations in a manner that ensures the proper handling, measurement, disposition, and site security of leasehold production; and protecting other natural resources, environmental quality, life, and property. The primary objective is to maximize ultimate recovery of oil and gas with minimum waste and with minimum adverse effect on ultimate recovery of other mineral resources, other natural resources, and environmental quality.

Drilling and production reports are required to be submitted to the Minerals Management Service (MMS) pursuant to its regulatory requirements ((Oil & Gas Operations Report (OGOR), Form MMS MMS-4054)).

Well Completion Report

A Well Completion or Recompletion Report and Log, Form 3160-4, is required to be filed within 30 days after completion of a well either for abandonment or production. The completion report is to reflect the mechanical and physical condition of the well. Geologic information, and, when applicable, information on the completed interval and production, is required.

Subsequent Well Operations

Producing wells in active oil and gas fields will periodically require repair and workover operations. Operations requiring prior approval (Sundry Notice, Form 3160-5) of the authorized officer of the BLM include redrilling, deepening, casing repairs, plug-back, alteration of casing, nonroutine fracturing jobs, recompletion in a different interval, water shut off, commingling production between intervals, conversion to injection, and new pit construction. Operations conforming to standards of prudent operation practice and that do not involve surface disturbing activities, such as routine fracturing or acidizing jobs or recompletion in the same interval, do not require prior approval from the authorized officer. A subsequent report of these operations must be filed on Sundry Notices and Reports of Wells, Form 3160-5 (Sundry Notice Form 3). Any subsequent well operation involving surface disturbance must have prior approval of the surface management agency authorized officer.

All wastes are to be treated or disposed of in an environmentally approved manner. Modifications of production handling equipment may require the submittal of a new site facility diagram or may require a new site security plan.

Approval Procedures

For operations requiring prior approval by the surface management agency or BLM, the operator must submit a Sundry Notice or APD, as applicable. With the appropriate form, a detailed written statement of the plan of work is to be provided to the authorized officer. When additional surface disturbance is proposed, a description of any subsequent new construction, reconstruction, or alteration of existing facilities, including roads, dam sites, flowlines and pipelines, pits, tank batteries, or other production facilities on any lease, must be submitted to the authorized officer for environmental reviews and approval. On FS-administered lands the BLM will coordinate with the FS to obtain its approval on surface disturbing activities. Emergency repairs may be conducted without prior approval provided the authorized officer is promptly notified. Emergency repairs are defined as those that are necessary in order to avoid imminent, significant impact to human safety or the environment.

Production Startup Notification

Operators will notify the authorized officer by Sundry Notice (Form 3160-5) or letter no later than the 5th business day after any well begins production anywhere on a lease site or allocated to a lease site, or resumes production in the case of a well that has been off production for more than 90 days (Onshore

Order No. 4 for oil and Onshore Order No. 5 for gas).

Measurement of Production

All oil, other hydrocarbons, and gas produced from the leased lands are to be put in a marketable condition to the extent economically feasible.

Oil production is to be measured by tank gauging, positive displacement metering system, or other methods acceptable to the authorized officer. No oil is to be diverted to a pit except in emergency situations or with prior approval from the authorized officer. Oil in the pit must be recovered promptly, and the pit must be kept reasonably free from surface accumulations.

Gas production is to be measured by orifice meters or other methods acceptable to the authorized officer. The flaring or venting of gas from leasehold operations must meet the requirements of Notice to Lessees-4A (NTL-4A), Royalty or Compensation for Oil and Gas Lost, or an applicable Onshore Oil and Gas Order.

Disposal of Produced Water

Produced water from leasehold operations will be disposed of by subsurface injection, lined pits, surface discharge into channels or impoundments, or other methods acceptable to the authorized officer in accordance with the requirements of Onshore Order No. 7, Disposal of Produced Water and other Federal or State regulations. Disposal of produced water often requires permits from State agencies or the Environmental Protection Agency, in addition to authorization by BLM under Onshore Order No. 7. In some instances, when surface disturbance associated with produced water disposal occurs on Federal lands, an additional surface management agency authorization may be necessary. In cases of water disposal into pits or other impoundments, the structures must conform to approved construction requirements in accordance with Onshore Order No. 7, BLM Manual 9172, and/or applicable State agency requirements. Pits, water impoundments, and surface discharge that present a potential hazard to humans, livestock, wildlife, and other resources should be subject to appropriate mitigation, such as fencing, caging, and covers. Refer to Figure1 for fence construction standards.

Pollution Control/Hazardous Waste

All spills or leakages of oil, gas, salt water, toxic liquids or waste materials, blowouts, fires, personal injuries, and fatalities shall be reported by the operator to the BLM and the surface management agency in accordance with the requirements of Notice to Lessees-3A, (NTL-3A), Reporting of Undesirable Events and in accordance with any applicable local requirements. The BLM requires immediate reporting of all Class I events (more than 100 barrels of fluid/500 MCF of gas released, any quantity that affects live water, or fatalities involved). Volumes discharged during any of the above incidents will be estimated as necessary. Operators must take immediate action to prevent and control spills and BLM, the surface management agency, and other applicable regulatory authorities must be consulted prior to treating or disposing of wastes and spills. Operators should become familiar with local surface management agency requirements for reporting and managing spills and leaks.

Sufficiently impervious secondary containment, such as containment dikes, containment walls, drip pans, or equivalent protection actions are to be constructed and maintained around all qualifying petroleum facilities, including tank batteries, consistent with the Environmental Protection Agency's Spill Prevention, Control, and Countermeasure (SPCC) regulation (40 CFR 112). The containment structure must have sufficient volume to contain, at a minimum, the content of the largest tank within the facility/battery and sufficient freeboard to contain precipitation, unless more stringent protective requirements are deemed necessary by the authorized officer (Photograph 6). Containment dikes are not to be constructed with topsoil or coarse, insufficiently impervious spoil material.

PHOTOGRAPH 6. This central tank battery has been surrounded with a corrugated metal containment wall.

Noise Control

Noise that has the potential to disturb wildlife, livestock, and private surface owners or neighbors should be controlled to minimize or eliminate that disturbance. Appropriate sound muffling devices should be installed on all vehicles, compressors, and motors. Proper location of operations and roads can reduce disturbance caused by noise. Unavoidable noise should be limited to times that are the least objectionable if possible.

Visual/Scenic Resources

The operator is required to comply with visual resource management objectives established in the land use plan for all activities that alter landforms, disturb vegetation, or require structures (BLM 8400 Manual Series). Site-specific mitigation practices may be required by the surface management agency to minimize visual impacts. Selection of a paint color that allows the facility to blend with the natural landscape background is a primary consideration. Other considerations may include aesthetic siting of roads, well locations, and production facilities; reducing unnecessary disturbance; modifying production facility or well pad shape or size; manipulating vegetation; use of earthwork or vegetative screening; and complete interim reclamation of disturbed areas in more visually sensitive areas (Photograph 7).

PHOTOGRAPH 7. This pumping unit has been painted a color which helps it to blend with the surrounding juniper tree screening.

Placement of Production Facilities

Production facilities should be placed on the well pad so as to allow for maximum interim recontouring and revegetation of the well location. The best location for production facilities is typically half way between the cut slope and the fill slope. Consider placing tank batteries and natural gas compressors off-site in an area that is screened from view by vegetation or topography. Consider centralizing tank batteries at a location near the main access road, but screened from view, rather than placing tanks on each well pad. It is often possible to eliminate the need for all-weather roads to each individual well by constructing an all-weather access road to a centralized production facility.

Painting of Facilities

All facility structures should be painted a color that enables the facilities to blend in with the natural background color of the landscape as seen from a viewing distance and location typically used by the public. The selected color should be one or two shades darker than the dominant background color, typically a vegetation color. In visually sensitive areas, the use of properly chosen camouflage techniques may be an appropriate method for matching the texture of the landscape. Semigloss paints may be preferred due to their resistance to staining and weathering.

Inspection and Enforcement

Leaseholds that are producing or expected to produce significant quantities of oil or gas in any year, or have a history of noncompliance, will be inspected by the BLM at least once a year and all operations on National Forest System lands will be inspected by the FS at least once a year. Other factors, such as health and safety, environmental concerns, and potential conflict with other resources also determine inspection priority. Inspections of leasehold operations are made to ensure compliance with applicable laws, regulations, lease terms, the APD and its Conditions of Approval, Onshore Oil and Gas Orders, NTLs, and other written orders of the authorized officer. Operators are expected to initiate their own inspection programs, identify noncompliance, and take appropriate corrective actions, rather than relying on Federal inspections to identify problems.

CHAPTER 5

RECLAMATION AND ABANDONMENT

Reclamation Objective

Oil and gas development is a short- or long-term use of the land, not a permanent use. During the life of the development, all disturbed areas not needed for active support of production operations undergo "interim" reclamation in order to minimize the environmental impacts of development. At final abandonment, well locations, production facilities, and access roads undergo "final" reclamation and the character and productivity of the land is restored.

Planning for reclamation prior to construction is critical to achieving successful reclamation down the road. Reclamation becomes significantly more difficult, more expensive, and less effective if sufficient topsoil is not salvaged, interim reclamation is not completed, and if proper care is not taken to construct pads and roads in locations that minimize reclamation needs.

The primary objective of final reclamation is eventual ecosystem reconstruction. In most cases, this means returning the land to a condition approximating or equal to that which existed prior to the disturbance. This involves restoring the original landform or creating a landform that approximates and blends in with the surrounding landform. It also involves salvaging and reusing all available topsoil (whatever soil is on top) in a timely manner, revegetating disturbed areas to native species, controlling erosion, and monitoring results. Reclamation measures begin as soon as possible after the disturbance and are continued each year until successful reclamation is achieved. With proper reclamation measures, over time, additional local native species will re-colonize the site and the area will regain its original productive and scenic potential.

Reclamation can generally be judged successful when a self-sustaining, vigorous, diverse, native (or otherwise approved) plant community is established on the site with a density sufficient to control erosion and re-establish habitat or forage. Erosion control is generally sufficient when water naturally infiltrates into the soil and gullying, headcutting, slumping, and deep or excessive rilling is not observed. The site must be free of State- or county-listed noxious weeds, junk, debris, contaminated soil, and equipment. The operator should inform the surface management agency that reclamation has been completed and that the site is ready for final inspection when these requirements have been met.

Reclamation Plan

A reclamation plan is included in the Surface Use Plan of Operations and should discuss plans for both interim and final reclamation. Reclamation is required of any surface previously disturbed that is not necessary for continued production operations. The operator should submit a new plan with the Notice of Intent to Abandon (NIA) or Subsequent Report Plug and Abandon (SRA) using the Sundry Notices and Reports on Wells Form 3160-5 when abandoning wells and other facilities that do not have an approved reclamation plan. BLM will forward the request to the FS or other surface management agency, as appropriate. Additional reclamation measures may be required based on the conditions existing at the time of abandonment and made a part of the conditions of approval of the NIA or SRA. Earthwork for interim and final reclamation generally must be completed within 6 months of well completion or plugging, (weather permitting). The following are components of the reclamation plan.

Pit Reclamation

All pits must be reclaimed to a natural condition similar to the rest of the reclaimed pad area. In addition, the reclaimed pit must be restored to a safe and stable condition. In most cases, if it was necessary to line the pit with a synthetic liner, the pit should not be trenched (cut) or filled while still containing fluids (squeezed). Pits must be free of oil and other solid waste, allowed to dry, be pumped dry, or solidified in-situ prior to filling. The pit liner must be removed to the solids level or treated to prevent its reemergence to the surface or its interference with long-term successful revegetation. If necessary, the pit area should usually be mounded slightly or restored to the original contour to allow for settling and positive surface

drainage.

The concentration of hazardous substances in the reserve pit at the time of pit backfilling must not exceed the standards set forth in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). All oil and gas drilling-related CERCLA hazardous substances removed from a location and not reused at another drilling location must be disposed of in accordance with applicable State and Federal regulations.

Plugging the Well

Well abandonment operations may not be started without prior approval of the Sundry Notices and Reports on Wells, Form 3160-5, by the authorized officer. The Sundry Notice serves as the operator's Notice of Intent to Abandon (NIA). In the case of newly drilled dry holes, failures, and emergency situations, oral approval may be obtained from the authorized officer subject to written confirmation by application. The operator must contact the BLM prior to plugging a well to allow for approval and witnessing of the plugging operations.

Site Preparation and Revegetation

Disturbed areas should be revegetated after the site has been satisfactorily prepared. Site preparation will include respreading topsoil to an adequate depth, and may also include ripping, tilling, disking on contour, and dozer track-imprinting. The operator will usually be advised of the revegetation methods, objectives, and seasons to plant unless it is included in the APD reclamation plan. Native perennial species, or other plant materials specified by the surface management agency or private surface owner, will be used. Seeding should be accomplished by drilling on the contour whenever practical or by other approved methods (for example, dozer track-walking followed by broadcast seeding). Seeding and/or planting should be repeated until revegetation is successful, as determined by the surface management agency. Mulching, fertilizing, fencing, noxious weed control or other practices may be required. It is the operator’s responsibility to monitor the site, take the necessary steps to ensure reclamation success, and to notify the surface management agency when success is achieved.

Reclamation is most efficient when the ecology of the site is considered. The previous plant community or potential plant community native to the site should be identified to help determine the plant communities that can exist on the reclaimed site. Revegetation efforts will be hampered and costs increased if the site contains conditions detrimental to revegetation, such as heavy grazing pressure, insufficient salvaged topsoil, erosion, and compacted or contaminated soil.

Additional Guidelines

Supplemental guidelines and methods may be available that reflect local site and geographic conditions. These guidelines or methods may be obtained from the local surface management agency office. Technical advances in reclamation practices are continually being developed that may be successfully applied to oil and gas construction practices.

Pipeline and Flowline Reclamation

Pipeline routes and roads should be co-located as much as possible to reduce reclamation needs and impacts to other resources. Pipeline trenches are to be compacted during backfilling and must be maintained to correct backfill settling and prevent erosion. Reclamation involves placing fill in the trench, compacting the fill, regrading cut-and-fill slopes to restore the original contour, replacing topsoil, installing temporary waterbars only where necessary to control erosion, and revegetating in accordance with a reclamation plan. Waterbars and other erosion control devices must be maintained and repaired as necessary.

Following successful revegetation, surviving waterbars must be flattened to blend with the slope and then revegetated. If berms of topsoil were originally placed over the trench to accommodate settling, the surviving berms must also be flattened to blend with the surrounding landform and revegetated.

Final abandonment of pipelines and flowlines will involve flushing, removing, and properly disposing of any fluids in the lines. All surface lines and any lines that are buried close to the surface must be

removed. Deeply buried lines may remain in place unless otherwise directed by the authorized officer.

Well Site Reclamation

Well site reclamation includes both interim and final reclamation.

Interim Reclamation

Interim reclamation consists of minimizing the footprint of disturbance by reclaiming all portions of the well site not absolutely needed for production operations. The portions of the cleared well site not absolutely needed for safety purposes or for tanks, treaters, pumping units, workover rig setup, and vehicle traffic are recontoured to a final or intermediate contour that blends with the surrounding topography as much as possible. Sufficient level area remains for setup of a workover rig and to park equipment. In some cases, rig anchors may need to be pulled and reset after recontouring to allow for maximum reclamation. Topsoil is respread over areas not needed for all-weather operations. In many cases, the operator will respread topsoil over the entire location and revegetate to within a few feet of the production facilities unless an all-weather, surfaced, access route or turnaround is needed. In order to inspect and operate the well or complete workover operations, it may be necessary to drive, park, and operate on restored vegetation. This is generally acceptable provided damage is repaired and vegetation restored following use. Under some situations, such as the presence of moist, clay soils, the operator or surface management agency may prefer that vegetation and topsoil be removed during workover operations and restored following operations to prevent soil compaction. All of the salvaged topsoil should be spread over the area of interim reclamation so that topsoil is not stockpiled for the life of the well. Respreading and revegetating the topsoil allows it to maintain its viability during the life of the well (Photograph 8). Unless the well site is at its final contour, the topsoil and vegetation will be restripped from the site and reused once again at the time of final reclamation.

PHOTOGRAPH 8. During the start of well production, this well pad was recontoured, revegetated, and shaped to blend with the surrounding natural forest openings. Well production facilities were constructed off-site and out of view.

Final Reclamation

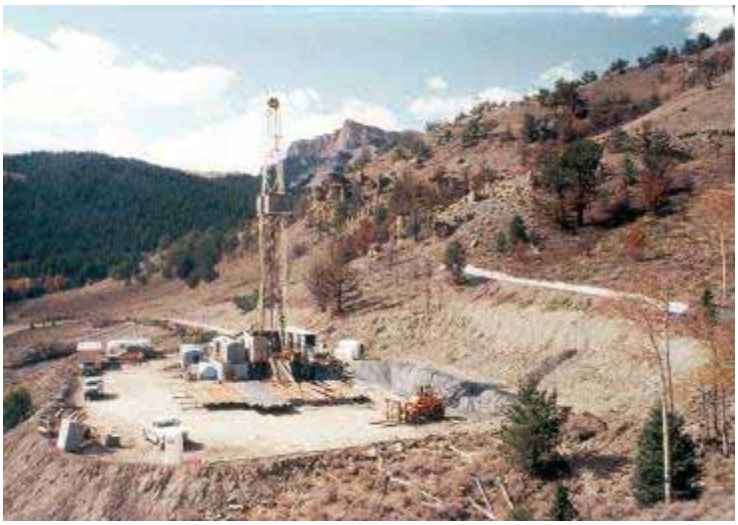
At final reclamation, well sites that do not blend seamlessly with the surrounding landform should not be left in place, even if there has been successful regrowth of vegetation on the site. Revegetation alone does not constitute successful reclamation. Restoration of the original landform is a key element in ensuring that the effects of oil and gas development are not permanent. To achieve final reclamation of a

recently drilled dry hole, the well site must be recontoured to original contour or a contour that blends with the surrounding landform, stockpiled topsoil redistributed, and the site revegetated. To achieve final reclamation of a formerly producing well, all topsoil and vegetation must be restripped from all portions of the old well site that were not previously reshaped to blend with the surrounding landform. All disturbed areas are then recontoured back to the original contour or a contour that blends with the surrounding landform, topsoil is redistributed, and the site revegetated. In recontouring areas that have been surfaced with gravel or similar materials, the material is to be removed from the well location or buried deep in the recontoured cut to prevent possible surface exposure. All excavations and pits must be closed by backfilling when they are dry and free of waste and graded to conform to the surrounding terrain.

Salvaged topsoil must be respread evenly over the surfaces to be revegetated. The topsoiled site should be prepared to provide a seedbed for reestablishment of desirable vegetation. Site preparation may include gouging, scarifying, dozer track-walking, mulching, fertilizing, seeding, and planting.

Waterbreaks and terracing should only be installed when absolutely necessary to prevent erosion of fill material and should be removed when the site is successfully revegetated and stabilized. (See Photographs 9 A&B)

PHOTOGRAPH 9A: The well pad and access road are constructed to the minimum size necessary to safely conduct drilling operations.



PHOTOGRAPH 9B: The well pad and access road have been recontoured back to the original contour, the topsoil respread, and the sites revegetated.

Road Reclamation

Interim reclamation consists of reclaiming all portions of the road not needed for vehicle travel. Wherever possible, cut slopes, fill slopes, and borrow ditches should be covered with topsoil and revegetated to restore habitat, forage, scenic resources, and to reduce soil erosion and maintenance costs.

Oil and gas roads not on the surface management agency Transportation System and no longer needed for resource management shall be closed and undergo final reclamation. Final reclamation will include recontouring the road back to the original contour, seeding, controlling noxious weeds, and may also include other techniques to improve reclamation success, such as ripping, scarifying, replacing topsoil, placing waterbars, pitting, mulching, redistributing woody debris, and barricading.

Seed of native, perennial species, or other plant materials specified by the surface management agency or private surface owner, will be used. If waterbars were used, they should be removed and seeded following successful revegetation.

Reclamation of Other Associated Facilities

All other facilities and areas of surface disturbance associated with Federal oil and gas lease development, including water impoundments, powerlines, metering buildings, compression facilities, and tank batteries must be removed and reclaimed in accordance with the standards identified previously and with the requirements of the surface management agency.

Water Well Conversion

In some instances, the surface management agency or private landowner may wish to acquire a well that has encountered usable fresh water. In those cases, requirements for abandonment may be modified. The private landowner or surface management agency will acquire all liability for the final plugging and reclamation of the wellsite. Documentation of liability release will be issued to the responsible party.

Inspection and Final Abandonment Approval

Final abandonment will not be approved until the surface reclamation work required by the APD, Notice of Intent to Abandon, or Subsequent Report Plug and Abandon has been completed and the required reclamation is acceptable to the surface management agency. The operator is responsible for monitoring reclamation progress and taking the necessary actions to ensure success.

The operator must file a Subsequent Report of Abandonment (SRA) following the plugging of a well. A Final Abandonment Notice (FAN) must be filed upon completion of reclamation operations, which indicates that the site meets reclamation objectives and is ready for inspection. Upon receipt of the FAN, the surface management agency will inspect the site to ensure reclamation is fully successful.

Release of Bonds

If the well and associated facilities are covered by an individual lease bond, the period of liability on that bond can be terminated once the final abandonment has been approved. The principal can request termination of the period of liability from the State Office holding the bond. If the well is covered by a statewide or nationwide bond, termination of the period of liability of these bonds is not approved until final abandonment of all activities conducted under the bond have been approved. The operator may request termination of the bond on the FAN.

CHAPTER 6

APPEALS

The objective of maintaining successful working relationships can be accomplished by maintaining open lines of communication. In most cases, up-front and frequent phone calls, e-mails, meetings, and field tours can generate understanding, lead to compromise, and eliminate the delay, cost, and frustration of the administrative appeal process.

Administrative Relief (BLM)

State Director Reviews (SDR) are conducted according to 43 CFR 3165.3. Appeals are processed according to 43 CFR 3165.4. All actions and decisions of the BLM, pursuant to the oil and gas program as governed by 43 CFR 3160, and all Onshore Oil and Gas Orders and Notices to Lessees promulgated therefrom, are subject to State Director Reviews, appeals, or both, upon request. However, a State Director Review must be conducted before pursuing an appeal under this set of regulations. State Director Reviews apply to decisions related to APD conditions of approval or stipulations, inspection and enforcement actions, and APD or Sundry Notices. State Director Reviews and appeals must be filed in the appropriate office according to the regulatory timeframes prescribed.

Forest Service Appeals

FS decisions approving use of National Forest System lands are subject to agency appeal procedures in accordance with 36 CFR Part 215 or 251. Decisions governing Surface Use Plan of Operations and Special Use Authorization approvals that involve analysis, documentation, and other requirements of the National Environmental Policy Act (NEPA) are subject to agency appeal procedures under 36 CFR Part 215. If an appeal is filed, the FS must respond within 45 days and operations must not occur for 15 days following the date of appeal disposition. FS regulations at 36 CFR Part 251 govern appeals of written decisions of the FS related to issuance, denial, or administration of written instruments to occupy and use National Forest System lands. A list of the types of written instruments is provided at 36 CFR 251.82 and includes a Surface Use Authorization and Surface Use Plan of Operations related to the authorized use and occupancy of a particular site or area.

Bureau of Indian Affairs Appeals

The operator may appeal decisions of the BIA under 25 CFR Part 2.

ACRONYMS IN COMMON USE

ADT - Average Daily Traffic

APD - Application for Permit to Drill

BLM – USDI, Bureau of Land Management

BIA – Bureau of Indian Affairs

CA - Communitization Agreement

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980

CEQ – Council on Environmental Quality

CFR - Code of Federal Regulations

CMP - Corrugated Metal Pipe

COA - Condition of Approval

EPA **-** Environmental Protection Agency

ESA - Endangered Species Act

FAN - Final Abandonment Notice

FWS – USDI, Fish and Wildlife Service

FS - USDA, Forest Service

MLA - Mineral Leasing Act

NEPA - National Environmental Policy Act of 1969

NFS – National Forest System

NHPA- National Historic Preservation Act

NIA - Notice of Intention to Abandon

NOI - Notice of Intent

NOS - Notice of Staking

NTL - Notice to Lessee, National, State, or District

POD - Plan of Development

RMP - Resource Management Plan

ROD - Record of Decision

ROW - Right-of-Way

SDR - State Director Review

SHPO – State Historic Preservation Officer

SMA - Surface Management Agency, (includes only Federal agencies with land management responsibilities)

SME – Surface Management Entity (used when referring to other Federal agencies and non-Federal surface owners, as a combined group.)

SN - Sundry Notice

SRA - Subsequent Report of Abandonment

SUA - Special Use Authorization

SWD - Salt Water Disposal

UA - Unit Agreement

Figure 8. Agency Location Map