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(June 1969)

	UNITED STATES **DEPARTMENT OF THE INTERIOR** **BUREAU OF LAND MANAGEMENT** **MANUAL TRANSMITTAL SHEET**	**Release** **1-1749** **Date** **1/28/13**

Subject

H – 1624-1 – Planning for Fluid Mineral Resources

1. **Explanation of Materials Transmitted: This release inserts Chapter V, Master Leasing Plans and a Glossary, into H-1624-1 – Planning for Fluid Mineral Resources, Rel. No. 1-1583 dated 5/7/1990.**

2. **Reports Required: None.**

3. **Materials Canceled: None.**

4. **Filing Instructions: File as directed below**

REMOVE	INSERT
None	Chapter V and the Glossary (11 pages)

Michael Pool

Acting Director,
Bureau of Land Management

Form 1221-2
(June 1969)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MANUAL TRANSMITTAL SHEET

Release
1-1583

Date
5/7/90

Subject

H-1624-1 PLANNING FOR FLUID MINERAL RESOURCES

1. Explanation of Materials Transmitted: This Handbook provides detailed instructions for complying with the fluid minerals supplemental program guidance (SPG) for resource management planning as prescribed in BLM Manual Section 1624.2. It contains, among other things, procedural guidance for analyzing and documenting reasonably foreseeable fluid mineral development and the impacts of such development on the human environment.

2. Reports Required: Within the next year, after the field has had some experience in implementing this Handbook guidance, the Washington Office will request Field Office comments to determine if changes are warranted. Additional related guidance on pre-lease and post-lease plan conformance and NEPA compliance review procedures and more detailed guidance on cumulative impact analysis procedures may also be incorporated into the Handbook at that time.

3. Materials Superseded: None.

4. Filing Instructions: File as directed below.

REMOVE	INSERT
None	H-1624-1

(Total: 50 Sheets)

Carson W. Culp, Jr.
Acting Deputy Director

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CHAPTER I - INTRODUCTION

A. Purpose of the Handbook.

This Handbook is intended for use by the Bureau of Land Management (BLM) specialists involved in preparing planning and associated environmental analyses and documents. It is also intended for use by BLM officials responsible for development, oversight and compliance with Section 202 of the Federal Land Policy and Management Act (FLPMA) and the National Environmental Policy Act (NEPA) within the fluid minerals program.

The purpose of this Handbook is to provide guidance on how to comply with the resource management planning requirements set forth in the supplemental program guidance for fluid minerals (BLM Manual Section 1624.2). The 1624.2 Manual establishes the fluid minerals determinations that, except under certain specified circumstances (see BLM MS 1620.06), are required in every resource management plan (RMP) prepared by the BLM. The BLM Manual Section 1624.2 also identifies factors which should be analyzed and considered in making fluid mineral determinations. The guidance provided in Chapters 2, 3, and 4 of this Handbook is intended to assist in preparing the following: an RMP, a plan amendment, or a planning analysis involving fluid minerals; an environmental assessment (EA) tiered to the existing environmental document or a supplemental environmental impact statement (EIS) involving fluid minerals; a fluid minerals EA or EIS that is prepared in an area where there is no land use plan; and a plan or environmental document of another surface management agency (SMA) involving fluid minerals where the BLM is a cooperating agency.

B. Overview of the Decision Tiers for the Fluid Minerals Program.

The BLM's planning and NEPA guidance provides for tiered decision making (see BLM MS 1601.1 and the BLM NEPA Handbook, H-1790-1). In the fluid minerals program the major decision tiers are as follows:

1. Policy Tier. The Director establishes Bureauwide policies and procedures for the leasing of Federal fluid minerals and the management of exploration, utilization, development and abandonment activities on Federal oil and gas or geothermal leases. Bureauwide policy and procedural guidance is set forth in regulations, manuals, instruction memoranda, interagency and intergovernmental agreements, operating orders, and notices to lessees. State Directors may supplement this guidance through State Office instruction memoranda or manual guidance. The following are examples of documents which contain national policy and procedural guidance relating to planning and NEPA compliance for the fluid minerals program:

a. Regulations. 40 CFR Part 1500 (NEPA), 43 CFR Part 1600 (Planning), 43 CFR Part 3100 (Oil and Gas Leasing), 43 CFR Part 3200 (Geothermal Resource Leasing).

b. Operating Orders and Notices to Lessees. Onshore Oil and Gas Order No.1 and NTL's 2B, and 3A, Geothermal Resources Operational Orders Nos. 1, 2, 3, and 4.

c. Manuals. BLM Manual Series 1600 (Planning), BLM MS 1790 (NEPA), BLM MS 3031 (Energy and Mineral Resource Assessment), BLM Manuals Series 3100 (Onshore Oil and Gas Leasing), and BLM Manual Series 3200 (Geothermal Resource Leasing).

d. Handbooks. BLM H-1790-1 (NEPA), BLM Handbook Series 3100 (Onshore Oil and Gas Leasing), and BLM Handbook Series 3200 (Geothermal Resource Leasing).

e. Interagency Agreements. The 1984 Interagency Agreement between the BLM and the Forest Service on fluid mineral leasing, the 1987 Interagency Agreement between the BLM and the National Park Service (NPS) on geothermal leasing, and the 1984 Memorandum of Understanding between the BLM and the Department of Defense on fluid mineral leasing. State Offices may also have interagency agreements which prescribe policies or procedures affecting the fluid minerals program, e.g., agreements with the Governor's Office on consistency review procedures for resource management planning.

2. Resource Management Planning Tier. The State Director determines where and under what conditions oil and gas or geothermal exploration, development, and utilization activities will be permitted. These determinations are made in RMP’s or plan amendments in accordance with policies and procedures set forth in BLM's planning regulations and manual guidance. These determinations are the basis for the timing, surface use, and no surface occupancy stipulations that are attached to a Federal oil and gas or geothermal lease. The RMP also identifies the circumstances necessary for granting a waiver, exception or modification to any stipulation.

Compliance with NEPA has been integrated into BLM's resource management planning process. The BLM has a statutory responsibility under NEPA to analyze and document the direct, indirect and cumulative impacts of past, present and reasonably foreseeable future actions resulting from Federally authorized fluid minerals activities. By law, these impacts must be analyzed before the agency makes an irreversible commitment. In the fluid minerals program, this commitment occurs at the point of lease issuance. Therefore, the EIS prepared with the RMP is intended to satisfy NEPA requirements for issuing fluid mineral leases (see Chapter III of this Handbook). Bureauwide standards and guidelines for complying with NEPA requirements are set forth in the BLM NEPA Handbook (H-1790-1).

3. Activity Planning and Implementation Tier. The District or Area Manager establishes the site specific conditions under which exploration, development, and abandonment will be permitted on specific leases, and determines if stipulation waivers, exceptions or modifications are warranted. All site specific determinations must conform with the RMP and are established in the process of approving notices of intent, applications for permit to drill (APD's), geothermal drilling permits (GDP's), field development plans, utilization plans and permits, sundry notices, and reclamation plans. Activity planning related to other resource programs addresses the impacts, if any, of the fluid minerals program on that resource or activity and the impacts of any conditions or restrictions on the fluid minerals program.

CHAPTER II – CONDUCT PREPLANNING

A. Introduction.

1. Planning Schedule. Every year the BLM and the FS jointly publish a Federal Register notice to notify other Federal agencies, State and local governments, Tribal governing bodies, user groups, and the general public of their respective land use planning schedules. The BLM portion of this notice is prepared by the Washington Office using information provided by BLM State Offices. It lists, by State, District, and Resource Area, all major resource management planning efforts currently underway or tentatively scheduled to begin within the next three years.

2. Preplanning Activity. Resource management planning activities that occur between the preliminary identification of a new planning start in the planning schedule and the publication in the Federal Register of the Notice of Intent (NOI) to prepare an RMP or plan amendment are commonly referred to as preplanning. (See BLM Manual Section 1631.3 for a general discussion of these preplanning activities.) If fluid minerals are to be adequately addressed in a proposed RMP or plan amendment involving fluid minerals, the tasks described in the following three sections should be completed during the preplanning period.

B. Scheduling Inventories and Assessments.

State Office program leads for fluid minerals should review the BLM‘s annual planning schedule to identify areas where additional inventory work may be required to support projected new planning starts. Assuming that new starts are identified three years in advance, any collection of information and data and/or mineral inventory work that may be required can be completed before the planning effort is formally initiated. Data on fluid mineral resources should be gathered and analyzed, as outlined in Chapter III.

C. Determining Scope and Level of Effort.

During the preplanning period a number of preliminary decisions are made about the scope and focus of the proposed planning effort, the organization of the planning team, who will do what, when it will be done, and how it will be funded. Depending on the State, the document that summarizes these preplanning decisions may be called a preparation plan, a preplanning analysis, a project management plan, or a preplanning contract.

The preplanning document is usually prepared by the planning team leader, working with the interdisciplinary planning team, and line management. The document is usually completed prior to issuing the Notice of Intent and it is normally signed by the Area Manager, the District Manager, and the State Director.

The fluid minerals program should be represented in one form or another in the discussions that lead to the preplanning document. This document specifies, among other things, whether fluid minerals activities will be associated with any preliminarily identified planning issues or management concerns, how fluid minerals will be handled in the preliminarily identified plan alternatives, how existing fluid minerals NEPA documentation will be incorporated into the published documents, and the extent to which the fluid minerals specialist will be involved in the planning effort. (See the "Preplanning Contract Training Package" prepared by the Phoenix Training Center, l600-INT-3, for a detailed discussion of preplanning activities and the contents of a preplanning contract.)

Note that, unless an exception applies, fluid minerals determinations are required in every RMP regardless of whether or not fluid minerals is associated with a planning issue or management concern. This should be reflected in the preplanning document. If management has decided to use one of the exceptions discussed in BLM Manual Section 1620.06, the preplanning document should explain why the requisite determinations will not be made. However, it is highly unlikely that one of the exceptions could ever be justifiably used for fluid minerals determinations.

D. Digitizing Data.

During the preplanning period, decisions are also made about whether the proposed RMP or plan amendment will be prepared using automated resource data. Assistance on automating is readily available from the Area, District, or State Offices as well as the Service Center. If management decides that automated data will be employed, the following fluid minerals related information should be considered for automation purposes: public land survey, surface ownership, mineral rights status, transportation and utility corridors, withdrawals, fluid minerals leases, lease stipulations and areas covered by the stipulations, well locations, oil and gas or geothermal fields, potential for occurrence and development and/or oil and gas or geothermal plays, petroleum information (PI) data, and geologic strata.

Standards of accuracy should be identified for each data set entered. In general, statistics on land surveys and land status are considerably more accurate than estimates of mineral resource potential. For example, land ownership data may be accurate to within 0.01 acre but the mapped boundary line identifying mineral potential may only be accurate to within plus or minus 2 miles.

When using digital products, care should be taken to ensure that the final numbers do not imply a greater degree of accuracy than can be supported by the resource evaluations or the intended degree of management constraints. Composite estimates for all mineral potential within the planning area might be shown to the nearest 1,000, 5,000, 10,000 acres, or whatever increment best fits the data.

CHAPTER III - CONDUCTING AND DOCUMENTING THE ANALYSES OF FACTORS

A. Introduction.

The BLM's planning regulations (43 CFR 1610.4) describe a nine step process, following preplanning, for preparing resource management plans or plan amendments. These steps are: (1) identify issues; (2) develop planning criteria; (3) collect data; (4) analyze the management situation; (5) formulate alternatives; (6) estimate effects; (7) select the preferred alternative; (8) select the plan; and (9) monitor and evaluate the plan. These steps and the requirements for interagency coordination and consultation and public participation are discussed in detail in BLM Manual Sections 1614 through 1616 (see Illustration 1).

The interdisciplinary planning team, working with line management, goes through each of these steps in every resource management planning effort. Although the planning process is portrayed as a series of sequential and discrete steps, in practice, the process is intended to be iterative and dynamic. If fluid minerals determinations are being made and/or affected by other resource determinations, a fluid minerals specialist should be involved in every step of the process.

The supplemental program guidance for fluid minerals (MS 1624.2) identifies three factors of analysis which should be considered in making fluid minerals determinations in resource management plans or plan amendments: (1) the potential for fluid mineral occurrence and development; (2) the cumulative impacts of reasonably foreseeable development; and (3) the necessity for constraints (BLM MS 1624.22). These analyses are completed during the planning process. This chapter provides guidance on how to analyze and document the analyses of these factors.

B. Procedural Guidance.

1. Assemble Data and Information. The interdisciplinary team begins compiling relevant data and information early in the planning process, preferably during preplanning. The fluid minerals specialist should focus attention on collecting data to assist in conducting the analyses of the factors identified in the supplemental program guidance for fluid minerals. The fluid mineral specialist is expected to review data from available sources (e.g., USGS, DOE, American Petroleum Institute, Potential Gas Committee, State agencies, professional societies, and academic sources) to develop a broad data base. BLM files are also important sources of information; they may consist of oil/gas/geothermal maps, well location file cards, well completion reports, and production reports. Previous mineral assessments, such as KGS/KGRA and prospectively valuable classifications, and other evaluations that may have been done for technical reports, exchanges, withdrawals and other actions, may be used as data sources. In many cases, this information has already been compiled and summarized on maps and data bases. Some of this information can be obtained from commercial computer services, such as Petroleum Information and Dwights, or may be provided by service companies. Special procedures and restrictions on using proprietary data and information are discussed in BLM MS 1273.3.

Exclusive of those areas closed to fluid mineral development by law, regulation, Executive Order, and Secretarial decision, fluid minerals data and information for the entire planning area (e.g., resource area) should be assembled regardless of surface or mineral ownership. Data on fluid mineral resources and activities in areas adjacent to the planning area may also be useful and necessary for analyzing the potential for occurrence and development and projecting reasonably foreseeable development. The types of data and information generally useful for analyzing fluid minerals potential and estimating impacts are discussed in greater detail below:

a. Past and present data on leasing and development activities and operations. Data and information on historic trends and patterns of fluid mineral exploration and development activities in the planning area, including both boom and bust periods, as well as industry expressions of interest in future leasing and development should be assembled. Generally this information will include past and present data on:

(1) The number and location of leases, units, communitization agreements, development contracts, areas where bonuses have been paid, and areas with comparatively high percentage of leased land.

(2) The number, location, and types of wells drilled under each lease (e.g., wildcat, development, injection, and disposal); the representative depth of wells drilled; the number and location of dry holes; the success ratio for wells drilled; the location, production history and life expectancy of producing fields.

(3) The nature and size of typical facilities or developments associated with fluid mineral exploration and development, e.g., drillpads, pits, roads, pipelines, transmission lines, production facilities, gas storage projects, enhanced recovery projects, water source wells, routine hydraulic fracturing, tank batteries, and other ancillary facilities.

(4) The nature and extent as well as the timing and sequence of typical exploration and development activities and operations, including general information on input requirements and residual outputs or waste products.

(5) Social and economic information related to fluid mineral resources, including employment and income patterns and trends in the affected area.

b. Geological data and estimates of fluid mineral resources. The fluid minerals specialist should review available geologic and fluid mineral resource data and information and consolidate it for the respective planning area. The types of data that will be useful for planning and NEPA compliance purposes include:

(1) Estimates of recoverable and undiscovered resources, including unconventional fluid mineral resources (i.e., coal bed methane, tar sands, and tight gas sands). The U.S. Geological Survey's oil and gas resource estimates of undiscovered resources are discussed in greater detail in item c. below.

(2) Structural and stratigraphic data and information related to basins, fields and plays (may include regional structure contour and isopach data; this type of information may be obtained from maps showing faults, major folds, volcanic features, and distribution of geologic formations, etc.).

(3) Geophysical (seismic) and geochemical data that pertain to the location and analysis of the fluid mineral resource potential.

(4) Geothermal features and thermal gradient data and information.

c. U.S. Geological Survey Estimates of Oil and Gas Resources. Available USGS resource estimates are analyzed along with BLM-derived estimates to identify oil and gas activity and discovery trends. The Deputy State Director for Mineral Resources is responsible for ensuring that USGS resource estimates and unpublished reports are available to the BLM fluid minerals specialist. The USGS oil and gas resource assessment for the United States is summarized in the "Estimates of Undiscovered Conventional Oil and Gas Resources in the United States - a Part of the Nation's Energy Endowment" (published jointly by the USGS and MMS). More details regarding USGS oil and gas resource estimates for each province and play are or will be available as a series of open file releases.

The USGS defines more than 200 separate plays in the onshore United States. Each play consists of the area containing geologically related oil and gas accumulations. The boundary of each play depends on the stratigraphy, structure and maturation of the source and reservoir beds. For each play the fields were divided into three groupings: the first third discovered, the second third discovered and the last third discovered. For each third, the sizes of the largest discovery and the average discovery are determined. Further expected field sizes and number of remaining fields are projected from this data. The USGS reports contain three useful pieces of information: the play area and boundary; the estimated total remaining undiscovered oil and gas resources in each play; and the number of fields remaining to be discovered and distribution of field size. Most USGS reports also contain discovery rates in terms of fields discovered per number of wildcat tests.

Three important aspects of the USGS analysis deserve special attention. First, the USGS includes as recoverable resources those resources which cannot currently be drilled because of economic limits. Thus, the largest remaining resources of several plays lie in the undrilled deep part of basins rather than the shallow areas where the present drilling and production are concentrated. Secondly, the USGS estimates the resources of undeveloped areas, mainly in Alaska, which have little or no drilling. Third, the USGS estimates do not include unconventional oil and gas resources, such as tar sands, coal-bed methane, and tight gas sands.

2. Identify and Describe Existing Management Practices. The interdisciplinary team identifies and describes existing management practices and activities for all of the resources and resource uses in the planning area. This is generally completed prior to or early during the analysis of the management situation (step four of the planning process). The fluid minerals specialist focuses on describing existing management relative to fluid minerals.

a. The description of fluid minerals management practices should be based on existing policies, rules, operating orders, notices, directives and management plans (e.g., an existing MFP or RMP and associated NEPA documentation). The description should reflect how the program operates in the planning area, including permitting and procedural requirements of other agencies or levels of government for leasing, exploration and development.

b. To facilitate preparation of documents that will eventually be published for public review, existing fluid minerals practices should be described, to the extent possible, in terms of the determinations set forth in MS 1624.2. Management areas should be identified, i.e., areas currently open to development under standard terms and conditions, areas currently open with minor constraints, areas currently open with major constraints, and areas closed to leasing. How existing leases are managed, including direction and practices related to lease stipulations, stipulation waivers, geophysical exploration and rehabilitation activities, should also be identified and described.

c. The description should cover the entire planning area, regardless of surface or mineral ownership. In other words, it should cover leasing, exploration, and development activities and practices in the planning area, as well as adjacent areas that logically should be included because of common resources or shared ecosystems, regardless of whether or not the BLM administers the surface and/or subsurface. Information on terms and conditions should be based on existing management or land use plans and programs of surface management agencies and other agencies external to the BLM (e.g., USFS, NPS, Bureau of Reclamation, Military, State, Tribal and local agencies).

3. Analyze Resource Capability and Potential. Based on available data, the interdisciplinary team analyzes the capability or potential of the resources as necessary to identify management opportunities and limitations. The analysis must be completed prior to or as part of step four of the planning process when the planning team analyzes the management situation. The fluid minerals specialist focuses on analyzing fluid mineral occurrence and development potential.

a. Oil and Gas Resources. With respect to oil and gas resources, the fluid minerals specialist should consider the USGS resource estimates. These estimates may not cover all the oil and gas resources in a BLM planning unit. The specialist will need to independently estimate all other oil and gas resources in the planning unit and integrate them into the planning document.

Other oil and gas resources include additional play resources based on new data available after the USGS study, resources of small fields which were not dealt with by the USGS, resources of frontier plays disregarded by USGS, and resources contained in unconventional reservoirs (e.g., tight sands, coal bed methane, and tar sands). The fluid minerals specialist will need to analyze and discuss unconventional oil and gas resources not covered by the USGS estimates in the same manner as conventional resources are treated.

The USGS resource estimates are based on oil and gas plays which, in many instances, are larger than a planning unit. Therefore, a portion of the total oil and gas estimate in a play must be allocated to the individual planning unit. The resource occurrence potential within a play is assumed to be constant within a play, but the resource estimate does not imply a uniform distribution of the oil and gas resources nor of development potential within the play. Oil and gas recoverable resources are locally dependent upon factors such as porosity, permeability, depth, trap size, and surface locality. Most of the USGS assessment techniques do not address the parameters on a local level.

All USGS and BLM generated plays must be treated similarly. The general procedure is as follows: determine the percentage of the plays encompassed by the planning unit; identify the limiting reservoir and geologic parameters attributable to the planning unit for each play (e.g., porosity, pinchouts, structure, and thermal maturation); determine a projected field size distribution for, each play; identify those areas within each play which have the potential for discovery of commercial fields during the life of the plan; and allocate resource estimates by play to the planning unit. The fluid mineral resources that are identified should be expressed as a range. Note that the estimated total remaining fluid mineral resources in the study area will not be discovered during the life of the plan. The analysis should be coordinated with all other planning units within each play.

b. Geothermal Resources. With respect to geothermal resources, the fluid minerals specialist will need to compile available geothermal resource data and structural-geologic information to make a determination regarding the location and extent of geothermal resources potentially available for electrical generation or direct use applications. The geothermal resources that should be analyzed include hydrothermal convection (i.e., vapor- and hot water-dominated) systems, hot igneous (i.e., molten or hot dry rock) systems, and conduction-dominated areas (i.e., high heat flow provinces).

c. Rating and Mapping Potential. As a part of this analysis, a resource potential map should be produced which shows: major geologic trends; USGS or other published play boundaries or KGRA boundaries; play boundaries for conventional and unconventional oil and gas resources developed by BLM; and areas of high, medium, low or no potential for occurrence and development as outlined below. In rating and mapping potential, include a description of the level of confidence which indicates the approximate accuracy of any boundaries identified (i.e., using standard cartographic techniques).

(1) Oil and Gas. Due to the nearly ubiquitous presence of hydrocarbons in sedimentary rock, use the following for classifying oil and gas potential:

HIGH. Inclusion in an oil and gas play as defined by the USGS national assessment, or, in the absence of a play designation by USGS, the demonstrated existence of: source rock, thermal maturation, and reservoir strata possessing permeability and/or porosity, and traps. Demonstrated existence is defined by physical evidence or documentation in the literature. (Note that reasonable adjustments to any USGS play areas and boundaries may be made if it is apparent that a particular boundary was set up based on administrative convenience rather than a definable change in geological character.)

MEDIUM. Geophysical or geological indications that the following may be present: source rock, thermal maturation, and reservoir strata possessing permeability and/or porosity and traps. Geologic indication is defined by geological inference based on indirect evidence.

LOW. Specific indications that one or more of the following may not be present: source rock, thermal maturation, or reservoir strata possessing permeability and/or porosity, and traps.

NONE. Demonstrated absence of (1) source rock, (2) thermal maturation, or (3) reservoir rock that precludes the occurrence of oil and/or gas. Demonstrated absence is defined by physical evidence or documentation in the literature.

(2) Geothermal. Use the following for classifying geothermal potential:

HIGH. Inclusion in a KGRA; or the existence of a hydrothermal convection system demonstrated by geological evidence of: a structural fault/fracture system and related thermal spring activity or other thermal features (i.e., geysers, fumaroles, mud volcanoes, vents, etc.); and high subsurface temperatures measured in wells and/or estimated from geochemical temperature indicators. Demonstrated existence is defined by physical evidence or documentation in the literature.

MEDIUM. Existence of a hot igneous system demonstrated by geologic evidence of Late Tertiary or Quaternary volcanism and higher than normal geothermal gradient as documented in existing literature.

LOW. Existence of a conduction-dominated area demonstrated by geologic evidence of radiogenic heat production or geopressured environment and higher than normal geothermal gradient as documented in existing literature.

NONE. Demonstrated absence of evidence indicating the existence of hydrothermal convection systems, hot igneous systems, and higher than normal geothermal gradient. Demonstrated absence is defined by physical evidence or documentation in the literature.

4. Project Reasonably Foreseeable Development (RED) Under Existing Management. The next step is for the interdisciplinary team to project management activities and actions, including developments, which are likely to occur in the planning area over the life of the plan (i.e., generally 15 to 20 years or whatever has been determined to be the planning horizon or timeframe for the RMP) assuming continuation of existing management. The fluid minerals specialist focuses attention on projecting fluid minerals leasing, exploration, development, production and abandonment activities. The description of existing fluid minerals practices and information on existing leases and related exploration and development activities as well as the potential for development in the planning area provides the basis for projecting the RFD under existing management. The level of detail necessary for describing the reasonably foreseeably development scenario is basically a function of: the amount of geologic data available regarding fluid mineral potential; and the nature or level of resource conflicts or controversies, i.e., planning issues or management concerns involving fluid mineral leasing and development. The RFD scenario for fluid minerals should address the following:

a. The delineation of areas with similar (e.g., high, medium, low or none) exploration and development potential; the number, density and type of wells likely to be drilled within these areas (e.g., wildcat, development, deep, shallow, or other); and the estimated cumulative production by type of product (e.g., oil, gas, geothermal or by-products). The projection should reflect, as necessary, the estimated percent of the activity that is likely to occur on land managed by the BLM and other Federal surface management agencies.

(1) In areas where previous development has occurred, the projections should be based on past and present leasing, exploration, and development activity as *well* as professional judgment on geological and related technological and economic factors. Extrapolations of historical drilling and/or production activity may be used as the basis for projections. The location of proven reserves, including reserves in existing fields/pools that may be developed by secondary or other enhanced recovery methods, should also be taken into consideration. The historical drilling record should be reviewed for wells that were completed as producers and dry holes. This information may then be analyzed by the specialist to determine success rates and/or discovery rates in areas with similar development potential. Historical cumulative production may also be compared to the number of wells it took to produce the reserves in order to estimate the number of wells it may take to produce a comparable field/pool.

(2) In frontier areas and areas of low development potential, these analyses may not be possible due to lack of drilling or production data. In such areas, geologic, leasing, and existing exploration information (e.g., wildcat tests, geophysical exploration) may be the only sources of information available. For these areas, an assumption shall be made that a baseline discovery will involve certain exploration activity leading up to a discovery and subsequent baseline development activity. To ensure NEPA compliance, a minimum level of exploration and development activities should be projected over the life of the RMP.

(3) Assumptions used in projecting exploration and development activities (e.g., regarding prospect size, well spacing, technological changes or applications, economic conditions, product prices, etc.) should be explicitly documented in the analysis.

(4) An example of how the projected level of oil and gas activity may be documented is shown below. Always assume at least one boom and bust cycle over the life of the plan.

> It is expected that 70 to 80 wildcat wells will be drilled in the next 10 years with a discovery rate of 1 in 7. The 10 fields discovered are expected to range in size from half a million barrels to *5* million barrels according to USGS estimates (See Appendix A for a list of the field sizes). Normal spacing for fields in the play is 40 acres and the average recovery is a half million barrels per well. The total number of new producing wells expected (including approximately 10 successful wildcat wells) is *25* to 30. It is also expected that 20 to *25* additional wells will be drilled in existing fields. About 200 presently producing wells will be abandoned and the production sites reclaimed.

b. Typical surface and subsurface developments and activities that are likely if these types of wells are drilled (e.g., drillpads, pits, roads, pipelines, transmission lines, production facilities, gas storage projects, enhanced recovery projects, water source wells, routine hydraulic fracturing, tank batteries, and other ancillary facilities, whether direct or in association with exploration and development). Historical and current fluid minerals operations information should be reviewed to determine what these developments and activities might be. Standard and directional drilling activities and potential secondary or other enhanced recovery activities should be considered. Other activities that should be reviewed and considered are seismic operations, and subsequent well operations that may result in additional surface disturbance. To facilitate post lease NEPA compliance, particular attention should be given to describing those activities that are not categorically excluded from NEPA documentation.

c. Land use requirements that would be associated with these exploration, development and utilization activities (e.g., surface use requirements in acres or linear miles of access and pipelines), sequence, timing and duration requirements (e.g., field life), waste disposal needs (e.g., produced water, H_2S, $C0_2$ venting, and flaring), and special requirements or surface use needs associated with disposal activities. The specialist should review fluid minerals information (e.g., APDs, plans of operation and utilization, well records, etc.) and analyze available data to project average surface land use needs for these activities. Also the specialist should analyze available data to estimate the duration of the various phases, e.g., exploration, drilling, and production phases.

5. Analyze the Impacts Resulting From the Continuation of Existing Management. Upon completion of a reasonably foreseeable scenario for all resources and resource uses, the interdisciplinary team is in a position to analyze the potential direct, indirect and cumulative impacts assuming continuation of existing management practices.

Impacts are the ecological, aesthetic, historic, cultural, economic, social, or health effects caused by an action. Direct impacts are those which occur at the same time and place as the action. Indirect impacts are those which occur later in time or farther removed in distance from the action but are still reasonably foreseeable (e.g., growth inducing effects, effects on population size or density and related effects on natural systems, etc.). Cumulative impacts are those which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

Based on the projection of RFD, the interdisciplinary team analyzes the potential impacts resulting from exploration activities, producing wells, facilities, roads, pipelines, abandonments, and reclamation. With respect to fluid minerals, the analysis of impacts should address the following:

a. The site specific direct and indirect impacts normally associated with the type of exploration, development, production and abandonment activities likely to occur in the planning area, i.e., impacts of the typical exploration and development activities.

b. The direct, indirect and cumulative impacts of the exploration, development, production and abandonment activities projected to occur over the life of the plan i.e., total impacts including the cumulative impacts resulting from all the activities projected in the RFD. Impacts on all resources, regardless of who owns or manages the resources, must be identified and analyzed. Impacts caused by activities of other surface management agencies and agencies or persons external to the BLM must also be addressed in this analysis.

c. The mitigation, including rehabilitation and abandonment, measures that would be employed to avoid or reduce adverse impacts based on existing management practices, i.e., terms and conditions on exploration and development activities. Mitigation measures include constraints, requirements or conditions which are imposed on fluid mineral lessees to avoid or reduce adverse impacts on the environment, including resources owned or managed by other public agencies or private parties.

d. The residual impacts that would remain following the application of the mitigation measures identified above, i.e., effectiveness of mitigation measures in ameliorating potential impacts.

e. The impacts of existing management of other resources and uses on fluid minerals leasing, exploration, development, production and abandonment activities, including production opportunities foregone.

f. The extent to which there is incomplete or unavailable information which is relevant to the analysis of adverse impacts and essential to a reasoned choice among alternatives. If such information cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the fluid minerals specialist must identify the existing credible scientific evidence which is relevant to the analysis of adverse impacts and analyze the impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For purposes of this analysis, impacts which have catastrophic consequences, even if their probability of occurrence is low, should be addressed provided that the analysis is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. A worst case analysis is not required. (See 40 CFR 1502.22.)

6. Identify Problems and Opportunities Associated with Existing Management. The interdisciplinary team uses the results of the preceding impact analysis to identify potential opportunities and/or problems associated with continuation of existing management. Problems may involve unacceptable or controversial impacts on other resource values or uses, including those resources owned or managed by other public agencies or private parties.

7. Formulate Alternatives to Existing Management. Based on the analysis of the management situation, the interdisciplinary team formulates a reasonable range of alternatives to existing management. Alternatives are directed towards responding to identified issues and concerns, resolving the problems with existing management, and exploring opportunities for enhancing or expanding resources or resource uses. The fluid mineral specialist generally focuses on opportunities or problems related to or dealing with fluid mineral development. However, the analysis and formulation of alternatives requires involvement of all resource specialists.

a. If no opportunities or problems related to or dealing with fluid minerals management are identified, then the manner in which fluid minerals are managed will be, generally speaking, the same across all alternatives. Keep in mind that NEPA requires consideration of alternatives if the proposal involves unresolved conflicts, concerning alternative uses of available resources (Section 102(e) of NEPA).

b. In many resource areas, existing management guidance covers some, but not all, of the determinations called for in the SPG for fluid minerals. For example, there may be existing management direction concerning areas open and closed to leasing but none concerning geophysical exploration. If this is the case, at least one alternative to existing management must be formulated and analyzed in the RMP or plan amendment, namely, an alternative that includes all of the required determinations.

c. If opportunities and problems or unresolved conflicts are identified, the interdisciplinary team will formulate one or more alternatives to address them. With respect to fluid minerals, alternatives formulated will vary in terms of where, when, and how fluid minerals exploration and development will be authorized.

d. Generally, based on the team's review of opportunities and problems, they will identify any surface or subsurface management constraints or mitigating measures that are required to take advantage of opportunities and to resolve any problems. These mitigating measures or constraints, if greater than those that could be imposed under the standard terms and conditions of a fluid mineral lease, are then translated into lease stipulations. In identifying constraints on fluid minerals activities, the team should consider the following:

(1) The least restrictive stipulation that effectively accomplishes the resource objectives or uses for a given alternative should be used.

(2) If multiple stipulations are proposed for the same area, the potential effects of overlaps should be considered. For example, if overlapping seasonal restrictions effectively preclude any surface disturbing activity year round, modifying those stipulations should be considered; or if other resource values are of high enough value and the protections are justified in the public interest, a no-surface-occupancy (NSO) stipulation should be employed in lieu of the seasonal restrictions.

e. Several alternatives will generally be developed to address opportunities and problems identified. For example, there may be an opportunity or need to establish a resource condition objective related to a desired plant community in a given area. The same area may be identified as having the potential as a special recreation management area. If the area is already an active fluid minerals area with high or medium potential for further development, the team will need to determine what, if any, problems or conflicts may arise as a result of these multiple resource objectives and uses. Several alternatives may be developed to address these problems or conflicts and to allow for multiple uses in the area. In one alternative, the team may identify any changes (from existing management) in surface and/or subsurface management constraints for fluid minerals activities that would be required to meet the resource condition objective and manage the area as a special recreation management area. Such constraints, if greater than those that could be imposed under the terms and conditions of the standard lease form, would be translated into lease stipulations for that alternative. In another alternative, more constraints on recreation use may be imposed to resolve conflicts with relatively fewer constraints on fluid minerals activities as a result. In yet another alternative, the area may be closed to additional leasing.

f. Each alternative is formulated and described to the same level of detail and in the same manner as was done for describing the existing management. To facilitate preparation of documents that will eventually be published, the constraints associated with fluid minerals aspects of each alternative should be described in terms of the SPG determinations.

8. Develop RFD Scenarios and Analyze Impacts for Each Alternative. If the proposed alternatives to existing management vary significantly in terms of the manner in which fluid minerals are managed, the fluid minerals specialist, working with or through the interdisciplinary team, will have to generate a separate RFD scenario for each alternative to the same level of detail as was done for the RFD assuming continuation of existing management (see B.4. above). The team will then use these scenarios to help analyze the potential direct, indirect, and cumulative impacts of each alternative (see B.5. above). The analysis of impacts is generally used as the basis for comparing and eva1uating the alternatives. Management then selects one of the alternatives as the preferred alternative or develops another alternative (e.g., using a combination of existing alternatives) as the preferred. This may involve additional analysis of the "new" alternative to ensure that impacts have been adequately addressed.

(3) Documentation Guidance.

1. In the Unpublished Planning Records. Most of the information and data assembled and used in analyzing the factors will be maintained in the unpublished planning records, generally as part of the analysis of the management situation. The management situation analysis is a working "document" or set of records used by the interdisciplinary planning team to describe existing management, help identify problems and opportunities and formulate plan alternatives.

a. The analysis of the potential of the potential for development may be documented in a minerals report in accordance with BLM MS 3060. A format for the mineral assessment report is outlined in BLM MS 3031.

b. The description of existing management and the analysis of opportunities and problems associated with such management is documented in the management situation analysis.

c. Working documents associated with the formulation of alternatives and any technical reports or computations used to analyze environmental impacts are also maintained in the unpublished records.

2. In the RMP EIS. Generally, the information presented in the published draft RMP/draft EIS and proposed RMP/final EIS is limited to that which will assist the public and other reviewers in understanding and evaluating the alternatives and their impacts. The results of the analysis of factors considered in making fluid minerals determinations, however, are summarized and incorporated into the RMP/EIS. Illustration 2 identifies appropriate places within the established format standards for draft, proposed and approved RMPs or plan amendments and associated EISs for documenting fluid minerals information (also see BLM Manual Section 1602, Plan Documentation and Records). Additional guidance on presenting fluid minerals data and information in the RMP/EIS is provided below. The planning team, however, must use their best judgment regarding the extent of coverage.

a. Existing fluid minerals management, including constraints, is summarized and presented in the RMP/EIS as the "no action" alternative. This alternative serves as the baseline for discussing the other alternatives and for comparing the effects of choosing one alternative over another.

b. Each alternative to existing management is described to the same level of detail as the "no action" alternative. Alternative fluid minerals determinations and management constraints are summarized and incorporated, as appropriate, into one or more of the alternatives presented. Illustration 3 provides an example of how constraints can be summarized for alternatives using narrative, maps, and tables. If a closure or operating constraint is discretionary with the BLM, evidence that a less restrictive mitigation measure was considered should be reflected in the range of alternatives analyzed in detail.

c. The potential for occurrence and development is often useful in describing features of alternatives. Illustration 3, referenced above, exhibits how one can superimpose the potential for development on the map of areas open and closed to leasing. A table summarizing the availability of land for leasing and development relative to resource potential is prepared for at least the preferred alternative (see MS 1624, Appendix 1). The acreage estimates shown in the table should be rounded to reflect the accuracy of the data (see discussion in Chapter II.D.).

d. Fluid minerals management actions or features which are common to all alternatives are generally only documented once in the plan to minimize redundancy in the text. They may be documented separately or incorporated in the description of one alternative and cross-referenced in the description of the other alternatives.

e. A brief description of the geologic environment and the social and economic conditions related to fluid mineral activities which have occurred or are occurring in the planning area are summarized in RMP/EIS. The discussion should focus on those aspects of the existing environment that would be affected by the alternatives being considered. The extent of the discussion of fluid minerals resources will vary across plans based on the extent of past and present as well as projected fluid minerals activity and its actual or potential influence and importance in the human environment. Information for this description is drawn from the material prepared for the analysis of the management situation. An example of a description of fluid minerals related aspects of the affected environment along with maps, tables, and other figures to support the text are shown in Illustration 4.

f. The assumptions on which the impact analysis is based are discussed in the RMP/EIS. At a minimum, a description of typical exploration and development activities and a description of the reasonably foreseeable development (RFD) over the life of the plan are presented in the RMP/EIS. Any variations in the RFD across alternatives should be clearly described. An example of the RFD scenario and assumptions used in projecting impacts in an area of moderate and low fluid mineral potential is shown in Illustration 5.

g. The direct and indirect impacts as well as the cumulative impacts of reasonably foreseeable development must be described in the RMP/EIS for each alternative, including the no action alternative. The impacts discussion may be presented by resource or by alternative. Impacts which are common to all alternatives, e.g., impacts related to a typical operation, only need to be summarized once in the document and cross referenced in the discussion of impacts for each alternative. An example of an RFD scenario and the cumulative impacts of development for an area of high potential is shown in Illustration 6. A matrix or table summarizing the alternatives and the impacts of alternatives is prepared and displayed in the RMP/EIS. This summary table may portray the differences, if any, in the RFD associated with each alternative as well as the differences in direct, indirect, and cumu1ative impacts on the human environment. Documentation requirements associated with incomplete or unavailable data, if any, should be followed in discussing impacts. (See 40 CFR 1502.22.)

h. Mitigation measures and the effectiveness of such measures are described in the RMP/EIS. For the preferred alternative the RMP/EIS should provide evidence that less restrictive measures were considered but found inadequate to provide effective protection for other land uses or resource values determined through the planning process to be deserving of protection.

i. Any detailed technical or programmatic material which supports the main body of the RMP/EIS text and is helpful to understanding that text are included in appendices. The following may be included in an appendix:

(1) Detailed information regarding past and present fluid minerals activity or geological features in the planning area which supports the projections of RFD. Such information may be placed in an appendix if the planning team determines that this information is sufficiently important for reviewers to understand the RMP/EIS.

(2) Additional details on the impacts of the RFD scenario. Such description may serve to facilitate any subsequent NEPA review if sufficient details are provided on how projected exploration and development activities will be managed and on the nature of the typical site specific impacts normally associated with such activities.

(3) A detailed description of how the fluid minerals program operates in the State. A detailed description of Federal, State or local permitting requirements and other operational requirements that are common to all fluid minerals activities statewide is often useful to reviewers but not essential in the main body of the text.

CHAPTER IV - DOCUMENTING AND DISPLAYING DET'ERMINATIONS

A. Introduction.

The SPG for fluid minerals describes a number of fluid mineral determinations that, except under certain specified circumstances, are required in every resource management plan and every fluid minerals plan amendment (BLM MS 1624.21).

B. Management Areas.

The RMP or plan amendment must identify those portions of the resource area that wil1 be: 1) open to leasing, exploration and development under the terms and conditions of the standard lease form; 2) open to leasing, exploration and development under seasonal or other minor constraints; 3) open to leasing, exploration and development under no-surface-occupancy and similar major constraints; 4) closed to leasing for discretionary reasons; and/or (5) closed to leasing for nondiscretionary reasons.

These management area determinations must be displayed on a map for at least the preferred alternative. This map may be supplemented by narrative or tables that describe the constraints and the acres affected by each constraint. The acreage estimates should be rounded to reflect the accuracy of the data (see discussions on data accuracy in Chapter II.D. and Chapter III.B.3.c. and example shown in Illustration 3).

The narrative should explain the extent to which management determinations were influenced as a result of coordination with other surface management agencies (both Federal and State) and private owners. The narrative should summarize the justification for constraints, nondiscretionary and discretionary closures, including references to any applicable laws, executive orders, etc.

C. Management Direction.

The plan or plan amendment must also establish guidelines on how fluid minerals exploration and development activities will be managed in the resource area. These guidelines should cover at least the following topics.

1. Existing Leases. The plan or plan amendment must describe how, if at all, identified leasing, exploration, development, production and abandonment constraints or requirements will be applied in areas currently under lease. The constraints and requirements identified in a plan or plan amendment must be applied to all new leases and all lease renewals. Such constraints or requirements may also be applied to new use authorizations on existing leases provided that they are within the authority reserved by the terms and conditions of the lease. The plan or plan amendment should clearly describe the long term resource condition objectives for areas currently under development. Such objectives may be used to guide rehabilitation activities - prior to abandonment.

2. Lease Stipulations. The RMP/EIS serves as the primary vehicle for identifying and documenting the need for constraints on fluid mineral exploration and development activities. Constraints in the form of stipulations are conditions of lease issuance which provide protection for other resources values or land uses by establishing authority for substantial delay or site changes or the denial of operations within the terms of the lease contract. Constraints in the form of conditions of approval (COAs) on applications for permit to drill (APDs) are site specific requirements or measures imposed to protect resources or resource values. COAs must be reasonable and consistent with lease rights.

The authorized officer has the authority to relocate, control timing, and impose other mitigation measures under Section 6 of the Standard Lease Forms (BLM Oil and Gas Lease Form 3100-11 and BLM Geothermal Lease Form 3200-24). Lease stipulations should always be used to clarify our intent if we know in advance of the need to protect certain resources or resource values. (see 43 CFR 3101.1 and BLM MS 3101 for additional guidance on lease stipulations.)

The plan or plan amendment must describe the resource condition objectives that have been established and the types of lease stipulations, conditions of approval, and levels of protection (setbacks, slopes, seasonal limits, and other constraints whether minor or major) that will be employed to accomplish these objectives. The need for stipulations and/or conditions of approval and to set protection levels should be supported by the analyses in the RMP. The resource condition objectives and associated stipulations, conditions of approval and protection levels should be described in the RMP.

3. Stipulation Waivers, Exceptions and Modifications. The plan or plan amendment serves as a vehicle for explaining to industry and the public the conditions under which waivers, exceptions, or modifications of lease stipulations may be granted. A waiver is a permanent exemption to a lease stipulation. An exception is a one time exemption to a lease stipulation which is determined on a case-by-case basis. A modification is a change to the provisions of a lease stipulation, either temporarily or for the term of the lease (see MS 3103).

All circumstances for granting a waiver, exception, or modification must be documented in the plan or plan amendment. For example, the plan or plan amendment may determine that there will be no new surface disturbance allowed on identified elk winter range between November 15 and April 15. This constraint would be imposed on any new lease in the form of a stipulation. The plan or plan amendment would describe all situations for granting a waiver, exception or modification to this stipulation. The plan may indicate that a waiver could be granted if it is determined that elk no longer use the area for winter range, an exception could be granted if a mild winter was occurring and the long term weather forecast was for continuation of this trend, and a modification could be granted if it is determined the elk have changed their migration patterns and are not entering the area until mid-December, thus justifying a change in the start of the seasonal constraint to December 15.

The plan or plan amendment should also identify the documentation requirements for supporting a waiver, exception or modification and any public notification associated with granting them.

4. Geophysical Exploration. Generally, all areas open to fluid mineral leasing are open to geophysical exploration. The plan or plan amendment should identify any areas which are closed to leasing but open to geophysical exploration subject to certain conditions or restrictions, e.g., in wilderness study areas. The plan or plan amendment must also determine the conditions under which geophysical exploration is to be allowed with consideration given to different geophysical methods and practices to be followed. This can usually be handled by identifying those situations, if any, in which geophysical exploration will be treated differently than development activities, i.e., identify restrictions on geophysical methods or practices which apply in specific areas or under certain circumstances.

D. Management Objectives.

The planning team may also establish management objectives related to fluid minerals in the plan or plan amendment which are not required under the supplemental program guidance for fluid minerals but which may be needed to achieve multiple-use objectives for the planning area. For example, long term mitigation objectives may be established to reduce conflicts between fluid minerals and renewable resources by creating opportunities for renewable resources in areas outside high and moderate fluid mineral areas. In other words, teams may wish to identify and consider opportunities, particularly in high and medium fluid mineral potential areas, that exist for enhancing renewable resource values such that present day conflicts could be resolved and areas now subject to NSO could one day be leased with surface occupancy allowed or areas now subject to closure could be leased with less restrictive mitigating measures.

CHAPTER V – MASTER LEASING PLANS

A. Introduction.

The BLM introduced the Master Leasing Plan (MLP) as part of its 2010 Oil and Gas Leasing Reform effort. In some distinct geographic areas, additional planning and analysis may be necessary prior to new or additional oil and gas leasing and development because of changing circumstances, updated policies, and new information. The MLP process takes a more focused look at resource management plan (RMP) decisions pertaining to oil and gas leasing and post-leasing development of the area. The MLP establishes a guiding framework for the development of the area and provides a vision for how future development will proceed.

Through the MLP process, the BLM will reconsider RMP decisions pertaining to oil and gas leasing and will evaluate likely development scenarios and varying mitigation levels. The BLM will conduct the MLP process at a more focused level than the broader level of analysis normally conducted in an RMP, but at a less site-specific level than would typically be conducted for a master development plan where the operator has proposed a fully defined development plan. The geographic area covered by an MLP will ordinarily be a specifically identified portion of the applicable RMP planning area. In most cases, this focused planning and analysis will result in the incorporation into the RMP of new oil and gas leasing decisions as well as development decisions. These decisions would apply to future leasing and development in that geographic area.

The BLM will conduct the MLP process in accordance with the National Environmental Policy Act (NEPA) process, using an interdisciplinary team that will involve the public and stakeholders that may be affected by the BLM's MLP decisions. The BLM will ordinarily initiate an MLP as an RMP amendment. However, if the BLM anticipates that the likely outcome of the MLP will not result in the creation of new lease stipulations or changes to existing RMP decisions warranting a plan amendment, it may not be necessary to initiate the MLP as a plan amendment. The NEPA analysis for the MLP will likely provide a basis for tiering for future leasing or developmental analysis, potentially narrowing the scope of analysis needed for subsequent NEPA review.

An MLP will be prepared when the criteria listed below are met, or at the discretion of the BLM. Preparation of an MLP can occur through the RMP amendment process or as part of an RMP revision. Because MLP analysis is more focused than the broader level of analysis normally conducted in an RMP revision and because the scope of an MLP is narrower than an RMP revision, initiating an MLP through the RMP amendment process may provide the best opportunity for developing MLPs.

B. MLP Criteria.

The preparation of an MLP is required when all four of the following criteria are met:

1. A substantial portion of the Federal lands in the MLP area is not currently leased.

2. There is a majority Federal mineral interest in the MLP area.

3. The oil and gas industry has expressed a specific interest in leasing in the MLP area demonstrated through discussions, expressions of interest, or existing leases in the area, and there is a moderate or high potential for oil or gas confirmed by the discovery of oil or gas in the general area.

4. Additional analysis is needed to address likely resource impacts (including cumulative impacts) if oil and gas development were to occur where there is a potential for:

    - Multiple-use or natural/cultural resource conflicts; or
    - Impacts to air quality; or
    - Impacts on the resources or values of a unit of the National Park System, national wildlife refuge, or National Forest wilderness area, as determined after consultation or coordination with the National Park Service (NPS), Fish and Wildlife Service (FWS), or Forest Service; or
    - Impacts on other specially designated areas.

The BLM may also prepare an MLP under other circumstances at the discretion of the Field Manager, District Manager, or State Director.

C. Elements of an MLP.

The two main elements of master leasing planning for an area are the development of (1) resource condition objectives and (2) resource protection measures.

1. Resource Condition Objectives.

    The BLM will develop resource condition objectives to provide standards for subsequent development and reclamation of the MLP analysis area (see also: H-1601-1, *Land Use Planning Handbook*, page 12, Types of Land Use Plan Decisions, Desired Outcomes). The underlying RMP may already include resource condition objectives for all or a portion of the MLP analysis area. If so, an MLP may retain the resource condition objectives in the applicable RMP. Alternatively, the BLM may adopt new resource condition objectives for the MLP area based on new or updated information or policy standards and incorporate these new objectives into the RMP through amendment or revision.

    Examples of resource condition objectives could include:

    - Sagebrush communities will include native grass and forb cover in balance with open to moderate (5 to 25 percent) shrub canopy cover and within the ecological site potential. Perennial grass components will be at or above 10 percent cover. Native forb composition will be at or above 5 percent cover.

- Visibility-impairing pollutants levels will be managed to achieve the reasonable progress goals and timeframes established within the State of Wyoming's Regional Haze State Implementation Plan (SIP).
- Riparian areas will be managed for properly functioning condition (PFC); stream channel morphology and functions are appropriate for local soil type, climate, and landform.

The MLP should identify the resource protection measures, such as lease stipulations, that are necessary for achieving the resource condition objectives.

2. Resource Protection Measures.

The term "resource protection measures," as used in this section of the handbook, means any practice or action that would reduce environmental impacts and help achieve resource condition objectives. Resource protection measures may include management actions, such as phased leasing or unitization of an area; closing lands to leasing; lease stipulations restricting the timing, location, or method of operations; or conditions of approval that incorporate Best Management Practices (BMP) for reducing the environmental impact of operations. Refer to BMP definition in Onshore Oil and Gas Order Number 1 (72 FR 10329, March 7, 2007.)

Land use planning policy for the oil and gas program requires an RMP to identify where the BLM has opened or closed the planning area to leasing. For open areas, the RMP also must identify the constraints (stipulations) that will apply to future leases, such as timing limitations, controlled surface use, or no surface occupancy (H-1601-1, *Land Use Planning Handbook*, Appendix C, II, H, (pages 23–24)). These land use planning-level decisions guide future land management actions and site-specific implementation decisions. Through the MLP process, the BLM may reconsider existing RMP decisions including areas designated in the RMP as open or closed to leasing and existing lease stipulations (e.g., timing limitations, controlled surface use, and no surface occupancy) and their associated exception, waiver, and modification criteria. The BLM may also adopt new management actions in the RMP by identifying specific conditions of approval necessary for achieving the MLP's resource condition objectives.

The BLM should incorporate resource protection measures, such as unitization requirements or surface disturbance limits (caps) that apply broadly to the development of an entire field, into the RMP as lease stipulations. Similarly, resource protection measures that the BLM has traditionally characterized as BMPs (e.g., emissions controls, liquids gathering systems, extensive interim reclamation, etc.), and applied as conditions of approval at the time of permitting, may also be incorporated into the RMP through controlled surface use stipulations. Incorporating resource protection measures into the RMP as lease stipulations will ensure that the BLM will apply the resource protection measures to new leases and associated development, and enables bidders to better identify the resource protection costs associated with development of the lease parcels.

Field offices are encouraged to utilize adaptive management principles to address uncertainty regarding development and the effectiveness of stipulations in achieving resource condition objectives. (Refer to Adaptive Management: The U.S. Department of the Interior Technical Guide (2009), and any updates thereto, for additional guidance.) The BLM should design lease stipulations and Conditions of Approval to be adaptable to changing resource conditions and development technologies. (Refer to the Lease Stipulation section of this handbook.) The BLM should design the purpose and criteria for exception, waiver, and modification for each stipulation to recognize and accommodate changing environmental protection needs over time. For example, the BLM should write modification criteria to allow for both increasing and decreasing levels of environmental protection as a means for adapting to changing circumstances, such as improving or deteriorating resource conditions, wildlife population movements, or relevant new scientific information, that may warrant less or more protective measures to meet goals, objectives, and outcomes in RMPs.

In limited circumstances, establishing resource condition objectives may provide a sufficient basis for applying resource protection measures as Conditions of Approval without the need for a lease stipulation. For existing leases, these instances will generally be limited to where (1) the new requirements are consistent with rights granted to the holder under the lease; and (2) the resource condition objectives are quantitative, specific, and measureable. With respect to potential new leases, however, field offices are encouraged to include an Information Notice (43 CFR 3101.1-3), also referred to by the BLM as a Lease Notice, in the Notice of Competitive Lease Sale to advise potential lessees of important resource concerns and the possibility of additional constraints at the time of permitting.

MLPs must identify whether the resource protection measures identified in the MLP will also apply to areas currently under lease. The Federal Government retains certain rights when issuing an oil and gas lease. While the BLM may not unilaterally add a new stipulation to an existing lease that it has already issued, the BLM can subject development of existing leases to reasonable conditions, as necessary, through the application of Conditions of Approval at the time of permitting. The new constraints must be consistent with the applicable land use plan and not in conflict with rights granted to the holder under the lease. The Interior Board of Land Appeals has made clear that, when making a decision regarding discrete surface-disturbing oil and gas development activities following site-specific environmental review, the BLM has the authority to impose reasonable protective measures not otherwise provided for in lease stipulations, to minimize adverse impacts on other resource values. See 30 U.S.C. §226(g); 43 CFR 3101.1-2. *See Yates Petroleum Corp.*, 176 IBLA 144 (2008); *National Wildlife Federation*, 169 IBLA 146, 164 (2006).

Examples of Resource Protection Measures.

The following are examples of resource protection measures that the BLM may adopt to reduce environmental impacts and help achieve resource condition objectives within the MLP area.

- Planned or required unitization of Federal lands might be considered in areas where working with only one operator, rather than many, would increase the likelihood of eliminating redundant infrastructure and corridors, thereby reduce habitat fragmentation.

- Phased development may be appropriate where it is important to leave areas of habitat undisturbed by ongoing construction and drilling activity while other areas are developed. Developed areas would be required to undergo interim reclamation before drilling could move on to the next area.

- Limitations on surface disturbance (pending acceptable interim/final reclamation) may be placed on the percentage of bare ground allowed in a developed area at any one time in order to preserve habitat in important wildlife areas or reduce erosion in areas with highly erosive soils.

- Multiple wells per well pad may be required to limit the number of surface locations in scenic areas, fragile soil areas, or important wildlife habitat while still allowing the necessary number of downhole locations.

- Liquids gathering pipeline systems feeding centralized offsite production facilities may greatly reduce year-round fluids haul traffic during the life of the field in areas of important wildlife habitat.

- Newer technologies to reduce/capture emissions may be considered to ensure full field development does not contribute to eventual nonattainment of national ambient air quality standards under the Clean Air Act or adversely impact Air Quality Related Values, such as visibility.

- Practices to protect scenic quality by reducing the visual contrast of development may be considered, such as (1) siting roads to follow the contours of the landscape; (2) siting well locations where they are less visible and where cuts and fills can be minimized; (3) consolidating and using low profile equipment; (4) screening, disguising, or placing equipment offsite; (5) painting equipment to blend with the background; and (6) burying pipelines and powerlines in existing disturbed areas.

- Placement of all linear disturbances (e.g., powerlines, pipelines, roads) in common corridors and development of a comprehensive area wide planned transportation network across jurisdictions might eliminate unnecessary cross-country clearing and resulting fragmentation of habitat.

- Extensive interim reclamation of roadway disturbance up to or including the road surface and reclamation of pads to the well head/production facilities would minimize long-term surface disturbance in order to reduce vegetative loss, reduce opportunity for invasive species, stabilize soils, protect water and air quality, maintain visual resources, and improve and accelerate opportunities for successful final reclamation.

- Final reclamation fully restoring the original landform and re-establishing the native plant community would help to restore important ecosystems, wildlife habitat, hydrologic systems, and scenic resources.

- Phased leasing could aid in protecting important resource values (e.g., visual or sensitive species) in areas where the mineral development potential and the mode of development are presently unknown. Phased leasing could provide the opportunity to lease a limited and less sensitive portion of the area for development in order to determine the area's production potential. Leasing decisions in the RMP could adopt an adaptive management approach so that if oil and gas were successfully discovered and produced, there would then be the opportunity to analyze the impact of additional leasing. (Phased leasing differs from the rest of the examples in this list because it is an approach to decision-making regarding lease issuance, rather than a stipulation applied to a lease. Nevertheless, phased leasing is a management tool that may be considered as part of developing an MLP. However, prior to selecting this tool, the BLM should consider the potential effect on orderly mineral resource development, extraction, and drainage.)

D. Potential Development.

When sufficient information is available, the MLP should include a Reasonably Foreseeable Development (RFD) scenario that projects the anticipated oil and gas exploration and development activity in the MLP area. (Refer to the RFD chapter in this handbook.) This forecasting will provide a basis upon which the BLM may determine the need for additional resource protection measures. The RFD is based primarily on geology (potential for oil and gas resource occurrence), and past and present oil and gas activity (e.g., locations, characteristics, and trends). Other factors should also be considered, such as changing economics, evolving drilling and production technology development, existing or anticipated infrastructure, and transportation. If necessary information is not available, the best available data should be used and analytical assumptions regarding development should be clearly explained in the NEPA document for the MLP. The analysis of the RFD within the MLP should enable field offices to evaluate in-field considerations such as potential development scenarios, desired major transportation and utility corridors, and desired surface spacing.

E. Identifying and Evaluating Potential Resource Conflicts in an MLP.

The following non-exhaustive list of important national and local resource issues should be considered, as applicable, by the interdisciplinary team when developing an MLP:

1. Ambient air quality and potential impacts, including cumulative impacts, to Air Quality or Air Quality Related Values, such as visibility, from development.

2. The effect of oil and gas leasing on special designations such as units within the National Landscape Conservation System, Special Recreation Management Areas, and Areas of Critical Environmental Concern.

3. Inventoried lands with wilderness characteristics.

4. Nearby state, Tribal, or other Federal agency lands, including National Park Service (NPS) and Fish and Wildlife Service (FWS) lands, that could be adversely affected by BLM-authorized oil and gas development.

5. Important cultural resources, including traditional cultural properties of importance to Native American tribes and historic trails.

6. Scientifically significant paleontological resources.

7. Fisheries and wildlife habitat, migration corridors, and rare plants.

8. The status of visual resource inventories and appropriate designations of Visual Resource Management Classes.

9. Watershed conditions, steep slopes, and fragile soils.

10. Surface water and groundwater protection, including municipal watersheds and aquifers.

11. Public health and safety (e.g., management of fluids and emissions).

12. The ability to achieve interim and final reclamation standards (Gold Book, Chapter 6).

13. Other mineral potential and the effect of developing oil and gas on the other mineral resources.

F. Developing an MLP through the RMP Revision or Amendment Process.

The following guidance outlines the general principles for developing an MLP through the RMP revision or amendment process and preparing the supporting NEPA analysis. Given the individual circumstances specific to each planning area in an RMP revision or amendment, it may be necessary to modify the approach outlined below:

1. The MLP should be easily recognizable throughout the RMP document (e.g., discussing master leasing planning in the Executive Summary of the RMP).

2. Field offices should consider incorporating the purpose and need for developing an MLP as a separate and distinct element of the purpose and need statement for the overall RMP.

3. Development of the MLP should be included as part of the discussion of the scoping process and planning issues.

4. The application of the MLP criteria to the area should be described. If an area does not meet the criteria requiring an MLP and the BLM is choosing to exercise its discretion to complete an MLP, the rationale for preparing an MLP should be discussed.

5. The boundaries of any MLP area should be clearly delineated on a map.

6. The MLP information should fall within the Leasable Minerals section of the alternatives, affected environment, and environmental consequences chapters of the RMP's supporting NEPA analysis.

7. The planning document should include alternative ways of implementing the MLP. One way to accomplish this is to develop MLP-specific sub-alternatives within the MLP alternative or alternatives of the overall RMP. For example, if a Draft RMP included an MLP as part of Alternative B, a field office could develop alternatives B-1, B-2, and B-3 within Alternative B that vary the stipulations, Conditions of Approval, and other management actions in the MLP area.

8. In the affected environment chapter, discuss the relevant resource values and uses present in the MLP area that may result in conflicts with oil and gas development (whether actual or reasonably foreseeable).

9. Project the reasonably foreseeable development for the area, identify resource condition objectives, and adopt resource protection measures using the guidance in section C of this chapter.

10. The analysis should demonstrate the effectiveness of resource protection measures for helping to achieve resource objectives.

11. In the environmental consequences chapter, the analysis should include a discussion that is specific to the MLP area and its identified resource values. The MLP analysis will generally address oil and gas development in greater detail than is found in the remainder of the RMP, but in less detail than if a development plan had been submitted by an operator. An analytical discussion of the effects of resource protection measures and other management actions proposed in the MLP-specific sub-alternatives may reach a conclusion similar in scope to the following example: "The management actions (1, 2, 3, etc.) applied in [Name of MLP area] will result in less adverse impacts to the following

resource values (1, 2, 3, etc.), as evidenced by less overall surface disturbance, shorter periods of disturbed surface [etc.].”

12. Decisions in the Record of Decision or other decision document should specify what elements of the MLP alternatives are being selected for adoption in the RMP, if any.

13. Above all, the analytical approach should remain consistent with basic concepts of analysis under NEPA; analysis can only address what is reasonably foreseeable. The level of detail of the analysis should be tailored to support the level and specificity of the decisions being made.

Glossary

Condition of Approval (COA)	A site-specific and enforceable requirement included in an approved Application for Permit to Drill (APD) or Sundry Notice that may limit or amend the specific actions proposed by the operator. Conditions of Approval minimize, mitigate, or prevent impacts to public lands or other resources.
Information Notice (Also referred to as a Lease Notice)	An Information Notice provides notice of existing requirements and may be attached to a lease by the authorized officer at the time of lease issuance to convey certain operational, procedural, or administrative requirements relative to lease management within the terms and conditions of the standard lease form. Information notices may not serve as the basis for denial of lease operations.
Lease Stipulation	A stipulation is an enforceable term of the lease contract, supersedes any inconsistent provisions of the standard lease form, and is attached to and made a part of the lease. Lease stipulations further implement BLM regulatory authority to protect resources or resource values. Lease stipulations are designed to provide a level of protection for other resource values or land uses by restricting lease operations during certain times or in certain locations or to avoid unacceptable impacts, to an extent greater than the lease terms in the standard form approved by the Director.
Lease Stipulation Types	
• No Surface Occupancy (NSO)	Use or occupancy of the land surface for fluid mineral exploration or development is prohibited in order to protect identified resource values. The minerals under NSO lands may potentially be developed by directionally or horizontally drilling from nearby lands that do not have the NSO limitation.
• Timing Limitation (TL)	Prohibits surface use during a specified time period to protect identified resource values. (Seasonal Restriction)
• Controlled Surface Use (CSU)	Use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constraints that may modify lease rights.
Lease Stipulation and Permit Condition of Approval Exceptions, Waivers, and Modifications.	
• Exception	A one-time exemption for a particular site within the leasehold; exceptions are determined on a case-by-case basis; the stipulation continues to apply to all other sites within the leasehold. An exception is a limited type of waiver.
• Waiver	A permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.
• Modification	A change to the provisions of a lease stipulation, either temporarily or for the term of the lease. May maintain, increase, or decrease the level of environmental protection. Depending on the specific modification, the stipulation may or may not apply to all sites within the leasehold to which the restrictive criteria are applied.

Master Leasing Plan (MLP)	A plan that includes analysis of a distinct geographic area that takes a more closely-focused look at RMP decisions pertaining to leasing and post-leasing development of the area. The MLP also establishes a guiding framework for the development of the area and provides a vision for how future development will proceed.
Reasonably Foreseeable Development Scenario (RFD)	A technical report containing a long-term projection (scenario) of a particular use of the public lands, in this case oil and gas exploration, development, production, and reclamation activity.

Illustration I
(III.A)

Summary of BLM Planning Process

			1	2	3	4
Process Phase	PREPLANNING	NOTICE OF INTENT	IDENTIFY ISSUES	PLANNING CRITERIA	INVENTORY DATA COLLECT	MGMT SITUATION ANALYSIS
PURPOSE	"To establish a commitment to the project at all levels within BLM." "To scope out the key elements of project management."	"To get started." "To seek public involvement."	"To orient the process on problems/multiple-uses conflicts to be addressed in detail." "To focus attention on the critical tradeoffs." "To ask the questions that must be answered."	"To provide sideboards/constraints on issues to be addressed." "To guide development of the RMP." "To define the scope of the analysis."	"To provide essential facts for making analysis, evaluations, and decisions."	"To describe existing environmental elements and socio-economic conditions." "To describe current BLM management." "To determine ability of public lands to respond to the issues and concerns." "To identify management opportunities and limitations."
PRODUCTS	"A 'contact' or Preplanning analysis that includes project support requirements, public participation, plan schedules, team make-up, budget, and training needs."	"A Federal Register Notice." "Media announcements." "Letters to mailing list."	"A clear statement of a manageable number of significant issues for internal tracking, review, and inclusion in the RMP."	"A complete list for use by interdisciplinary team during process." "A summary for public review (usually with the issues in newsletter or other form) and inclusion in RMP."	"A collection of data in various forms from all sources: old planning documents, digital data, new inventory results, resource program data and other source material."	"This may be a shelf document or part of the RMP; usually 3 parts are included." "Resource Area Profile or the Affected Environment Chapter." "Existing Management Situation or 'No Action' alternative." "Capability Analysis as building blocks for other alternatives."

	5	6	7	8	9
Process Phase	ALTERNATIVE FORMULATION	ESTIMATION OF EFFECTS	SELECT ALTERNATIVE	SELECT THE RMP	MONITORING AND EVALUATION
PURPOSE	"To portray a mix of multiple uses and actions which could resolve the issues and address concerns." "To identify full range of options." "To provide different answers to the planning questions."	"To describe potential impacts and changes that would occur with each alternative." "To identify ways to avoid or mitigate the adverse impacts."	"To identify which alternative best resolves the issues." "To clearly explain the course of the action BLM proposes to take." "To provide the opportunity for public review and comment."	"To select the proposed RMP and approve it considering public review and comment." "To document the decision."	"To track implementation of action plan decisions." "To help keep the RMP current." "To determine if implementation is successful in meeting RMP objectives." "To assess whether the RMP continues to reflect the best resource management decisions."
PRODUCTS	"Descriptions of several comprehensive management alternatives, each of which could be a complete plan." "Together with the 'No Action' alternative (see phase 4), this makes up the alternatives Chapter of the RMP."	"The Environmental Consequences Chapter of the RMP."	"The description of the Preferred Alternative and the rationale for its selection." "The Draft RMP/Draft EIS."	"The Proposed RMP/Final EIS. Record of public comment, Governor's review, protests and responses." "The Approved RMP and Record of Decision."	"A monitoring plan that describes the standards, methods and intervals for monitoring and evaluating the RMP." "The documented results of monitoring including the data and analysis leading to any decision to modify the RMP through plan maintenance, amendment, or preparation of a new plan."

Outlines of Published Planning Documents Involving Fluid Mineral Resources COMBINED DRAFT RMP AND DRAFT EIS (BLM MS 1602.22 AND MS 1602.3)

Introductory Materials

- Include cover sheet identifying type of action and character;
  letter from SD or DM (optional)
- Provide a brief summary
- Include a table of contents.

Chapter 1. Purpose and need

- Identify purpose and need, i.e., to determine where and under what conditions leasing, exploration, and development of fluid mineral resources may occur in the resource area; cite authorities: FLPMA/NEPA.
- Provide location map (base map) and planning area description.
- Describe what will he covered in the RMP or plan amendment.
  - In the ease of a plan amendment, explain the reason for considering the amendment and its relationship to the existing plan.
  - Identify any related or associated plan elements not being changed
  - Explain application to split estate.
- Describe what planning or environmental documents will be superseded or replaced by the RMP or plan amendment.
- Briefly describe the planning process.
- Identify planning issues; indicate those involving fluid minerals.
- Identify planning efforts.

Chapter 2. Alternatives

- Identify the “no action” alternative as continuation of existing management.
- Fully describe alternatives considered and analyzed in detail including differences in fluid mineral resource allocations
  - Tables, maps and charts should be used to portray determinations; acreage data may be rounded to reflect relative accuracy of data.
  - Standard operating procedures for fluid minerals are generally included in the description of the no action alternative and cross-referenced for other alternatives
  - A “no leasing” alternative would only be analyzed to the extent it is reasonable.
- Identify the preferred alternative.
- Identify alternatives considered but not analyzed in detail; indicate why they were not analyzed in detail.
- Address management of existing leases, i.e., conditions of approval to be attached, what happens when leases expire
- Describe mitigation measures, i.e., stipulations, developed
- Describe conditions under which stipulation waivers, exceptions, or modifications will be granted
- Provide summary comparison of alternatives

Chapter 3. Affected Environment

- Describe the affected environment, including geologic features, mineral resources, and social and economic considerations
- Display mineral potential on maps
- Use maps as appropriate to display other relevant information on fluid minerals, e.g., field location, well location or density, pipelines, ancillary facilities, other resources
- Ensure that all elements of the affected environment are fully addressed, e.g., T&E species, water quantity and quality, etc.

Outlines of Published Planning Documents Involving Fluid Mineral Resources

Draft RMP/Draft EIS (cont.)

Chapter 4. Environmental Consequences
- Document the RFD scenarios for each alternative.
- Identify assumptions used for the analysis (pad size, acres disturbed, road net, etc.).
- Describe direct, indirect, and cumulative effects of each alternative analyzed in detail
  - * Effect of alternatives on fluid mineral development/availability, as well as the impacts of fluid minerals activities on affected resources, including off-site resources.
  - * Cumulative impacts must address impacts of all resource activities.
  - * In the case of a plan amendment, explain the relationship of this analysis to the environmental analysis prepared in association with the plan being amended
- Identify and describe mitigation measures and residual impacts remaining after mitigation measures have been applied.

Chapter 5. Consultation, Coordination, and Public Participation
- Describe scoping and public participation activities and results.
- Describe interagency consultation and coordination activities and results; including efforts to ensure consistency
- List agencies, organizations and persons to whom the Draft has been or is being sent.

List of Preparers
Bibliography
Index
Appendices
- Include any detailed descriptions or technical discussions of fluids exploration, development, abandonment, life cycle, etc. as necessary for readers to understand the discussion and analysis presented in the main body of the document.

COMBINED PROPOSED RMP/FINAL EIS (BLM MS 1602.22 AND MS 1602.3)

Do not use an abbreviated format for the proposed RMP and final EIS. The format and content of the proposed RMP/final EIS is essentially the same as the format and content of the draft. Additional items required in the final are noted below:

Introductory Material

Chapter 1. Purpose and Need
- Describe where you are in the process.
- Summarize/highlight any changes as a result of comments on the draft.

Outlines of Published Planning Documents
Involving Flue Mineral Resources

Chapter 2. Alternatives

- Identify/describe in detail the proposed RMP or plan amendment, including:
  - * Resource condition objectives, i.e., resource values that the BLM intends to protect, maintain, or enhance through implementation of the RMP or plan amendment. For fluid minera1s this means describe resource condition objectives which affect or are affected by fluid minerals activities and form the basis for fluid minerals determinations.
  - * Management areas, i.e., indicate on a map or maps where existing and reasonably foreseeable 1and uses wil1 be permitted, restricted, and/or excluded. For fluid minerals this means identifying and mapping the management areas s defined in the SPG.
  - * Management direction, i.e., any terms or conditions associated with permitted land or resource uses in the area. For fluid minerals this means identifying mitigation measures in the form of lease stipulations that apply in each management area and the circumstances for granting a waiver, exception or modification to any stipulations.
  - * Approved or proposed special designations.
  - * Subsequent administrative or case processing actions for resource uses.
  - * Activity plans needed, if any, and any monitoring or other special assessments or studies required for resource uses in the area.
  - * Intra-program priorities for major activities.
  - * Major capital improvements or acquisition needs.
- Describe how and why we selected the proposed RMP or plan amendment, i.e., the role of public comment, etc.
- Describe any new alternatives or features of existing alternatives which resulted from review comments, i.e., were not previously analyzed in detail

Chapter 3. Affected Environment

- Identify and incorporate changes, if any, in the description of the affected environment based on review comments.

Chapter 4. Environmental Consequences

- Identify and incorporate major changes in the impact analysis or mitigation measures based on comments, new information, etc.
- Describe direct, indirect and cumu1ative impacts of any new or reformulated alternatives which were not in the draft (Note: If new alternatives with significantly different impacts are identified as a result of comments on the draft, it may be necessary to issue a supplement to the draft for public review prior to selecting the proposed RMP.).

Proposed RMP/Final EIS (cont.)

Chapter 5. Consultation, Coordination, and Public Participation Consultation

- Describe the results of the review of the draft RMP/draft EIS.
- Include comment letters and responses to comments.
- List agencies, organizations, and persons to whom Proposed RMP/FEIS is being/has been sent

List of Preparers
Bibliography
Index
Appendices

- Technical appendices circulated with the draft do not necessarily have to he recirculated. Appendices to the proposed RMP/final EIS are those which help the reader understand why we selected our proposed RMP or amendment.

Outlines of Published Planning Documents
Involving Fluid Mineral Resources

RECORD OF DECISION (ROD)
(See 40 CFR 1505.2 and 516 DM 5.4)

Decision: State that the RMP or plan amendment is approved. Briefly describe decisions (reference where in the approved RMP or plan amendment the decisions are described). Identify changes, if any, in the proposed RMP or plan amendment as a result of protests.

Alternatives: Describe the alternatives that were analyzed and identify which one is environmentally preferable.

Management Considerations: Explain the management considerations that were weighed in selecting the approved RMP or plan amendment.

Mitigation: State whether all practicable means to avoid or minimize environmental harm were adopted. Briefly describe mitigation measures (reference where mitigation is discussed in approved RMP or amendment).

Monitoring: State that a plan monitoring program is adopted. Briefly describe the monitoring activities (reference where monitoring is discussed in the approved RMP or plan amendment).

Public Involvement: State that the views of the public were sought. Briefly describe public participation and how results were used.

Consistency: State that the RMP or plan amendment is (or is not) consistent with the plans, programs, and policies of other Federal agencies and of State and local governments. Explain any inconsistencies.

Public Availability: Describe where copies of the approved RMP or plan amendment may be obtained.

State Director signs and dates the ROD

Outlines of Published Planning Documents

Illustration 2, Page 5

Involving Fluid Mineral Resources

APPROVED RESOURCE MANAGEMENT PLAN

Chapter 1. Introduction

- Explain why the RMP was prepared.
- Identify the planning, including an area location map.
- Describe the relationship between the RMP or plan amendment and other BLM planning levels and studies.

Chapter 2. Resource Management Plan

- Describe resource condition objectives, i.e., the resource values that the BLM intends to protect, maintain, or enhance through implementation of the RMP or plan amendment. For fluid minerals this means describe any resource condition objectives which affect or are affected by fluid minerals activities and form the basis for fluid minerals management determinations.
- Identify management areas, i.e., indicate on a map or maps where existing and reasonably foreseeable land uses will be permitted, restricted, and/or excluded. For fluid minerals this means identifying and mapping the management areas as defined in the SPG.
- Identify management direction, i.e., any terms or conditions associated with permitted land or resource uses in the area. For fluid minerals this means identifying mitigation measures in the form of lease stipulations that apply in each management area, circumstances for granting a waiver, exception or modification to any stipulations, and rehabilitation objectives or requirements.
- Identify any approved or proposed special designations.
- Explain subsequent administrative or case processing actions for resource uses in the area.
- Identify activity plans needed, if any, and any monitoring or other special assessments or studies required for resource uses in the area.
- Identify intra-program priorities for major activities in the area.
- Describe major capital improvements or acquisition needs.

Chapter 3. Implementation and Monitoring

- Describe the procedures that will be followed in implementing and tracking management actions approved in the RMP or plan amendment.
- Describe the procedures that will be followed to assure that non-Bureau initiated activities, e.g., fluid mineral leasing and development, are in conformance with the RMP or plan amendment.
- Describe the procedures that will be followed to evaluate progress toward meeting the resource or program objectives identified in the RMP or plan amendment and to determine the effectiveness of measures to protect resources and resources values.
- Describe the procedures that will be followed to determine whether the decisions approved in the RMP or plan amendment continue to meet management needs, i.e., procedures for evaluating the plan and determining whether it warrants revision and amendment.
- Describe the procedures that will be followed to maintain the plan.

Examples of How Constraints Can Be Summarized for Alternatives

ALTERNATIVES – PREFERRED ALTERNATIVE

Mineral Management

Oil and Gas. Oil, gas, and tar sands would be leased with the Wyoming BLM Standard Stipulations for Surface Disturbing Activities, or future modifications of those stipulations. Additional stipulations may be applied at the time of leasing to mitigate impacts not covered by the Wyoming BLM standard stipulations (Map 8 and Appendix A).

- Approximately 11.200 acres in the Spanish Point Karst ACEC (about 1 percent of the federal mineral estate) would not be leased (Table 6).
- Approximately 86,100 acres (6 percent of the federal mineral estate) would be leased with a permanent "no surface occupancy" stipulation (standard stipulation number 4) to protect important wildlife habitat, and cultural and recreation sites.
- Approximately 985,600 acres (61 percent of the federal mineral estate) would be leased with a seasonal "no surface occupancy" stipulation (standard stipulations number 2a or 2b) to protect important wildlife habitat.

TABLE 6

MINERALS MANAGEMENT – ACRES OF OIL AND GAS LEASE RESTRICTIONS BY HYDROCARBON POTENTIAL

PREFERRED ALTERNATIVE

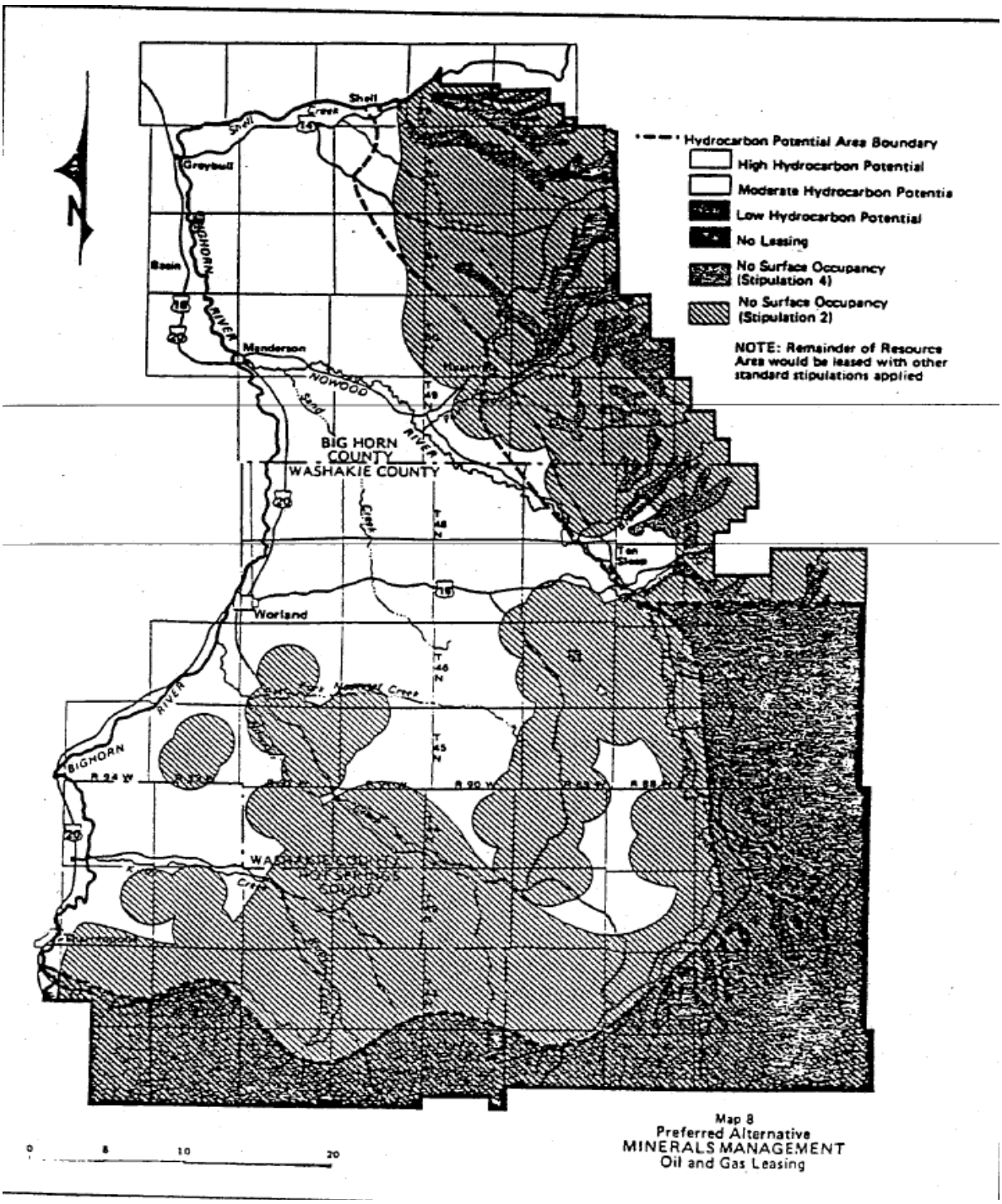
Category	Lease Stipulations	Hydrocarbon Potential[1] Mineral Estate Acres (Estimated)		
		High	Moderate	Low
Lease Restrictions (General)				
No Lease[2]		0	11,200	0
Permanent No Surface Occupancy[2]		400	35,700	50,000
Seasonal No Surface Occupancy		524,600	184,000	277,000
Lease Under Other Stips		437,000	57,100	26,000
		(Note: Numbers rounded)		
Specific Areas with No Surface Occupancy Lease Restrictions				
Permanent:				
West Slope Canyons	4[3]		35,600	47,900
Middle Fork Powder River	4			900
T&E Species Nesting Area	4	250		
Castle Gardens Campground	4	110		
Bates Battlefield	4			1,040
Medicine Lodge Archaeological Site	4		100	
Seasonal				
Sage Grouse Leks	2c	9,450	2,770	1,890
Elk Calving Areas	2c		5,400	12,200
Sage Grouse Habitat	2b	337,000	92,900	62,100
Crucial Elk Winter Range	2a	4,800	78,800	41,200
Elk Winter Range	2a	173,300	4,000	159,500

[1] Refer to "Evaluation Criteria for Hydrocarbon Potential" in Chapter 1 for a description of the methodology used to determine hydrocarbon potential.

[2] "No Lease" or "no surface occupancy" stipulations would be phased in over the life of the plan by application of those restrictions as they are considered for renewal or first-time issue. These stipulations would not be applied retroactively to existing leases.

[3] Refer to Appendix A. "Wyoming BLM Standard Stipulations for Surface Disturbing Activities" for a description of lease stipulations.

Examples of How Constraints Can Be Summarized
for Alternatives



Examples of How Constraints Can Be Summarized
for Alternatives

ALTERNATIVES – PREFERRED ALTERNATIVE

– Approximately 520,000 acres (33 percent of the federal mineral estate) would be leased with other standard surface protection stipulations applied.

Geophysical Exploration. All proposals for geophysical exploration would be evaluated on a case-by-case basis. Suitable surface protection measures as described in the Wyoming BLM Standard Stipulations for Surface Disturbance Activities (or future modifications), and access restrictions (ORV designations) would be applied. Generally, geophysical exploration would not be allowed on BLM-administered surface in oil and gas "no lease" areas. About 6,750 acres (less than 1 percent of the federal surface) would be closed to geophysical exploration, including about 250 acres of threatened and endangered species habitat and about 6,500 acres of BLM-administered surface in the Spanish Point Karst ACEC. Geophysical exploration on the remaining 1,227,250 acres (99 percent of the federal surface) would be affected by vehicle use limitations of various kinds. Including permanent or seasonal "no surface occupancy" (Table 7).

TABLE 7

MINERALS MANAGEMENT – ACRES
OPEN TO GEOPHYSICAL EXPLORATION
(Estimated Surface Acres)

PREFERRED ALTERNATIVE

	Hydrocarbon Potential		
Category Descriptions	**High**	**Moderate**	**Low**
Closed[1]			
Spanish Point Karst ACEC		6,500	0
T&E Species Habitat	250		
Total Closed	250	6,500	0
Limited[2]			
ORV Play Area	130		
Permitted/Licensed Use			
West Slope Canyons		40,300	47,900
Existing Roads & Trails			
Castle Gardens	110		
Wetlands	3,000		
Time or Season of Use			
Medicine Lodge		12,000	
Designated Roads & Trails			
Middle Fork			900
Upper Nowood			32,000
Laddie Creek		4,700	
Designated Roads & Trails and/or Season of Use Crucial Wildlife Habitat or Fragile Soils	404,000	114,000	171,2000
Total Limited	407,240	170,700	252,000
Total Open	333,000	44,500	20,000

NOTE All geophysical exploration would be subject to ORV use designations (see table 8)

[1] "Closed" applies to areas that are not open for leasing of oil and gas

[2] "Limited" applies to areas open for leasing of oil and gas but subject to Wyoming BLM Standard Stipulations for Surface Disturbing Activities including permanent or seasonal "no surface occupancy"

Examples of How Constraints Can Be Summarized
for Alternatives

ALTERNATIVES – A

Alternative A

Alternative A is the continuation of current management where the existing management and uses of public lands and resources would continue at their present levels.

Minerals Management

Oil and Gas. Oil, gas, and tar sands would be leased with the Wyoming BLM Standard Stipulations for Surface Disturbing Activities, or future modifications of those stipulations. Additional stipulations may be applied at the time of leasing to mitigate impacts not covered by the Wyoming BLM standard stipulations (Map 14 and Appendix A).

- Approximately 97.400 acres (6 percent of the federal mineral estate) would continue to be leased but with permanent "no surface occupancy" stipulations (standard stipulation number 4) to protect important wildlife habitat, and cultural and recreation sites (Table 9).
- Approximately 985,600 acres (61 percent of the federal mineral estate) would continue to be leased but with seasonal "no surface occupancy" stipulations (standard stipulation .

TABLE 9

MINERALS MANAGEMENT – ACRES OF OIL AND GAS LEASE RESTRICTIONS BY HYDROCARBON POTENTIAL

ALTERNATIVE A and B

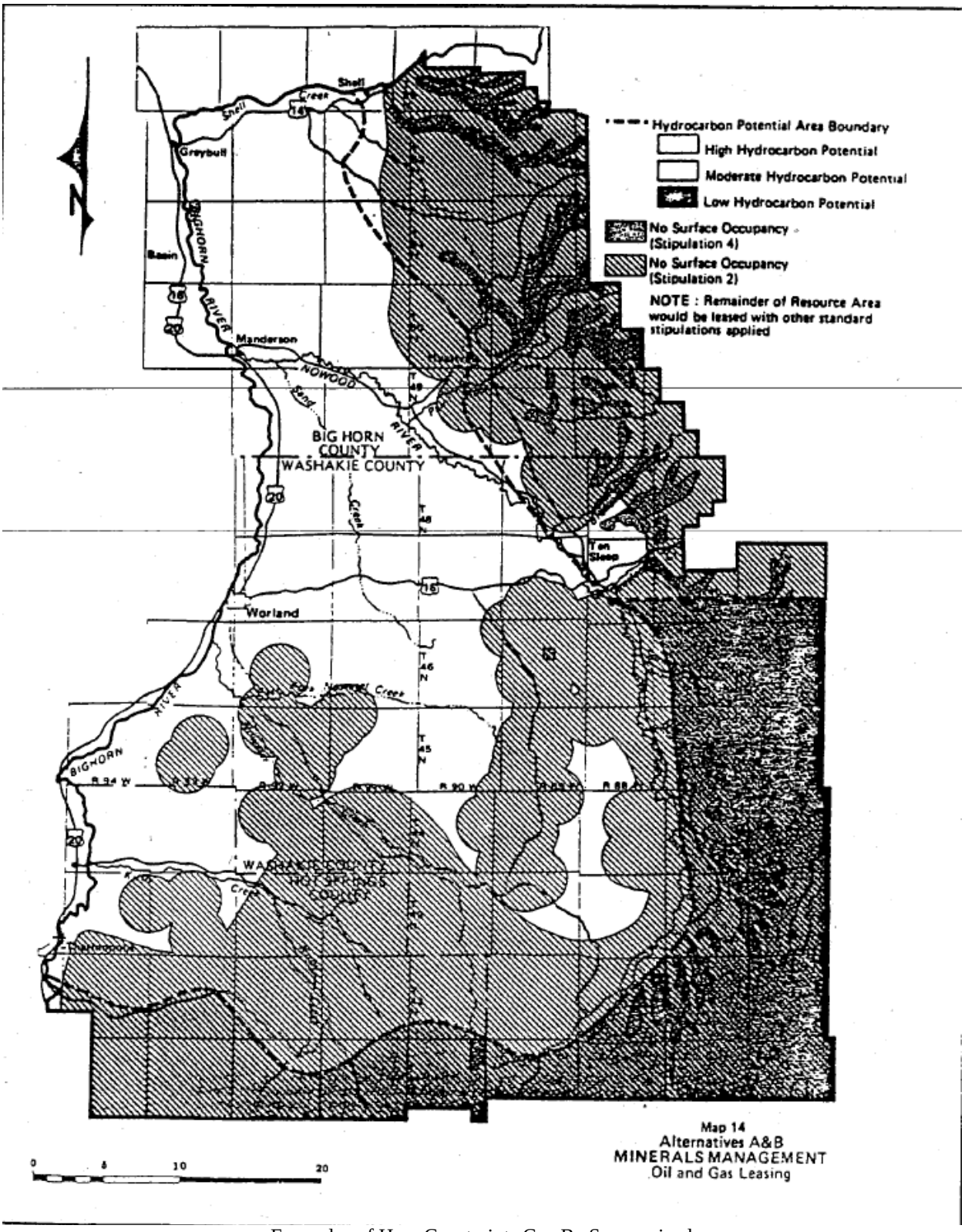
Category	Lease Stipulations	Hydrocarbon Potential[1] Mineral Estate Acres (Estimated)		
		High	Moderate	Low
Lease Restrictions (General)				
No Lease[2]		0		0
Permanent No Surface Occupancy[2]		400	47,000	50,000
Seasonal No Surface Occupancy		524,600	184,000	277,000
Lease Under Other Stips		437,000	57,100	26,000
		(Note: Numbers rounded)		
Specific Areas with No Surface Occupancy Lease Restrictions				
Permanent				
West Slope Canyons	4[3]		46,800	47,900
Middle Fork Powder River	4			900
T&E Species Nesting Area	4	250		
Castle Gardens Campground	4	110		
Bates Battlefield	4			1,040
Medicine Lodge Archaeological Site	4		100	
Seasonal				
Sage Grouse Leks	2c	9,450	2,770	1,890
Elk Calving Areas	2c		5,400	12,200
Sage Grouse Habitat	2b	337,000	92,900	62,100
Crucial Elk Winter Range	2a	4,800	78,800	41,200
Elk Winter Range	2a	173,300	4,000	159,500

[1] Refer to "Evaluation Criteria for Hydrocarbon Potential" in Chapter 1 for a description of the methodology used to determine hydrocarbon potential.

[2] "No Lease" or "no surface occupancy" stipulations would be phased in over the life of the plan by application of those restrictions as they are considered for renewal or first-time issue. These stipulations would not be applied retroactively to existing leases.

[3] Refer to Appendix A. "Wyoming BLM Standard Stipulations for Surface Disturbing Activities" for a description of lease stipulations

Examples of How Constraints Can Be Summarized
for Alternatives



Examples of How Constraints Can Be Summarized

for Alternatives

ALTERNATIVES – A

numbers 2a, 2b, or 2c) to protect important wildlife habitat.

– Approximately 520.000 acres (33 percent of the federal mineral estate) would remain open to leasing with other standard surface protection stipulations applied.

Geophysical Exploration. All proposals for geophysical exploration would be evaluated on a case-by-case basis. Suitable surface protection measures as described in the Wyoming BLM Standard Stipulations (or future modifications) and access restrictions (ORV designations) would be applied. About 835,000 acres (68 percent of the federal surface) would continue to be affected by various vehicle use limitations and applicable Wyoming BLM standard stipulations, including "no surface occupancy" (Table 10). Geophysical exploration on the remaining 399,000 acres (32 percent of the federal surface) would continue to be regulated by applicable surface disturbance stipulations, but would not include "no surface occupancy" or vehicle use limitations under ORV designations.

Tar sand. Included in the above acreage under other surface protection stipulations are about 55,000 acres in the Spanish Point Karst Area which were leased for oil and gas prior to enactment of the Combined Hydrocarbon Leasing Act (CHLA) of 1981. Deposits of tar sands are projected to exist in those leased areas. Because of constraints associated with those leases, tar sands cannot presently be developed. When those leases expire between now and 1991, and the area is re-leased, tar sands may be developed under the rights granted by new leases.

TABLE 10

MINERALS MANAGEMENT – ACRES OPEN TO GEOPHYSICAL EXPLORATION (Estimated Surface Acres)

ALTERNATIVE A

Category Descriptions	Hydrocarbon Potential		
	High	**Moderate**	**Low**
Closed[1]	0	0	0
Limited[2]			
Permanent No Surface Occupancy	500	35,500	38,000
Seasonal No Surface Occupancy	407,000	142,000	212,000
(See Table 9 for further breakdown)			
Total Limited	407,500	177,500	250,000
Total Open	333,000	44,500	20,000

NOTE All geophysical exploration would be subject to ORV use designations (see table 8)

[1] "Closed" applies to areas that are not open for leasing of oil and gas

[2] "Limited" applies to areas open for leasing of oil and gas but subject to Wyoming BLM Standard Stipulations for Surface Disturbing Activities including permanent or seasonal "no surface occupancy"

Examples of How Constraints Can Be Summarized
for Alternatives

ALTERNATIVES – C

Minerals Management

Because of management actions prescribed in the Watershed Management section, the amounts of federal mineral estate that would be leased with various surface use restrictions under the Preferred Alternative differ from the amounts that would be leased under this alternative (C). The management prescription for oil and gas leasing in Alternative C is as follows:

Oil and Gas. Oil, gas, and tar sand would be leased with the Wyoming BLM Standard Stipulations for Surface Disturbing Activities, or future modifications of those stipulations (Map 16-1 and Appendix A).

– Approximately 253,000 acres (16 percent of the federal mineral estate) would be leased with a permanent "no surface occupancy" stipulation (standard stipulation number 4) to protect important wildlife habitat, the Spanish Point Karst ACEC, and cultural and recreation sites (Table 13).

TABLE 13

MINERALS MANAGEMENT – ACRES OF OIL AND GAS LEASE RESTRICTIONS BY HYDROCARBON POTENTIAL

ALTERNATIVE C

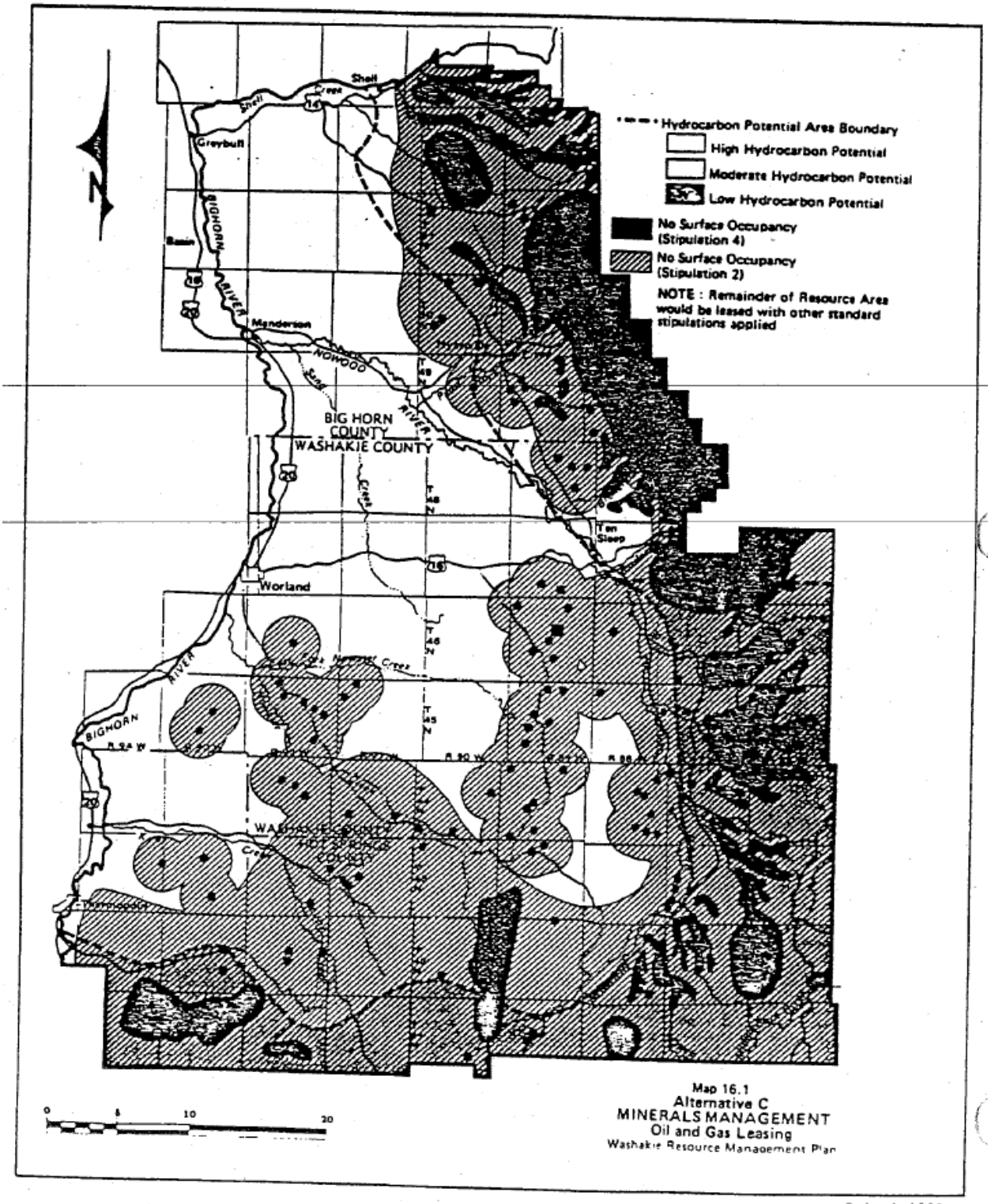
Category	Lease Stipulations	Hydrocarbon Potential[1] Mineral Estate Acres (Estimated)		
		High	Moderate	Low
Lease Restrictions (General)				
No Lease[2]		0	0	0
Permanent No Surface Occupancy[2]		14,000	134,000	105,000
Seasonal No Surface Occupancy		511,000	97,000	222,000
Lease Under Other Stips		437,000	57,000	26,000
		(Note: Numbers rounded)		
Specific Areas with No Surface Occupancy Lease Restrictions				
Permanent				
Spanish Point Karst ACEC	4[3]		11,200	
West Slope Canyons	4		35,600	47,900
Middle Fork Powder River	4		900	
T&E Species Nesting Area	4	250		
Castle Gardens Campground	4	110		
Bates Battlefield	4		1,040	
Medicine Lodge Archaeological Site	4		100	
Sage Grouse Leks	4	9,200	2,300	1,600
Elk Calving Areas	4		6,400	12,200
Crucial Elk Winter Range	4	4,800	78,00	41,200
Seasonal				
Sage Grouse Habitat	2b	337,000	92,900	62,100
Elk Winter Range	2a	173,300	4,000	159,500

[1] Refer to "Evaluation Criteria for Hydrocarbon Potential" in Chapter 1 for a description of the methodology used to determine hydrocarbon potential.

[2] "No lease" or "no surface occupancy" stipulations would be phased in over the life of the plan by application of those restrictions as they are considered for renewal or first-time issue. These stipulations would not be applied retroactively to existing leases.

[3] Refer to Appendix A. "Wyoming BLM Standard Stipulations for Surface Disturbing Activities" for a description of lease stipulations

Examples of How Constraints Can Be Summarized
for Alternatives



Examples of How Constraints Can Be Summarized
for Alternatives

ALTERNATIVES – C

- Approximately 830,000 acres (52 percent of the seasonal "no surface occupancy" stipulation (standard stipulations number 2a or 2b) to protect important wildlife habitat.
- Approximately 520,000 acres (32 percent of the federal mineral estate) would be leased with other standard surface protection stipulations applied.

Geophysical Exploration. All proposals for geophysical exploration would be evaluated on a case-by-case basis. Suitable surface protection measures as described in the Wyoming BLM Standard Stipulations for Surface Disturbing Activities (or future modifications), and access restrictions (ORV designations) would be applied. Generally, geophysical exploration would not be allowed on BLM-administered surface in oil and gas "no lease" areas. About 6,750 acres (less than , percent of the federal surface) would be closed to geophysical exploration, including about 250 acres of threatened and endangered species habitat and about 6,500 acres of BLM-administered surface in the Spanish Point Karst ACEC. Geophysical exploration on the remaining 1,227,400 acres (99 percent of the federal surface) would be affected by vehicle use limitations of various kinds (Table 14). The management prescriptions for the other leasable minerals in Alternative C are the same as those described in the Preferred Alternative.

TABLE 14

MINERALS MANAGEMENT – ACRES
OPEN TO GEOPHYSICAL EXPLORATIONALTERNATIVE C

Category Descriptions	Hydrocarbon Potential High	Moderate	Low
Closed[1]			
Spanish Point Karst ACEC		6,500	0
T&E Species Habitat	250		
Total Closed	250		
Limited[2]			
ORV Play Area	130		
Permitted/Licensed Use			
West Slope Canyons		35,600	47,900
Existing Roads & Trails			
Castle Gardens	110		
Wetlands	3,000		
Crucial Winter Habitat			
Fragile Soils	581,100	52,400	
Designated Roads and Trails and/or Time and Season of Use			
Medicine Lodge H U		4,300	
Upper Nowood	32,300		
Laddie Creek		4,700	
Middle Fork			900
Crucial Wildlife Habitat			
Fragile Soils	123,200	117,600	222,100
Wetlands		900	1,100
Total Limited	739,740	215,500	272,000
Total Open	0	0	0

NOTE All geophysical exploration would be subject to ORV use designations (see table 8)

[1] "Closed" applies to areas that are not open for leasing of oil and gas

[2] "Limited" applies to areas open for leasing of oil and gas but subject to Wyoming BLM Standard Stipulations for Surface Disturbing Activities including permanent or seasonal "no surface occupancy"

Examples of How Constraints Can Be Summarized
for Alternatives

ALTERNATIVES – ALTERNATIVE D

Alternative D

Alternative D emphasizes the protection and enhancement of environmental quality. It limits uses and development of resources that do not protect or enhance the quality of the natural environment.

Minerals Management

Oil and Gas. Oil, gas, and tar sand would be leased with the Wyoming BLM Standard Stipulations for Surface Disturbing Activities, or future modifications of those stipulations (Map 17 and Appendix A). Additional stipulations may be applied at the time of leasing to mitigate impacts not covered by the Wyoming BLM standard stipulations.

- Approximately 11,200 acres (about 1 percent of the federal subsurface) in the Spanish Point Karst ACEC would not be leased (Table 15).
- Approximately 784,000 acres (49 percent of the federal subsurface) would be leased with permanent “no surface occupancy" stipulations (standard stipulation number 4) to protect important wildlife habitat, and cultural and recreation sites.
- Approximately 808,000 acres (50 percent of the federal subsurface) would be leased with other standard surface protection stipulations applied.

Geophysical Exploration: Alt proposals for geophysical exploration would be evaluated on

TABLE 15

MINERALS MANAGEMENT – ACRES OF OIL AND GAS LEASE RESTRICTIONS BY HYDROCARBON POTENTIAL

ALTERNATIVE D

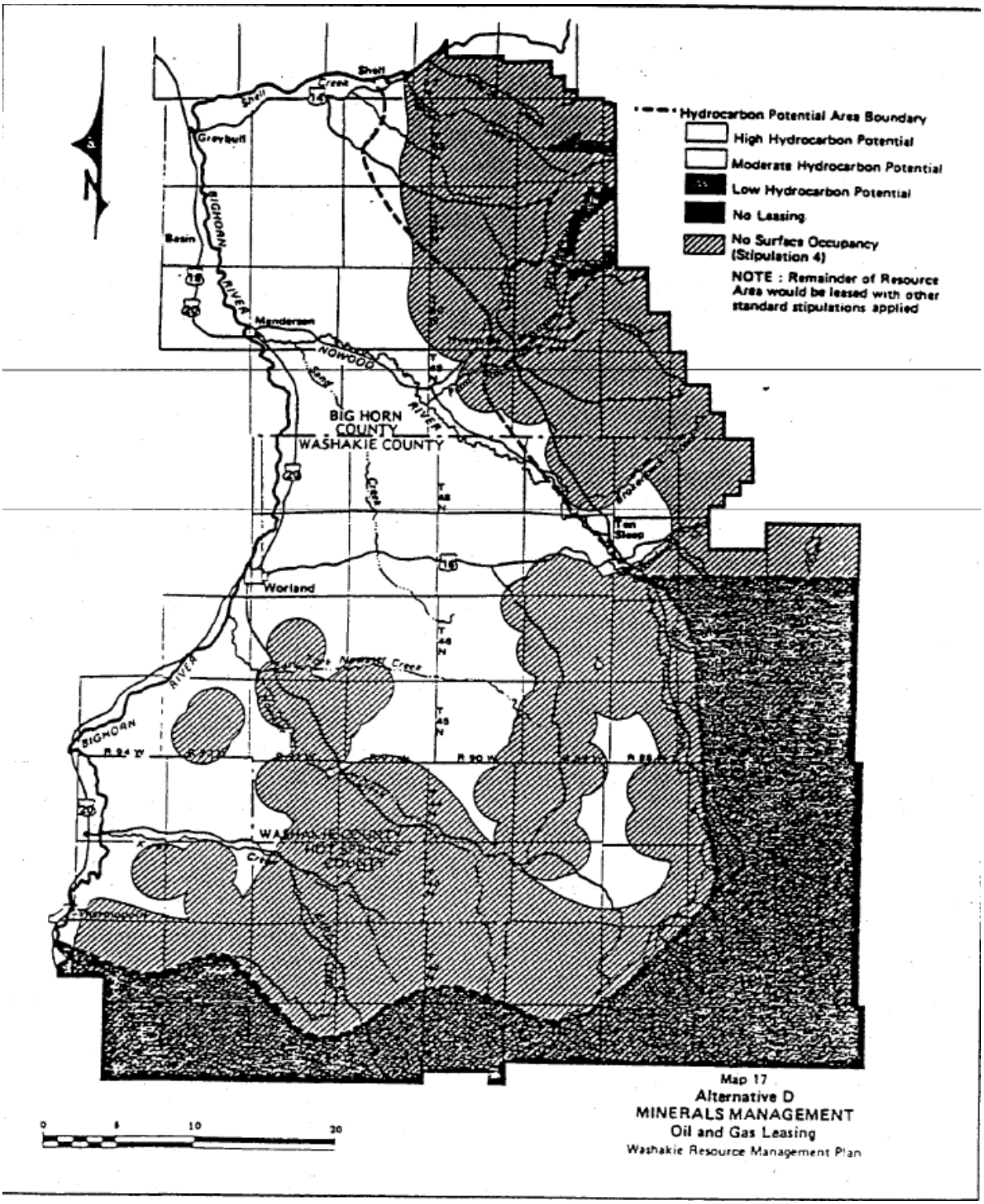
Category	Lease Stipulations	Hydrocarbon Potential[1] Mineral Estate Acres (Estimated)		
		High	Moderate	Low
Lease Restrictions (General)				
No Lease[2]		0	11,200	0
Permanent No Surface Occupancy[2]		371,600	146,500	266,000
Seasonal No Surface Occupancy		0	0	0
Lease Under Other Stips		590,400	130,300	87,000
		(Note: Numbers rounded)		
Specific Areas with No Surface Occupancy Lease Restrictions				
Permanent				
West Slope Canyons	4[3]		35,600	47,900
Middle Fork Powder River	4			900
T&E Species Nesting Area	4	250		
Castle Gardens Campground	4	110		
Bates Battlefield	4			1,040
Medicine Lodge Archaeological Site	4		100	
Sage Grouse Leks	4	9,200	2,300	1,600
Elk Calving Areas	4		5,400	12,200
Crucial Elk Winter Range	4	4,800	78,00	41,200
Sage Grouse Habitat	4	183,900	20,300	1,600
Elk Winter Range	4	173,400	4,000	159,500

[1] Refer to “Evaluation Criteria for Hydrocarbon Potential” in Chapter 1 for a description of the methodology used to determine hydrocarbon potential.
[2] “No Lease” or “no surface occupancy” stipulations would be phased in over the life of the plan by application of those restrictions as they are considered for renewal or first-time issue. These stipulations would not be applied retroactively to existing leases.

[3] Refer to Appendix A. "Wyoming BLM Standard Stipulations for Surface Disturbing Activities" for a description of lease stipulations

Examples of How Constraints Can Be Summarized
for Alternatives

ALTERNATIVES – C


Hydrocarbon Potential Area Boundary
High Hydrocarbon Potential
Moderate Hydrocarbon Potential
Low Hydrocarbon Potential
No Leasing
No Surface Occupancy (Stipulation 4)
NOTE : Remainder of Resource Area would be leased with other standard stipulations applied
N
Shell
Shell Creek
Greybull
BIGHORN RIVER
Basin
Manderson
NOWOOD
BIG HORN COUNTY
WASHAKIE COUNTY
Worland
Ten Sleep
BIGHORN RIVER
WASHAKIE COUNTY
HOT SPRINGS COUNTY
0
5
10
20
Map 17
Alternative D
MINERALS MANAGEMENT
Oil and Gas Leasing
Washakie Resource Management Plan

H-1624-1 - PLANNING FOR FLUID MINERAL RESOURCES

Example of How Constraints Can Be Summarized

for Alternatives

ALTERNATIVES - ALTERNATIVE D

TABLE 16

MINERALS MANAGEMENT - ACRES OPEN TO GEOPHYSICAL EXPLORATION

ALTERNATIVE D

Category Descriptions	Hydrocarbon Potential		
	High	Moderate	Low
Closed[1]			
Spanish Point Karst ACEC		6,500	
T&E Species Habitat	250		
Semi-Primitive Nonmotorized	50,000	44,600	18,400
Total Closed	**50,250**	**51,100**	**18,400**
Limited[2]			
ORV Play Area	130		
Permitted/Licensed Use			
West Slope Canyons		35,600	47,900
Existing Roads and Trails			
Castle Gardens	110		
Wetlands	3,000		
Crucial Wildlife Habitat;			
Fragile Soils	531,330	56,000	
Designated Roads and Trails and or Time and Season of Use			
Medicine Lodge H. U.		4,300	
Upper Nowood	32,300		
Laddie Creek		4,700	
Middle Fork			7,000
Crucial Wildlife Habitat:			
Fragile Soils	123,200	69,500	197,100
Wetlands		900	1,100
Total Limited	**690,070**	**171,000**	**253,100**
Total Open	**0**	**0**	**0**

NOTE All geophysical exploration would be subject to ORV use designations (see table 17).

[1] "Closed" applies to areas that are not open for leasing of oil and gas.

[2] "Limited" applies to areas open for leasing of oil and gas but subject to Wyoming BLM Standard Stipulations for Surface Disturbing Activities including permanent or seasonal "no surface occupancy."

a case-by-case basis. Suitable surface protection measures as described in the Wyoming BLM Standard Stipulations for Surface Disturbing Activities (or future modifications), and access restrictions (ORV designations) would be applied. Generally, geophysical exploration would not be allowed on BLM-administered surface in oil and gas "no lease" areas. About 120,000 acres (10 percent of the federal surface) would be closed to geophysical exploration, including about 6,500 acres of BLM-administered surface in the Spanish Point Karst ACEC. Geophysical exploration on the remaining 1,114,000 acres (90 percent of the federal surface) would be regulated by vehicle use limitations of various kinds (Table 16).

Tar Sand. Included in the above acreage under other surface protection stipulations or under "no surface occupancy" stipulations are about 55,000 acres in the Spanish Point Karst area which were leased for oil and gas prior to enactment of the Combined Hydrocarbon Leasing Act (CHLA) of 1981. Deposits of tar sands are projected to exist in those areas. Because of constraints associated with those leases, tar sands cannot presently be developed. When those leases expire between now and 1991, the areas would undergo consideration for re-leasing. There are no pre-CHLA leases that would directly affect the Spanish Point Karst ACEC. Therefore, about 55,000 acres could be re-leased, subject to the management prescriptions contained in this alternative.

Approximately 1,400 acres in post-CHLA leases affecting the ACEC would be leased with a "no surface occupancy" stipulation if, in fact, those leases expired and were consicered for re-lease.

Example of RMP Documentation of the Affected Environment

Excerpts from Geology and Mineral Resources and Socioeconomic Sections

AFFECTED ENVIRONMENT

GEOLOGY AND MINERAL RESOURCES

The planning area lies mainly within the northern part of the Green River Basin, a large structural and topographic depression drained by the southward flowing Green River and its tributaries. The Basin is bounded to the northeast by the Wind River uplift, a large foreland structure comprised of Precambrian igneous and metamorphic rocks which have been thrust to the southwest over Basin sediments. To the west is the Wyoming portion of the Overthrust Belt, comprised of several thrust sheets which moved to the east over the Basin sediments. Within these thrust sheets many structures developed which are highly prospective as hydrocarbon reservoirs.

The tectonic disturbances which created the major features described above were associated mainly with the Laramide orogeny. These disturbances occurred from late Mesozoic through early Tertiary time and also resulted in several important subsurface structural features. These include the Moxa Arch, a north-south trending structural arch lying just east of the overthrust belt leading edge, and the Pinedale anticline, a doubly plunging fold which parallels the Wind River uplift. Both the Moxa Arch and the Pinedale anticline contain large hydrocarbon reserves. Figure 6 illustrates basic hydrocarbon traps.

In early Tertiary time the subsiding Green River Basin was gradually lifted with fluvial and lacustrine sediments. Detrital materials were eroded from the surrounding mountains (Wind Rivers and Overthrust area) and deposited in the basin by numerous streams. Beginning in the Eocene, increasing volcanic activity in the Yellowstone-Absaroka area provided an additional source of sediments to the basin. By Oligocene time the Green River Basin was essentially full of sediment. The late Tertiary marked a period of large-scale regional uplift and erosion which exhumed the surrounding mountains and removed much sediment from the basin. During the Pleistocene, alpine glaciation reshaped the surrounding mountains and resulted in numerous gravel deposits being shed into the basin in the form of glacial moraines and outwash.

A stratigraphic column is included which depicts the rock sequence found in the northern Green River Basin. It includes the names and ages of the rocks that have been deposited here since Precambrian time (Figure 7) and represents a sedimentary column nearly 30,000 feet thick.

Mineral Resources

Oil and gas exploration and development (Appendix C-3) has been occurring in the area since the 1920s (Maps 20 and 2). Interest increased in the 1970s and early 1980s with over 2,000 miles of seismic lines run between 1979 and 1985 (Table 26).

TABLE 26

MILES OF SEISMIC LINES WITHIN PINEDALE RESOURCE AREA BY YEAR (1979-1985) (Includes private and state lands)

Year	Miles
1979	263
1980	335
1981	875
1982	227
1983	48
1984	175
1985	179
Total Miles	**2,102**
Average Miles per Year	**300**

The Green River Basin is one of the largest basins in the Rocky Mountain region and may rank first in ultimate gas producing potential. A large share of the gas production occurs in the planning area on the Moxa Arch. This area is the leading gas-producing region in Wyoming and is also a major producer of oil (Geo/Resource 1984). Producing formations include the Wasatch, Fort Union, Adaville, Bear River and the Nugget Stone.

The Pinedale anticline contains a large gas accumulation within the Fort Union Formation, but because the rock has such low permeability commercial production is currently marginal.

The potential Gas Committee, in their 1984 report "Potential Supply of Natural Gas in the United States" indicate cumulative gas production in the Big Piney-LaBarge area as of December 31, 1984, at 1.86 trillion cubic feet. Remaining proved reserves are placed at 1.92 trillion cubic feet of gas. In addition, the currently developing Riley Ridge gas field contains an estimated 5.8 trillion cubic feet of methane plus 18.4 trillion cubic feet of CO_2. Around 90 percent of production in the planning area is from the Big Piney-LaBarge area.

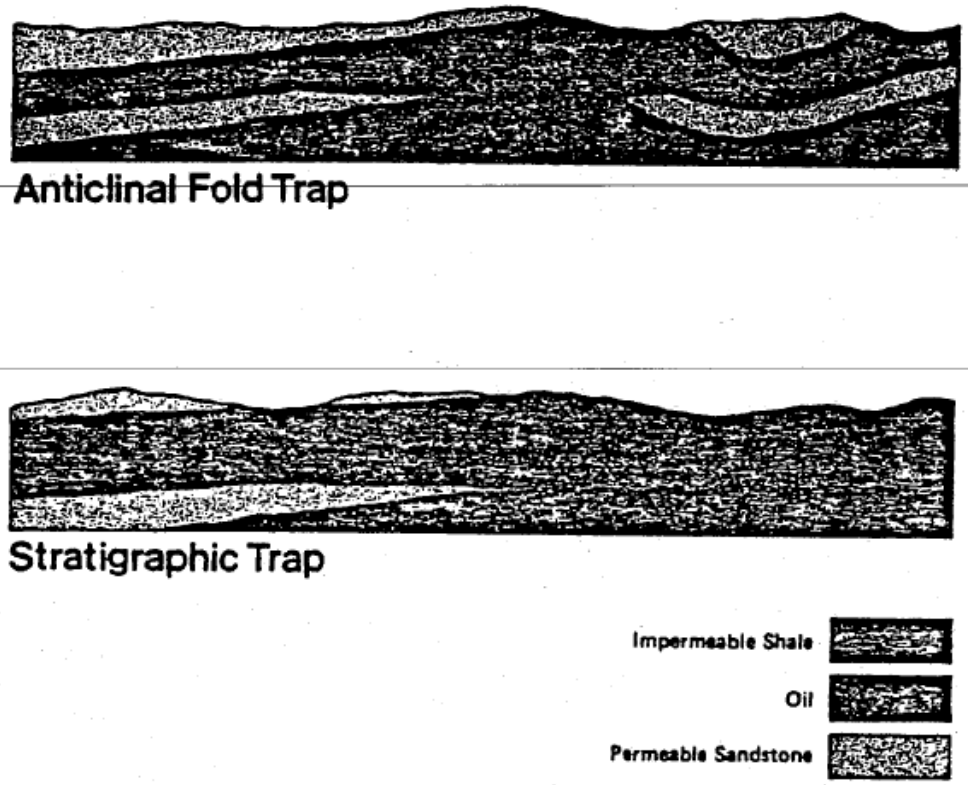


Figure 6
BASIC HYDROCARBON TRAPS

Example of RMP Documentation of the Affected Environment

Excerpts from Geology and Mineral Resources and Socioeconomic Sections

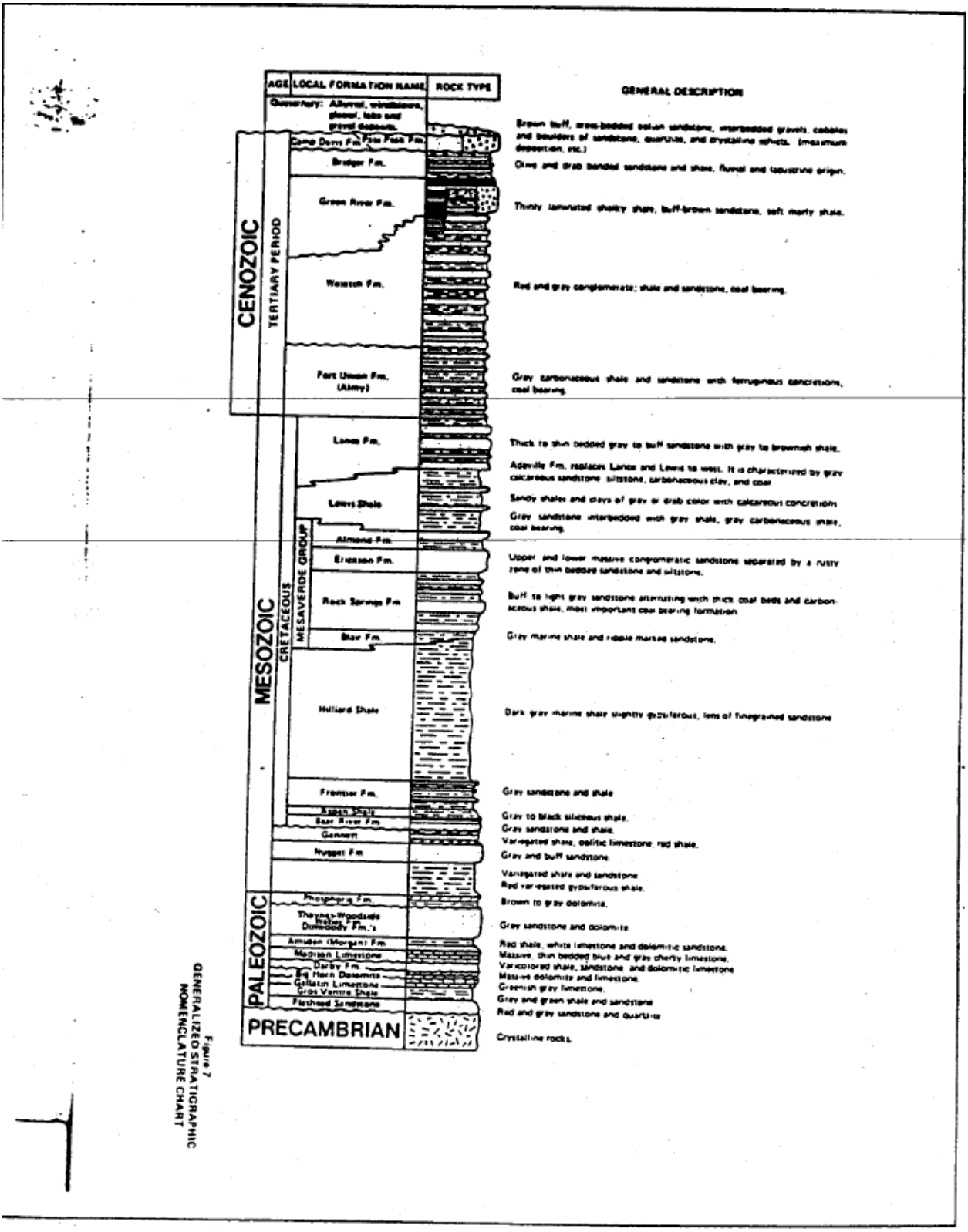
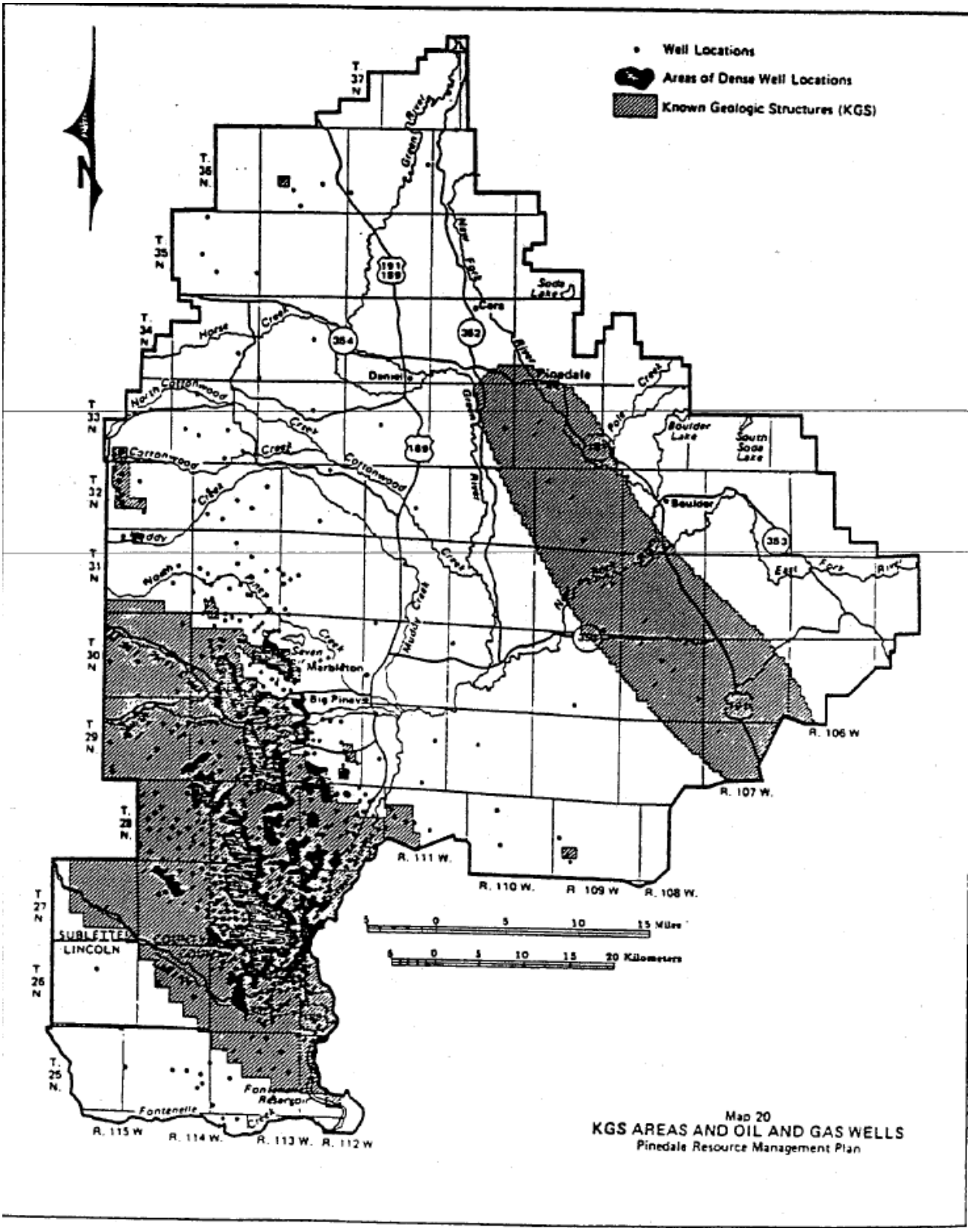


Figure 7
GENERALIZED STRATIGRAPHIC NOMENCLATURE CHART

Example of RMP Documentation of the Affected Environment

Excerpts from Geology and Mineral Resources and
Socioeconomic Sections



Example of RMP Documentation of the Affected Environment
Excerpts from Geology and Mineral Resources and
Socioeconomic Sections

AFFECTED ENVIRONMENT

SOCIOECONOMICS

Introduction

Description

The Pinedale Resource Area includes most of Sublette and Teton counties plus small portions of Fremont and Lincoln counties. The largest area communities are Jackson, Pinedale, and Big Piney. In addition, there are about 15 smaller area communities that provide limited services to residents and visitors. Also, Lander and Dubois in Fremont County are trading and service centers for the eastern portion of the planning area. This document focuses mainly on the area within Sublette and Lincoln counties. When other counties and related communities meaningfully affect the planning area, they are addressed in this section.

Leading Economic Sectors

Tourism, minerals, agriculture, construction, and manufacturing are leading area enterprises. Retail trade and services, which are linked heavily to tourism, jointly account for about 40 percent of area employment and 20 percent of personal income (Appendix I). The economy or Teton County depends heavily on tourism relative to the Grand Teton and Yellowstone National Parks while that of Sublette is more dependent on minerals, agriculture, and other activities.

Imports

Major domestic commodity imports by the planning area (Sublette/Teton counties) include such items as motor vehicles, aircraft, boats, mobile homes, railroad equipment and services, new construction, construction machinery and equipment, petroleum, food products, prepared feeds, motor freight transport and warehousing, insurance and business services, medical services (doctors, dentists, and hospitals), and wholesale trade (USDA 1978). Recent data are not available for Teton County imports, but Sublette County imports products and services worth over $130 million. Over half of these come from outside Wyoming (Wyoming 1986).

Exports

Although current export data for Teton County are not available, latest state information indicates that Sublette County exports total over $243 million. Petroleum and gas sales account for over two-thirds of the total (Wyoming 1986). Based on historic data, estimated industrial sector exports (products and services) by the combined Sublette/Teton counties area in 1978 totaled roughly $50 million, of which about 25 percent were from the hotel/lodging sector. An additional 13 percent was attributed to eating and dining enterprises, with general recreation services accounting for another 6 percent (USDA 1978).

Exports of meat animals and some miscellaneous meat products accounted for 18 percent of 1978 exports. Other leading items were manufactured apparel, tanned and finished leather goods, construction maintenance and repair services, ready mixed cement, sheet metal, real estate, and retail trade generally. Less than 4 percent of area total exports went to foreign destinations.

Property Values

Property valuation for the Sublette/Teton portion of the planning area totaled almost $224 million in 1984, roughly 10 percent above the 1983 level. Of this total, roughly 56 percent represented mineral production (mostly oil and natural gas), approximately 33 percent was real property, between 4 and 5 percent related to utilities, and the rest was personal property. Property values have increased annually since 1979. Total taxable land in the area was assessed at about $12.3 million in 1983 (USDI 1985b). Almost 40 percent of this value was attributed to irrigated land and about 12.6 percent to grazing lands. In total, agricultural lands of all types accounted for roughly 55 percent of total land valuations.

Taxes and Entitlements

In 1983, area taxes totaled between $13 million and $14 million, with about 60 percent from sales taxes. In this same year, area bank deposits amounted to roughly $134 million (Appendix 11 in fiscal year 1983, area entitlements from revenue sharing funds reached about $171,000. Annual entitlement levels have varied noticeably since fiscal year 1979 (USDI 1985b).

Example of RMP Documentation of the Affected Environment

Excerpts from Geology and Mineral Resources and Socioeconomic Sections

AFFECTED ENVIRONMENT

Population
Size

According to current state information, 1983 population in the Sublette and Teton county area was between 15,000 and 16,000, up from 14,000 in 1980. It has about doubled in size since 1970 (USDI 1985b). This area represented about three percent of the estimated state population in 1984. Estimates for 1986 place the combined population for these two counties at over 18,000, which is 3 to 4 percent of the state total in 1986 (Wyoming 1985d).

Sublette and Teton counties jointly encompass an estimated 8,851 square miles (USDI 1985b). At present, this translates into about 1.8 persons per square mile.

Over the next decade, population is projected by the state of Wyoming to increase 35 percent, based upon present economic expectations for the area. Males composed roughly 52 percent of both the planning area and state populations in 1983.

Employment
Level and Labor Force
At 10,630 in 1983, the annual labor force had roughly doubled in the planning area since 1973. However, employment during the same period increased by only 90 percent to 9.857. The resulting 773 unemployed residents raised the unemployment rate in 1983 to 7.3 percent (Appendix I).

The total number of unemployed and the corresponding unemployment rate has varied substantially over the decade prior to 1983, with the mid-1970s having unemployment rates approaching those of 1983. This probably reflects the chain reaction of economic impacts, especially on tourism and recreation in the area, resulting from the mid-1970s national energy shortfalls.

In 1983, the planning area labor force equaled less than five percent of the state total. Area employment was estimated to have increased to over 12,000 by 1986 (Wyoming 1985d).

Sectors employing the most people in 1983 included services, retail trade, government, construction, and agriculture. Of these, the first three employed between 55 and 60 percent of all persons employed in the area in 1983.

Income

Combined area personal income for Sublette and Teton counties increased yearly from 1974 to 1983, reaching roughly $220 million in 1983. This is about 3 to 4 percent of the state total (USDI 1985b). Average per capita income rose between 1977 and 1983 in Teton County, while declining slightly in Sublette County which has been more impacted by slower economic conditions and lower energy demands. At $11,738, the Sublette County per capita figure was slightly under the state average while Teton County's $14,582 level was about 20 percent higher than the 1983 state average.

Over 98 percent of the 1983 personal income in the area came from nonfarm sources, such as services: construction; retail trade; government operations; and, in Sublette County, minerals development. In that year, wages and salaries represented slightly over half of area personal income, and other labor income represented between 4 and 5 percent. Other forms of income include proprietor's income, dividends, interest, rent, and transfer payments. About 40 percent of Sublette and Teton counties joint personal income in 1983 was composed of dividends, interest, rent, and transfer payments.

Mining and Other Mineral Activities
Oil and Gas

In 1985, the base year for this analysis, there were 1,066 existing wells in the planning area. Of these, approximately 1,049 wells were on line producing oil, bas, or a combination of the two. In addition, Exxon had 17 new gas wells drilled and ready to come on line. Present estimates indicate that total output from these 17 Exxon wells drilled and ready to come on line. Present estimates indicate that total output from these 17 Exxon wells will be 480 cubic feet per day, or 175 billion cubic feet per year. Of this output, 65 percent would be CO_2 23 percent would be H_2S into about 696 long tons of sulphur per day. There is also a possible Phase II to the Exxon Riley Ridge project that would mean new wells in addition to the existing 17. However, the Phase II plans are still tentative, and the number of additional wells is not predictable at this time.

Example of RMP Documentation of the Affected Environment

Excerpts from Geology and Mineral Resources and Socioeconomic Sections

AFFECTED ENVIRONMENT

Exxon's Riley Ridge project (Phase II) will result in a marked increase in gas production in the planning area. Based on current projections, total yearly methane production in the planning area will at least double and CO_2 production alone will exceed methane production.

Output

Sublette County's production of oil in 1985 totaled over t.6 million barrels, up slightly from the 1.5 million reported a year earlier, but down roughly 30 percent from 1978. The state of Wyoming assessed the value of this output at slightly over $43.9 million (Wyoming 1986b).

Sublette County gas production in 1985 was roughly 31.8 billion cubic feet, down from the 39 billion of 1984, and roughly 30 percent under 1978. It is estimated that 1985 oil production rose above 1984 while gas declined because of the incentive of comparatively higher oil prices in 1985. According to state of Wyoming reports, 1985 gas output was valued at just under $83.5 million.

In addition to the direct output value of oil and gas ($127.4 million in 1985) produced in the planning area, there are indirect and induced effects on total area output revenue amounting to roughly $46.4 million, resulting in a total oil and gas revenue impact of about 5174 million (USDI 1985b).

Personal Income

Personal income directly related to area oil and gas activities amounted to roughly $6 million in 1985. When indirect and induced effects of these activities are included, the area income impacts totaled over $11 million that year.

Employment

Including the drilling and production stages of well activities, it is estimated that between 400 and 500 man years of direct annual employment are supported by area oil and gas activities. An additional 300 to 400 man years of related employment in other economic sectors are also spawned annually by these activities. Assuming no changes in technology or other relevant economic relationships, and based on current projections for number of wells expected over time, these annual employment figures could increase by at least 100 man-years per year by year 2005.

Other Minerals

In 1985, only about two percent of the state's total annual assessed mineral valuation was supplied by the planning area (Sublette County) (USDI 1985b).

The area's miscellaneous minerals output was valued at about $137,593 in 1985, mainly salable minerals such as sand, gravel, and moss rock. Other minerals, except oil and gas, have low to no development potential in the foreseeable future.

H-1624-1 PLANNING FOR FLUID MINERAL RESOURCES
Example of Reasonably Foreseeable Development Scenario
and Assumptions Used in an Area of Moderate to
Low Oil and Gas Potential

ASSUMPTIONS FOR OIL AND GAS ACTIVITY ON LEASES WITHIN THE NEBRASKA NATIONAL FOREST

Based on the past drilling history, it is estimated that approximately one to three exploratory ("wildcat") wells will be drilled every 5 to 10 years within the forest area. The estimated success rate of finding hydrocarbons in commercial quantities would be no greater than 10 percent, baaed on the average U.S. wildcat well success rate. Drill1ng is expected to be in the area of "moderate" to "low" potential. There is approximately a 1 in 50 (2 percent) chance of field discovery within the life of the forest's LRMP. Should a new field be discovered in the forest, the size of that field is expected to be approximately 400 acres, based on average field sizes in adjacent areas.

Development ("in-fill") wells would be drilled in any new field on a spacing pattern determined by the characteristics of the hydrocarbon reservoir. For purposes of analysis, a 40-acre spacing is predicted for any new field discovered, since nearby production is predominately oil. This would equate to approximately 10 wells for an average field size. Based upon the information given and knowledge of past drilling operations on the NBNF, the following is the projected surface disturbance that could occur.

1. Exploratory Wells
   a. Three wells in a 15-year period (life of LRMP)
   b. Well site covers 2-6 acres
   c. Roads
      i. Surface l8-20 feet wide
      ii. With ditches, etc., total surface of road about 40 feet
      iii. Length of road about .5 miles per well
      iv. Total acres disturbed by roads per well 2.0 acres
   d. Total surface disturbance per exploratory well (using top end of ranges) = 6.0 acres
   e. Total surface disturbance over 15-year period (life of plan) = 18.0 acres

2. Field Development
   a. Assumption -- size of field is 400 acres
   b. Assumption -- 40-acre spacing of wells (16 wells per section)
   c. Total predicted wells = 10
      i. Well site covers 2 acres
      ii. All facilities, including tank batteries, on well site
   d. Assumption -- 6 miles of roads per section (0.4 miles per well)
      i. Flowlines placed along roadways
   e. Total surface disturbance from wells = 144 acres (10 wells x 14.4 per well)
   f. Surface disturbance from road per well = 2.0 acres (40-foot roadway)
   g. Total surface disturbance from roads = 20 acres
   h. Total surface disturbance from field development = 164 acres

3. Exploratory Well Plus Field Development
   a. Total surface disturbance from field development and one additional exploratory well outside the field = 180.4 acres

Illustration Example of Reasonably Foreseeable Development Scenario and

Impact Analysis in an Area of High Oil and Gas Potential

REASONABLY FORESEEABLE DEVELOPMENT of OIL & GAS RESOURCES

This appendix presents an in-depth description of the oil and gas leasing and development program in the West HiLine planning area. In particular, it addresses reasonably foreseeable oil and gas development, under the direction provided in the Management Common to All Alternatives section, during the life of the plan and the cumulative impacts of leasing and development. This information supplements the management guidance and information presented in Chapters 2, 3 and 4. This appendix has been analyzed in conjunction with the information presented in the body of the RMP in determining the BLM's proposed alternative.

The RMP will determine which lands will be leased for oil and gas under what conditions; and those areas where leasing for oil and gas will be restricted or not undertaken. Issued oil and gas leases may be explored and developed, subject to lease stipulations, after additional site-specific analysis for conformance with this plan and additional NEPA analysis, as needed.

The BLM will consider this information again prior to issuing a Record of Decision.

A. OIL AND GAS LEASING

The Mineral Leasing Act of 1920 (as amended), provides that all public lands be open to oil and gas leasing unless a specific land order has been issued to close the area. Through the Bureau's land use planning system, the availability of public land for 1easing is analyzed and constraints on leasing and oil and gas operations are identified. Oil and gas 1eases are then issued from the Montana State Office in Billings.

The issuance of a 1ease authorizes the 1essee to actively explore and/or develop the lease, guided by any attached stipulations. Stipulations serve to point out areas of special concern. Time, distance, and surface occupancy stipulations are common lease restrictions used to protect surface resources.

Occasionally, stipulations protecting the mineral resource from drainage or requiring the new lessee to assume responsibility for any unplugged wells on a lease are added to protect mineral resources.

Standard stipulations (form MT 3109-1 July, 1984, in Appendix 2.2) are attached to all leases prior to issuance to provide minimum guidelines. In addition, certain areas may be designated for special stipulations. These special stipulations would be attached, for those designated lands, prior to lease offering. Additional site specific stipulations could be developed, consistent with this RMP, during the

field office evaluation of the Application for Permit to Drill (APD). Additional National Environmental Policy Act (NEPA) analysis and documentation would occur on these APDs as necessary.

The East, Middle and West Buttes of the Sweet Grass Hills, Kevin Rim, and Cow Creek ACECs and other important wildlife habitat areas may require application of restrictive (seasonal or timing) stipulations (see Appendix 2.2 and the minerals overlay to Map 1) to protect important habitats. The Upper Missouri National Wild and Scenic River Corridor is discretionally closed to leasing in the scenic and recreational segments; and nondiscretionarily closed to leasing in the wild segments. If in the future, the Secretary of the Interior develops regulations for leasing in the Upper Missouri River Corridor analyses would be conducted to determine the level of protection and to develop stipulations necessary to minimize surface and visual impacts.

Drilling and exploration activities on federal lands open to oil and gas leasing in the RMP planning area, are administered by the Havre and Great Falls Resource Area Offices, both under the guidance of the Lewistown District Office.

A federal lessee or operator is required to follow procedures set forth by: Onshore Oil and Gas Order No. 1, the Federal Oil and Gas Royalty Management Act (as amended) and Title 43 Code of Federal Regulations, Section 3100.

The following sections describe typical oil and gas operations for the West HiLine planning area.

B. OIL AND GAS OPERATIONS

1. Geophysical Exploration

Geophysical exploration is a general term used for various indirect exploration methods, the most common being seismic and gravity surveys. Gravitational prospecting detects micro-variations in gravitational attraction caused by the differences in the density of various types of rock through the use of an instrument known as a gravimeter. Data derived from gravity surveys is used to generate anomaly maps, from which faults and general structural trends can be interpreted. Survey measurements are taken at many points along a linear path with a gravimeter. The gravimeter is transported either by backpack, helicopter, or off-road vehicle (ORV). Because gravity surveys can be conducted from the air or by a backpacker, surface disturbance is not necessary. However, surface disturbance may occur if ORV use is permitted for the purpose of conducting the survey.

Seismic surveys are the most popular indirect method currently utilized for locating subsurface structures which may contain oil and gases. Seismic prospecting is based on the fact that shock waves (waves similar to those created when a pebble is dropped into a pool of standing water) are reflected, refracted (bent) to varying degrees and travel at different speeds as they pass through different rock types. As the shock wave encounters layers where the lower rock unit causes the waves to travel slower, some of the wave (energy) is reflected upward to surface sensing devices called geophones.

The geophones are connected by ground wire to a data recording truck which stores data on magnetic tape. The time required for the waves to travel from the source of the wave down to a given reflecting rock unit and back to the geophone is related to the depth by multiplying the shock wave velocity by one half the travel time. For different rock types the average velocity is determined from bore hole and core data or must be estimated if no data is available.

Seismic surveys are conducted by sending shock waves, generated by a small explosion or through mechanically beating the ground surface with a thumping or vibrating platform, through the earth's surface.

The thumper and vibrator methods pound or vibrate the ground surface to create a shock wave. Usually four large truck are used, each equipped with pads about 4-foot square. The pads are lowered to the ground and the vibrators are electronically triggered from the recording truck. Once information is recorded the trucks move forward a short distance and the process is repeated. Less than 50 square feet of surface area is required to operate the equipment at each recording site.

The small explosive method requires that charges be detonated on the surface or in a drill hole. Holes for the charges are drilled utilizing truck-mounted or air portable drills to drill small-diameter holes to depths of 100 to 200 feet. Generally 4 to 12 holes are drilled per mile of line and a 50-pound charge of explosives is placed in the hole, covered, and detonated. The created shock wave is recorded by geophones placed in a linear fashion on the surface. In rugged topography, a portable drill carried in by helicopter is often used to drill the holes rather than a truck-mounted drill.

The surface charge method utilizes $2^1/_2$ or 5 pound charges attached to wooden lath 3 feet above the ground surface. This type of charge results in the destruction of above ground vegetation, but this damage is usually undetectable after several growing seasons. The disadvantage of this type charge is its limited depth of shock wave penetration.

Example of Reasonably Foreseeable Development Scenario and

Impact Analysis in an Area of High Oil and Gas Potential

A typical drilling seismic operation may utilize 10 to 15 men operating five to seven trucks. Under normal conditions, 3 to 5 miles of line can be surveyed each day using the explosive method. The vehicles used for a drilling program may include heavy truck-mounted drill rigs, track mounted air rigs, water trucks, a computer recording truck, and several pickups for the surveyors, shot hole crew, geophone crew, permit man, and party chief.

Public roads and existing private roads and trails are used where possible. However, off-road cross-country travel is also necessary in some cases. Graders and dozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line; this usually establishes a well defined 2-track trail. Drilling water, when needed, is usually obtained from private landowners.

Terrain along the HiLine region is of the type which allows the use of thumpers or vibrotrucks. Therefore, geophysical exploration in this region should be accomplished with minimal surface disturbance.

2. Geophysical Operations

Geophysical operations may be conducted regardless of whether the land is leased or not. Notices of Staking, Applications for Permit to Drill, drilling activities and subsequent well operations can only be approved, subject to regulations, on leased lands.

Notices to conduct geophysical operations on BLM surface are received by the appropriate resource area. Administration and surface protection are accomplished through close cooperation of the operator and the BLM. Seasonal restrictions may be imposed to reduce fire hazards, conflicts with wildlife, watershed damage, hunting activity, etc.

An operator is required to file a “Notice of Intent to Conduct Oil and Gas Exploration Operations” for all geophysical activities on public lands administered by the BLM. The Notice of Intent should include maps showing the line location and access routes, any anticipated surface damages and a time frame for operations. The operator must be bonded.

Written approval must be obtained prior to commencing any surface blading activities and the operator must contact the BLM when operations begin. The operator is required to comply with written instructions and orders given by the Authorized Officer at the prework conference, site inspection (if required) and during field investigations. Periodic checks during and upon

completion of the operation will be conducted to ensure compliance with the terms of the Notice of Intent.

Oil and gas can be discovered by either direct or indirect exploration methods. Direct exploration methods such as the mapping of rock outcrops and oil seeps, drill core analyses and drilling may lead to the discovery of oil and gas deposits whereas indirect methods, such as seismic and gravity surveys are used to delineate subsurface features which may contain oil and gas.

3. Drilling Permit Process

The federal lessee or operating company selects a dr1ll site based on spacing requirements, subsurface and surface geology, geophysics, topography, and economic considerations. Statewide spacing regulations are established by the Montana State Board of Oil and Gas Conservation and are generally as follows:

Gas Wells: One well per 640 acres.
Oil Wells: 0 – 6000 feet: One well per 40 acres.
6001 - 11000 feet: One well per 160 acres.
11001 - feet: One well per 320 acres.

Example of Reasonably Foreseeable Development Scenario and

Impact Analysis in an Area of High Oil and Gas Potential

Exceptions to spacing requirements involving federal lands may be granted after a BLM review.

4. Notice of Staking (NOS)

Once the company makes the decision to drill, they must decide whether to submit a Notice of Staking (NOS) or apply directly for a permit to drill. The NOS is an outline of what the company intends to do, including a location map and sketched site plan. The NOS is used to review any conflicts with known critical resource values. The BLM utilizes information contained in the NOS and obtained from the onsite inspection to develop stipulations to be incorporated into the APD. As a result of the Federal Onshore Oil and Gal Leasing Reform Act of 1987 (Reform Act of 1987), upon receipt of an NOS the operator/company name, well name/number, well location and a map showing the drill site must be posted in a public place in the Bureau approving office and the Bureau Resource Area Office or the local surface management agency office for a minimum of 30 days prior to approving the APD.

5. Application for Permit to Drill (APD)

The operator may or may not choose to submit an NOS; in either case, an Application for Permit to Drill must be submitted. An APD consists of two main parts: the 13 point surface plan which

describes any surface disturbances and is reviewed by resource specialist, and the eight point plan which details the drilling program and is reviewed by the petroleum engineer and geologist. For the APD option the onsite inspection is used to assess possible impacts and develop stipulations to minimize these impacts. If the NOS option is not utilized the 30 day posting period as required by the Reform Act of 1987, will commence upon receipt of the APD by the BLM.

In the HiLine region, an archaeological clearance is required. However, there may be exceptions to this policy on a case by case basis. Additionally, the BLM must prepare any site specific environmental documentation required by NEPA and develop mitigation measures necessary to protect any adversely affected resources. The BLM approves all wells drilled on federal minerals regardless of surface ownership, except on National Forest Lands where the BLM only approves the eight point drilling program. The BLM also approves wells drilled on leased Indian tribal or allotted lands, but has no control over Indian leasing decisions. For privately owned surfaces it is the responsibility of the operator to obtain a surface owner agreement.

6. Drilling Phase

Once the APD is approved, the operator may begin construction activities. When a site is chosen that necessitates the construction of an access road the length will vary, but usually the shortest feasible route is selected to reduce the haul distance and construction costs. Environmental factors or a landowner's wishes may dictate a longer route in some cases.

During this first phase the operator moves construction equipment over existing roads to the point where the access road begins. Depending upon the type of terrain, equipment may include dozers (track-mounted and rubber-tired) scrapers and graders. Existing roads and trails often require improvement in places and occasionally culverts and cattle guards are installed. Because of the topography, and because most HiLine wells are only 1,500 to 2,200 feet deep they can be drilled using a truck mounted rig. Thus, often times very little or no access road work is necessary and this phase of construction requires very little time.

The second phase is the construction of the drilling pad or platform. Again, in much of the HiLine area the relatively flat, grassland topography requires little work to prepare a drill pad. In some cases no disturbance other than a mud (reserve) pit and cellar is required. If surface disturbance is necessary, soil material suitable for plant growth is removed and stockpiled in a designated area, to be used later for rehabilitation and reseeding. Drilling sites on ridge tops and hillsides are constructed by cutting and filling

portions of the location after the topsoil has been removed. The majority of the excess cut material is stockpiled in an area that will allow it to be easily recovered for rehabilitation. It is important to confine extra cut material to a stockpile so that it can be recovered for rehabilitation of the drill site.

The amount of level surface required for safely assembling and operating a drilling rig varies with the type of rig, but is usually 200 feet by 250 feet for typical HiLine wells of 1,500 to 2,200 foot depths. Deeper wells will require larger pads because of the rig size and associated equipment. When construction of a drilling location requires cut and fill, the foundation of the drilling derrick is usually placed on a cut surface ensuring that it rests on solid ground, thereby preventing it from leaning or toppling due to settling of uncompacted soil.

In addition to the drilling platform, a reserve pit is constructed. The reserve pit is used to contain the drilling fluids and drill hole cuttings. It is usually square or oblong, but is sometimes constructed in other shapes to accommodate topography. Generally, the reserve pit is 6 to 12 feet deep, but may be deeper to compensate for smaller length and width for deeper drilling depths. In some instances mud tanks are utilized thus eliminating the need for a pit. For air drilling, smaller reserve pits are used; usually less than 10 by 10 feet and approximately 6 to 10 feet in depth.

Depending on how the drill site is located relative to a natural drainage, it may be necessary to construct water bars or diversions to control surface runoff and erosion. The area disturbed for construction and the potential for successful revegetation depends largely on topography, soil type, climate and the degree of disturbance.

Usually drilling activities begin shortly after the location and access road have been constructed. The drilling rig and associated equipment are moved to the location and erected.

Water for drilling is hauled or piped to the rig storage tanks or reserve pit from rivers, wells, reservoirs or private sources. Occasionally, water supply wells are drilled on or close to the drill site. Bentonite, a type of clay, is mixed with the water to form the main constituent of the drilling mud. A wide variety of other materials and chemicals may be added to enhance the mud properties. Drilling mud performs several important functions; it cools the bit, reduces the drag of the drill pipe on the sides of the bore hole, seals off any porous zones, aids in preventing an uncontrolled release of formation fluids, and carries the

cuttings to the surface. High pressure air is sometimes used in place of mud. The use of mud or air is largely dependent upon the target formation, drilling depth and type of completion desired. The drilling mud or air is circulated through the drill pipe to the bottom of the hole, through the bit and up the well bore. At the surface the mud and rock cuttings are returned to the reserve pit where gravity separates the two or they are mechanically separated through a screen. The mud is recycled and returned to the system for further use. When drilling with air the cuttings are blown into the reserve pit.

The actual commencement of the drilling is referred to as “spudding in”. Initially, the drilling usually proceeds rapidly due to the unconsolidated nature of shallow formations.

Drilling is accomplished by rotating special bits bearing a controlled portion of the drill string weight. The rig structure and associated hoisting equipment bear the remainder of the drill string's weight. The weight on the bit is controlled to maintain as vertical a hole as possible or deviate from vertical when desired, and to prevent rapid wearing of the drill bit

The combination of rotary motion and weight on the bit causes rock to be chipped away at the bottom of the hole. As mentioned earlier, these chips are then transported to the surface where they are disposed of into the reserve pit.

The rotary motion is created by a square or hexagonal rod, called a kelly, which fits through a square or hexagonal hole in a large turntable, called a rotary table. The rotary table sits on the drilling rig floor and as the hole is deepened the kelly descends. When the kelly has gone as deep as it can, it is raised and a piece of drill pipe about 30 feet in length is attached to the drill pipe in the hole. The drill pipe is then lowered, the kelly is raised and attached to the top of it, and drilling recommences. By adding more and more drill pipe the hole is steadily deepened.

Eventually, the bit becomes worn and must be replaced. To change bits, the entire string of drill pipe must be pulled from the hole. Once the bit is replaced the drill string is reassembled, lowered into the hole and dr1lling is started again.

Drilling operations are continuous, 24 hours a day, 7 days a week. The crews usually work three 8-hour shifts or two 12-hour shifts a day. Typical HiLine wells require 3 to 4 days to reach total depth. At periodic intervals, BLM personnel, usually petroleum engineering technicians, (PETs), will conduct inspections of the drilling rig and operations to ensure

compliance with the approved plans in the APD. If at any time the operator wishes to change the approved plans in the APD, verbal approval may be obtained, but must be followed up in writing.

Upon completion of dr1lling, the well is tested to determine its capability to produce hydrocarbons (oil and gas). If oil or gas is found in commercial quantities the well is completed as a producer. Typically, oil producing wells in the HiLine region require a pump jack, stock tanks, heat treating facilities and usually a water disposal pit. Gas wells in this region are mostly "sweet gas" wells, that is, they contain no hydrogen sulfide gas. Sweet gas production requires a meter house and a gathering line or marketing line to transport the gas. In some cases a compressor station is required to compress the gas to a pressure necessary for entry into a pipeline.

If liquid hydrocarbons (condensates) are produced with the gas a separator and storage facility are necessary. Gas wells which produce water require a small (10 by 10 foot) water disposal pit. Sour gas wells (those which produce hydrogen sulfide gas) require special wellhead equipment due to the corrosive nature of the hydrogen sulfide. The sour gas may be treated to remove any hydrogen sulfide prior to entry into a sales pipeline, but in most cases is sold to a gas plant for treatment.

Installation of production facilities generally requires little additional surface disturbance beyond that necessary for drilling. However, additional disturbance does result from pipeline and gathering line installations. Gas meter houses are usually 10 by 10 foot skid-mounted, steel sheds. Pumpjacks in this area are usually 8-10 foot in height, require a slightly larger surface area than a gas shack and may or may not be skid mounted. The gas house and pumpjack are usually situated over the well head on the same area where the drill rig was set up. Water disposal pits needed for the evaporation of water produced in association with hydrocarbons generally fit within the boundaries of the drilling pad. After the production facilities are installed the remaining drilling disturbances are reclaimed.

During the production phase, BLM monitors and approves field activities needed for well and field operation and regulation. Many operations, e.g. plugging, completion in a different zone, deepening, etc., require prior approval. Others such as acidizing and fracturing do not require prior approval, but a subsequent report of operations describing the operation in detail must be filed.

If the well is not productive in commercial quantities it is considered a dry hole. Dry holes and producing wells which can no longer produce in commercial quantities must be plugged and abandoned.

7. Plugging and Abandonment

When a well is no longer capable of producing in paying quantities or has no other beneficial use, the well should be plugged and abandoned.

The BLM is responsible for the protection of federal minerals, regardless of the surface management agency or private ownership of the surface.

Because each well is different, the plugging program for that well must be carefully designed. Federal minerals plugging programs are designed to:

(a) Prevent fluid migration between zones.
(b) Protect mineral resources from damage.
(c) Isolate producing zones.

After the physical plugging is completed, the surface is reclaimed, per stipulations in the APD or the surface owner agreement.

Economic conditions dramatically affect drilling activity and at the present time oil and gas markets are depressed. However, an upturn in the petroleum market could create a significant increase in the number of drilling wells within the planning area as a great portion of the area has moderate to high oil and gas potential. The following sections briefly describe the planning area's historical, present and reasonably foreseeable oil and gas development.

C. Historical and Current Background

As with most parts of Montana underlain by sedimentary rock, the West HiLine planning area has a long history of oil and gas exploration and development. Production throughout the planning area is mainly from shallow, low pressure reservoirs of Cretaceous and older age. Most of the area's oil production occurs in Glacier and Toole Counties, whereas gas production occurs throughout the HiLine area. Table 1 list, by county, the major oil and gas fields within the West HiLine planning area.

Table 1

Major Oil and Gas Fields (By County)

County	Field	Production	Discovery Date
Blaine	Battle Creek Field	Gas	1977
	Bullwhacker	Gas	1967
	Leroy	Gas	1968
	Sawtooth Mountain	Gas	1967
	Tiger Ridge	Gas	1966
	Tiger Ridge North	Gas	1966
	Rabbit Hills	Oil	1972
	Bowes Dome	Oil	1949
	Bullhook	Gas	1966
Chouteau	Sherard	Gas	1923
	Bullwhacker	Gas	1966
	Huebschwerlen	Gas	
Glacier	Cut Bank	Gas, Oil	1926/1932
Hill	Tiger Ridge	Gas	1966
	Bullhook	Gas	1966
		Gas	
Liberty	Blackjack	Gas	1968
	East Keith	Gas	1947
	Flat Coulee	Gas, Oil	1933
	O'Briens Coulee	Gas	1963
	Sage Creek	Gas	1975
	Utopia	Oil	1976
	Whitlash	Gas, Oil	1918
Toole	Kevin Sunburst	Gas, Oil	1922
	Cut Bank	Gas, Oil	1926/1932
	Fred and George Creek	Oil	1963
	Border	Oil	1929
	Amanda	Gas	1922
	Arch Apex	Gas	
	N. Dunkirk	Gas	
	Dunkirk	Gas	1981
	Prairie Del.	Gas	1975
	West Butte	Gas, Oil	1968

Source: BLM 1988

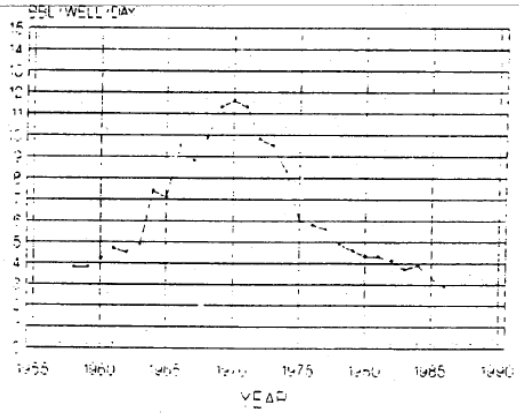
Example of Reasonably Foreseeable Development Scenario and

Impact Analysis is an Area of High Oil and Gas Potential

The oldest and largest oil fields in the HiLine region, the Kevin Sunburst and Cut Bank fields, were discovered in 1922 and 1932 respectively. Since that time cumulative production these fields exceeds 230,000,000 barrels of oil and 550,000,000,000 cubic feet of gas.

Although enhanced recovery techniques (mainly water flooding) have been tried since becoming technologically feasible; large cooperative efforts, e.g. secondary recovery units, did not get under way until the early 1960s. Figure 1, an oil production curve for the Northern Montana Region and Table 2, which shows oil production volumes for the Northern Montana Region, illustrate the increased average daily production resulting from these secondary recovery efforts. The production figures (Table 1 and Figure 1) from these secondary recovery efforts show an increase through 1970. The decline shown after that is because most of these wells are in the declining stages of production.

FIGURE 1: NORTHERN MONTANA REGION
OIL PRODUCTION



SOURCE MONTANA OIL & GAS ANNUAL REVIEW

The Northern Montana region is a state designation and is shown on Map 1.

TABLE 2
OIL PRODUCTION AND WELL HISTORY FOR NORTHERN MONTANA

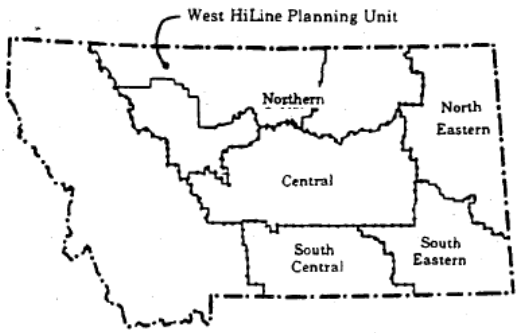
YEAR	PRODUCTION IN BBLS	NUMBER OF PRODUCING WELLS	AVERAGE DAILY PRODUCTION IN BBLS/WELL/DAY
1958	4,348,256	3120	3.8
1959	4,307,739	3067	3.8
1960	4,332,218	2811	4.2
1961	4,211,017	2447	4.7
1962	4,252,304	2615	4.5
1963	4,530,510	2550	4.9
1964	5,705,948	2216	7.4
1965	6,826,261	2649	7.1
1966	7,991,302	2308	9.5
1967	6,758,280	2097	8.8
1968	6,883,493	1898	9.9
1969	7,557,966	1827	11.3
1970	7,680,831	1806	11.6
1971	7,292,476	1768	11.3
1972	6,646,908	1856	9.8
1973	5,948,826	1708	9.5
1974	5,464,319	1802	8.3
1975	4,551,324	2067	6.0
1976	4,200,539	1978	5.8
1977	4,060,957	1999	5.6
1978	3,671,322	2052	4.9
1979	3,536,296	2089	4.6

TABLE 2 (CONT)
OIL PRODUCTION AND WELL HISTORY FOR NORTHERN MONTANA

YEAR	PRODUCTION IN BBLS	NUMBER OF PRODUCING WELLS	AVERAGE DAILY PRODUCTION IN BBLS/WELL/DAY
1980	3,516,807	2,212	4.3
1981	3,605,207	2,280	4.3
1982	3,680,043	2,455	4.1
1983	3,682,130	2,693	3.7
1984	3,708,185	2,610	3.9
1985	3,419,300	2,803	3.3
1986	3,220,769	3,017	2.9
TOTAL	145,591,533	N/A	N/A
Average	5,020,398	2,303	6.3

Source: Montana Oil and Gas Annual Reviews, 1958-1986

Map 1. Montana Producing Regions



H-1624-1 - PLANNING FOR FLUID MINERAL RESOURCES

Example of Reasonably Foreseeable Development Scenario and

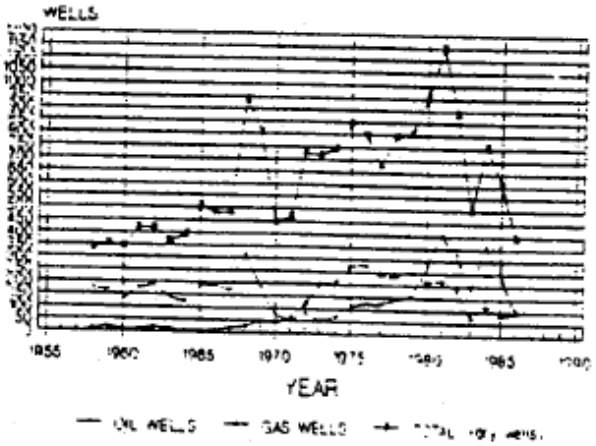
Impact Analysis is an Area of High Oil and Gas Potential

The Tiger Ridge field, and its related surrounding fields, is currently the largest gas producing region in the planning area. The Tiger Ridge field covers nearly 53,000 acres and has produced more than 75,000,000,000 cubic feet of natural gas since discovery in 1966.

Because of low gas prices (about $.10 per 1000 cubic feet in 1966) most early exploration was for oil and many wells capable of producing gas were considered to be of little or no value. However, wells drilled near existing pipelines and markets were produced. In the early 1970s the demand for natural gas increased as did its price and the level of exploration and development.

Figure 2 shows the increased number of gas wells drilled in the early70s as the price started to increase. In the early 80s the gas market became soft because of the number of gas wells completed. This resulted in less drilling for gas. The gas "glut" is still with us at present however, the wells drilled in the early 70s will start to decline in production and drilling should pick again in the future. Figure 3 shows the number of producing wells (oil and gas) in the Northern Region. The early 70s were influenced by both the oil embargo and subsequent shortage and the better market for gas. The total number of producing wells has increased in a steady manner since the early 70s because of these factors. If the oil prices stay low and the gas market stays soft we may expect the number of producing wells to stay at this level or possibly decline. There may be a one for one replacement of producing wells, one well gets abandoned and another gets completed.

FIGURE 2: STATE OF MONTANA WELLS
COMPLETED OIL VS COMPLETED GAS VS TOTAL*



* TOTAL WELLS INCLUDES DRY HOLES
SOURCE MONTANA OIL & GAS ANNUAL REVIEWS

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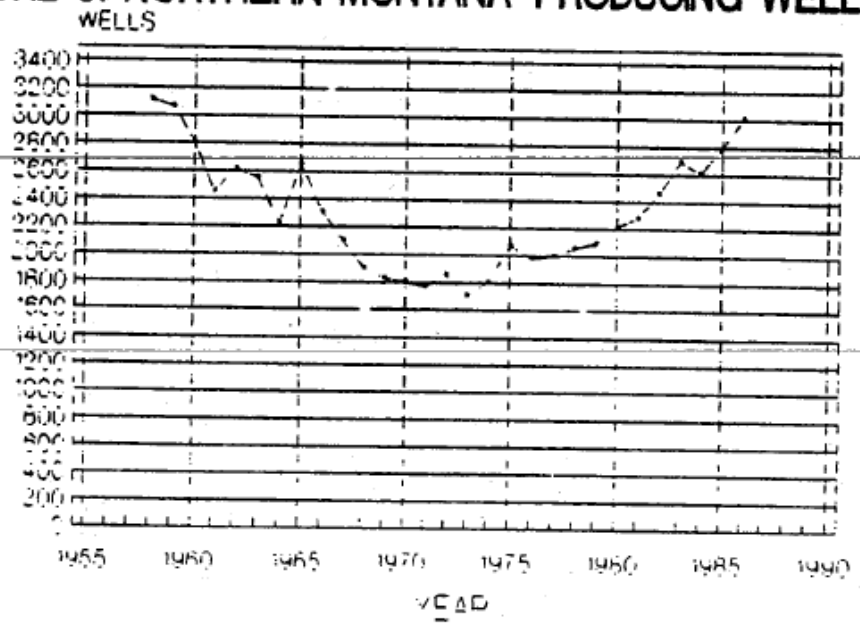
Example of Reasonably Foreseeable Development Scenario and

Impact Analysis in an Area of High Oil and gas Potential

FIGURE 3: NORTHERN MONTANA PRODUCING WELLS



SOURCE: MONTANA OIL & GAS ANNUAL REVIEWS

Table 3 and Figure 4 show the total number of wells drilled in the HiLine counties, versus the federal wells drilled in those same counties. Figure 5 through 10 show a county by county breakdown of this information. The federal drilling reflects the trend of the total. Unless there is a major shift in state or federal taxation or regulation, BLM would expect to see the number of federal wells drilled to follow the trend of total wells. If the drilling goes up the number of federal wells drilled would increase. If drilling goes up the number of federal wells drilled would increase. If drilling declines federal drilling would probably decline.

Each county has federal production and in most of the counties the federal production is a significant portion of the total (see Table 4).

D. Present Activity

Presently about 887,178 barrels of federal oil and 8,912,700,000 cubic feet of federal natural gas are produced each year in the planning area. However, oil production is declining as the reserves in Kevin Sunburst and Cut Bank fields are being depleted.

In 1986 the average oil production in the Northern Montana region was 2.9 barrels per well per day. This low level of production is possible because reservoirs in this region are shallow and production costs are less than those for deeper wells. In addition, most oil is produced by independent operators who have lower overhead and operating costs than a major oil company. Thus, they are able to produce these wells down to a lower production rate and smaller profit margin. However, as production rates continue to decline, more and more of these wells will become uneconomic and will require plugging.

As of January, 1988, there were approximately 995 active, unreclaimed well sites on federal minerals within the planning area. Each of these sites creates an estimated 2 acres of surface disturbance.

E. Reasonably Foreseeable Development Activity

Based on the preceding analysis of past and current oil and gas activities and trends, the following is a description of the reasonably foreseeable oil and gas exploration and development activity anticipated in the West HiLine area over the next 10 to 15 years.

1. Oil Production

Oil exploration and development wells in the Kevin Sunburst and Cut Bank fields targeted to the present producing formation (Madison Limestone) should continue to decrease. As the average daily production declines to a level where it is no longer possible to produce oil and gas at a profit, the number of well pluggings is expected to increase. In addition to plugging, some

TABLE 3
FEDERAL AND NON-FEDERAL HILINE WELLS DRILLED

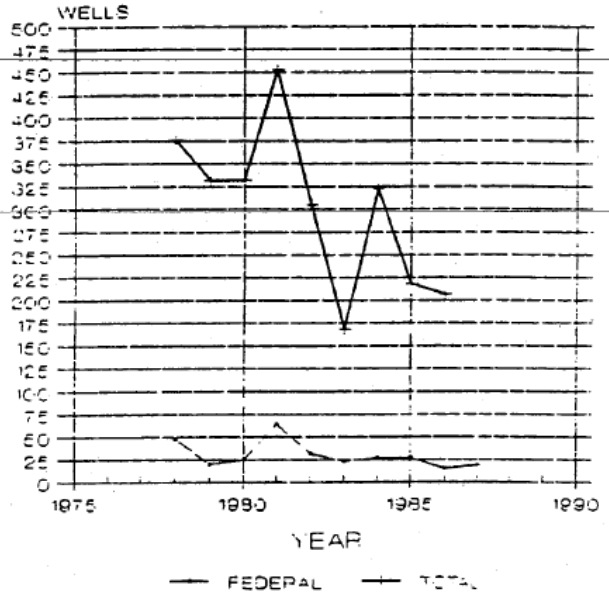
Year	Blaine	Choteau	Glacier	Hill	Liberty	Toole	TOTAL
1978							
FEDERAL	41	0	1	1	2	3	48
TOTAL	111	27	29	67	33	109	376
1979							
FEDERAL	12	2	1	0	2	3	20
TOTAL	69	16	26	56	45	120	332
1980							
FEDERAL	14	0	0	0	0	11	25
TOTAL	55	25	50	39	55	108	332
1981							
FEDERAL	20	3	1	1	4	35	64
TOTAL	90	32	48	44	46	193	453
1982							
FEDERAL	8	2	2	5	2	13	32
TOTAL	35	18	36	29	14	173	305
1983							
FEDERAL	5	5	1	1	1	10	23
TOTAL	19	15	29	10	10	85	168
1984							
FEDERAL	8	1	0	0	0	18	27
TOTAL	33	10	40	32	9	199	323
1985							
FEDERAL	10	2	0	0	2	13	27
TOTAL	28	4	37	29	3	117	218
1986							
FEDERAL	10	1	0	0	0	4	15
TOTAL	38	14	35	23	1	96	207.
1987							
FEDERAL	5	0	0	1	1	12	19
TOTAL	*	*	*	*	*	*	*
TOTAL FEDERAL	133	16	6	9	14	122	300
TOTAL	478*	161*	330*	329*	216*	1200*	2714*

*Non-federal well information for 1987 is not available at this time.
**Data does not include Indian wells
Source: BLM, 1988
Montana Oil and Gas Annual Reviews, 1978-1986.

Example of Reasonably Foreseeable Development Scenario and

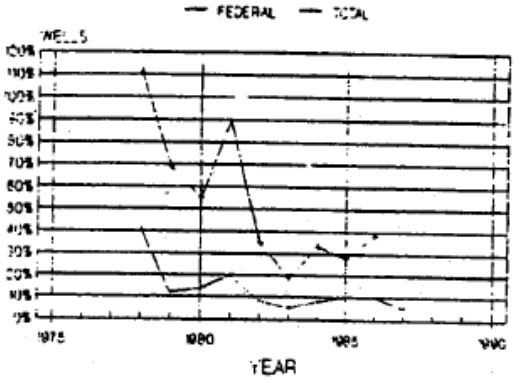
Impact Analysis in an Area of High Oil and Gas Potential

FIGURE 4: HILINE WELLS



SOURCE MONTANA OIL & GAS ANNUAL REVIEWS

FIGURE 5: BLAINE COUNTY WELLS
FEDERAL VS TOTAL 1978-1987



SOURCES MONTANA OIL & GAS ANNUAL REVIEWS
BLM 1988

FIGURE 6: CHOUTEAU COUNTY WELLS
FEDERAL VS TOTAL 1978-1987

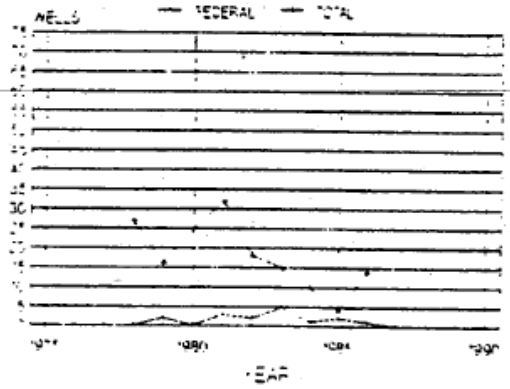
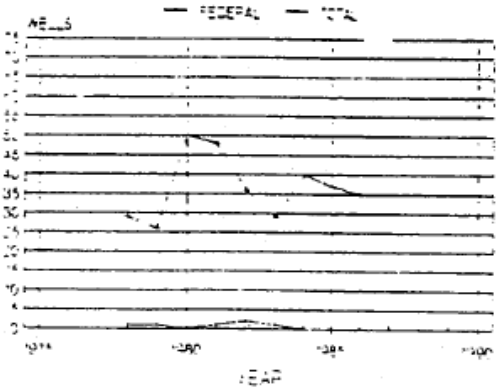
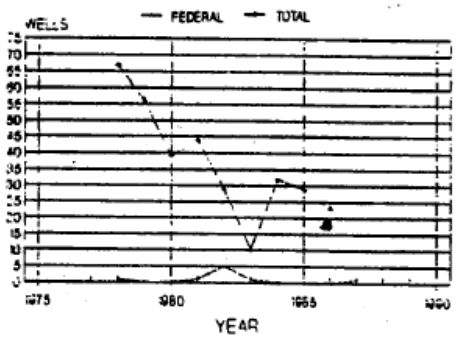


FIGURE 7: GLACIER COUNTY WELLS
FEDERAL VS TOTAL 1978-1987



Example of Reasonably Foreseeable Development Scenario and Impact Analysis in an Area of High Oil and Gas Potential

FIGURE 8: HILL COUNTY WELLS
FEDERAL VS TOTAL 1978-1987



SOURCES MONTANA OIL & GAS ANNUAL REVIEWS
BLM 1988

FIGURE 9: LIBERTY COUNTY WELLS
FEDERAL VS TOTAL 1978-1987

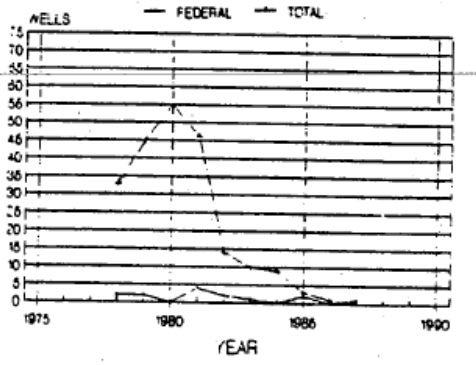
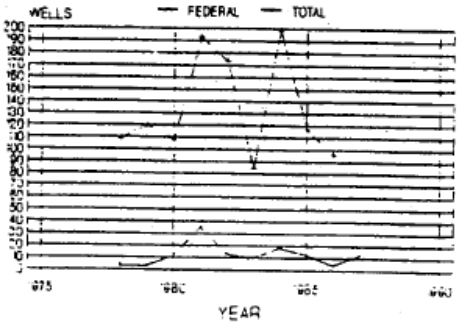


FIGURE 10: TOOLE COUNTY WELLS
FEDERAL VS TOTAL 1978-1987



SOURCES MONTANA OIL & GAS ANNUAL REVIEWS
BLM 1988

TABLE 4

Production by County and Federal Percentage for the HiLine Region 1984

	OIL PRODUCTION			GAS PRODUCTION		
County	Total Oil Production (in BBL)	Oil Produced From Federal Leases (in BBL)	% Fed	Total Gas Production (in MCF)	Gas Produced From Federal Leases (in MCF)	% Fed
Glacier	1,359,188	234,259	17.2	3,062,034	256,428	8.4
Liberty	381,247	277,004	72.7	2,252,765	432,924	19.2
Toole	1,750,933	329,808	18.8	5,884,349	984,420	16.7
Blaine	190,774	46,116	24.2	11,074,172	4,937,400	44.6
Choureau	0	0	0.0	1,126,370	835,416	74.2
Hill	2,175	0	0.0	6,749,471	1,466,112	21.7
TOTAL	3,684,317	887,187	24.1	30,149,161	8,912,700	29.6

Source: BLM, 1988
Montana, Oil and Gas Annual Reviews

of these existing wells are likely to be re-entered and deepened with expectations of encountering hydrocarbons in deeper sedimentary horizons. Little exploration of these older horizons has occurred to date, but hydrocarbons in the older, deeper, Denovian age, Nisku formation have been discovered and produced. The extent to which the deeper zones will add to new production in this area is unknown.

As previously described, the State of Montana has established an oil field spacing pattern of one well per 40 acres for wells 0 to 6000 feet in depth. However, in some fields such as the Kevin Sunburst field (spaced at one well per 4.4 acres) the spacing pattern may vary. Because new oil production anticipated to be discovered in the planning area is expected to be from deeper horizons within existing fields, the well spacing should be a maximum of one well per 40 acres. Therefore, a field of 640 acres would require 16 wells to be fully developed. These wells would be drilled over a 2 to 8 year period if the field were diligently developed and would produce for approximately 20 years. If secondary recovery techniques were employed, additional wells might be drilled for water injection purposes and the life of the existing oil wells would be extended for approximately 5 to 20 years.

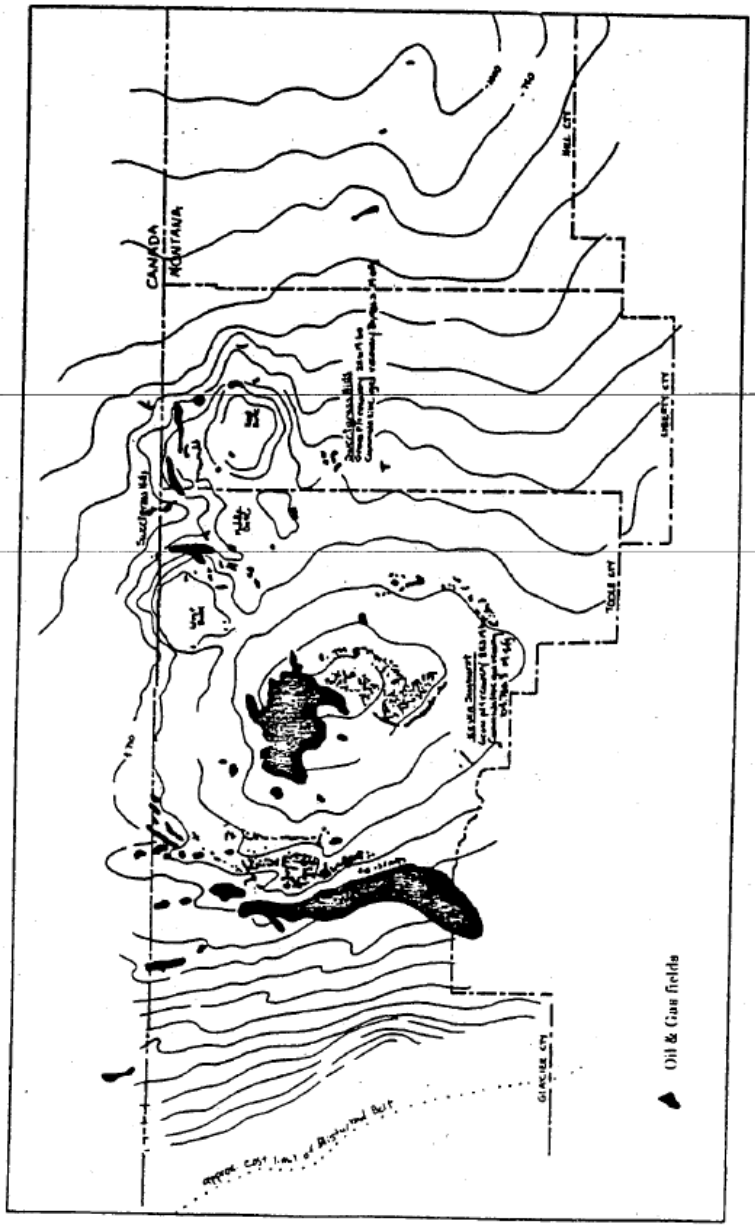
It is anticipated that most of the deeper exploration would occur in the Kevin Sunburst Dome region and at the periphery of other domal structures along the Sweet Grass Arch. The Sweet Grass Arch is a broad regional fold extending through Paleozoic and Mesozoic sediments and running northward from Great Falls into Canada. Present configuration of the arch is the result of Tertiary Laramide uplift. The Kevin-Sunburst Dome is “Imposed” on the west flank and on the crest of the arch. Other minor domes created as a result of sediments being uplifted by igneous (laccolithic) intrusions (Sweet Grass Hills) are scattered along the north central sections of the arch, (see Map 2).

Because crystalline basement rock (non-sedimentary rock very unlikely to contain hydrocarbons) is at a relatively shallow depth (5000 – 6000 feet) except in the extreme western portion of the planning area, future, deeper wells should result in only minor changes in how wells are drilled, the equipment necessary for drilling and completion, and the time necessary for drilling. The physical drilling of a deeper well would require larger equipment and slight modifications to the methods employed. Slightly larger reserve pits and drill pads would be needed and depending upon the production quantities, additional facilities may be required at the surface. With the exception of gathering and transport pipelines, it is not anticipated that additional surface disturbance about that necessary for drilling would be required for production facilities.

H-1624-1 - PLANNING FOR FLUID MINERAL RESOURCES

Example of Reasonably Foreseeable Development Scenario and

Impact Analysis in an Area of High Oil and Gas Potential



Map 2. Oil and Gas fields in the portion of the Sweet Grass Arch found in the West Hi Line Planning Area

With very little data on deep wells in the planning area, it is difficult to predict an average time required to drill to an older productive horizon, but it is estimated at 3 to 5 weeks for an exploratory hole and 10 to 20 days for a development well. Testing, logging and completion are estimated at 3 to 5 days.

Although no large oil field discoveries are expected within the planning area, continued exploration is anticipated. The rate of exploration should be in direct response to the price of oil. With domestic consumption rising and the increasing dependency on foreign oil, we can expect oil prices and domestic exploratory activity to increase over the next decade.

2. Gas Production

The state of Montana sets spacing unit sizes for the production of gas. Although the federal government is not bound by these spacing unit sizes, they are generally recognized. Until recently, most gas fields in the planning region were spaced to allow one well per 640 acres. Within the past several years many operators have requested a decrease in the size of the spacing unit, or for permission to drill an additional well per spacing unit. These requests resulted from data indicating that one well per 640 acres is not effectively draining the gas reservoirs in certain fields. As additional data is obtained, it is probable that more and more fields will be delineated for the production of gas based on one well per 320 acres.

As a result of these spacing changes, a typical, future, HiLine gas field with a surface area of 3200 acres could be expected to require 10 wells to be fully developed. Assuming diligent development, these wells would be drilled over a 5 to 10 year period and the field should produce for 20 to 25 ears. Larger fields will of course require a longer time to develop, thus extending the life of the field. The converse is true for smaller fields. Because 80% to 95% of the original gas in place can be recovered from a typical gas reservoir, no secondary recovery techniques are used.

Further development will continue in the existing gas fields to satisfy contract quotas, as existing individual well production declines due to depletion, and as a result of spacing changes.

Future exploration will most probably occur, as in the past, along the margins of existing fields as stepout wells. These exploratory wells will better delineate the boundaries of existing fields and will probably result in the discovery of several new fields over the next decade. These new discoveries should be comparable in depth, size, reserves and areal extent as existing fields in the area. No new large field, e.g. Tiger Ridge, discoveries would be anticipated within the next 10 to 15 years.

H- 164-1 – PLANNING FOR FLUID MINERAL RESOURCES
Example of Reasonably Foreseeable Development Scenario and
Impact Analysis in an Area of High Oil and Gas Potential

Given a sudden increase in the demand for natural gas or a sharp increase in price, a large exploration or development program throughout the planning area could develop very rapidly. This is primarily due to the relatively shallow existing reservoirs and the accessibility of land in the area. However, one of the major problems with developing and exploring for natural gas in Montana is the inability to transport produced gas to eastern and western markets. The Northern Natural Gas Company and Montana Power Company are continuously expanding their pipeline systems. Because most companies generally will not intensively or diligently drill an area when there is little or no market for the gas, future expansion of this pipeline network should promote exploration and development of new and existing fields, and, whenever necessary, allow for rapid exploration and development of oil and gas resources is the planning area.

3. General Oil and Gas Drilling Activity

Based on past activity and professional judgment it is reasonable to expect at least one cycle of increased drilling
\ activity over the next decade, and for approximately 30 to 35 non-Indian, federal wells to be drilled each year over the next 10 to 15 years. This means approximately 300 to 525 wells could be drilled on public minerals throughout the life of this plan mostly within or around current existing fields. Each of these sites could create an estimated 2 acres of surface disturbance.

Several (2-3) new gas fields approximately 3,200 acres in size and composed of 10 wells each may be developed. No new oil fields are expected but expansion and further development of existing fields is anticipated.

It must be pointed out that future explorations does not necessarily mean an increase in the number of producing wells. Table 5 summarizes the wells drilled throughout Montana (except) for Indian wells) between 1958 and 1986 and clearly illustrated that only a small percentage of exploratory wells are completed as producers. In addition BLM can expect an unknown number of wells to be plugged and abandoned in this time period.

Recent economic conditions within the oil industry resulted in a sharp decline in the number of active exploratory wells and the number of developmental wells. A turn around in the oil industry or an increase in the price of oil purchased from abroad, would spur an increase in oil and gas activity in the planning area. Continued low oil prices and depressed economic conditions would result in an increase in the number of abandonments and a decrease in domestic exploration and development.

TABLE 5
MONTANA WELL SUMMARY FOR 1958 - 1986

	DEVELOPMENT WELLS DRILLED			EXPLORATORY WELLS DRILLED			TOTAL WELLS DRILLED		
YEAR	OIL	GAS	DRY	OIL	GAS	DRY	OIL	GAS	DRY
1958	159	7	46	12	2	109	171	9	155
1959	156	12	71	7	6	101	163	18	172
1960	114	4	58	14	3	150	128	7	208
1961	169	6	60	7	2	173	176	8	233
1962	182	16	57	8	2	154	190	18	211
1963	131	6	60	8	5	152	139	11	212
1964	100	7	109	22	3	150	122	10	259
1965	177	9	107	14	1	199	191	10	306
1966	179	9	96	10	3	185	189	12	281
1967	162	14	104	7	5	191	169	19	295
1968	300	14	89	15	13	509	315	27	598
1969	171	44	105	15	5	466	186	49	571
1970	60	30	63	12	11	272	72	41	335
1971	49	36	34	3	22	323	52	58	357
1972	79	97	87	7	19	435	86	116	522
1973	46	165	100	6	36	366	52	201	466
1974	58	179	212	7	21	265	65	200	477
1975	105	261	222	6	15	236	111	276	458
1976	106	264	169	17	8	223	123	281	392
1977	98	220	188	24	19	129	122	239	317
1978	123	223	232	21	15	179	144	238	411
1979	120	235	182	35	20	211	155	255	393

TABLE 5 (CONT)
MONTANA WELL SUMMARY FOR 1958 - 1986

	DEVELOPMENT WELLS DRILLED			EXPLORATORY WELLS DRILLED			TOTAL WELLS DRILLED		
YEAR	OIL	GAS	DRY	OIL	GAS	DRY	OIL	GAS	DRY
1980	241	203	206	30	12	260	271	215	466
1981	276	133	188	126	85	341	402	218	529
1982	263	145	120	64	46	248	327	191	368
1983	160	55	88	25	16	156	185	71	244
1984	327	99	87	33	21	189	360	120	276
1985	227	84	90	16	2	192	243	86	282
1986	90	81	69	11	10	130	101	91	199
TOTAL	4428	2658	3299	582	428	6694	5010	3095	9993

F. CUMULATIVE IMPACTS OF THIS SCENARIO

This section describes the cumulative impacts, by resource component, of the preceding oil and gas development scenario on public minerals during the life of this RMP.

1. Air Quality

Air quality would be slightly affected locally by all stages of oil and gas development, including exploration, development, production and abandonment. Dust created during road and drilling pad construction increases particulate concentrations in the air. This problem would be worst during dry and windy weather, aggravated by the semi-arid climate and high winds that occur through most of the planning area. These impacts are localized and of short term duration. These concentrations would be relatively minor when compared to the increases from the continued use of roads by oil and gas maintenance personnel, landowners and lessees, and the general public for recreation purposes. Emissions from internal combustion engines would also contribute to particulate loading.

Dust from traffic and smoke and other emissions from vehicles and stationary engines used in the drilling operations would be the primary air pollutants during development of oil and gas wells. During the production stage, potential pollutants such as carbon monoxide, hydrocarbons, nitrogen oxides, sulphur oxides and hydrogen sulfide could occur in separation facilities, during disposal of liquid water and unwanted gas, by the burning of waste petroleum products, by the emission of objectionable odors and by the venting of noxious vapors from storage tanks. Locally significant air pollution could occur during production if a system failure resulted in accidental explosions, blowouts, oil spills or leaks.

Direct air contamination from oil and gas operations would cease on abandonment, but the continued use of roads and trails by the public could produce some dust in the immediate area for years to come.

The future effects of 300-325 new wells on federal lands in the planning area would be primarily from wind generated dust during construction operations and are considered short-term, local impacts.

Cumulatively, impacts to air quality from oil and gas operation in the planning area, have been and will continue to be insignificant.

2. Soils

Soils are usually affected by oil and gas operations in two ways
- Surface disturbances and soil compaction. A third kind of impact, the spilling of fluids on the soil, can also occur.

Soils disturbed by building drill pads, access roads and pipelines would be prone to accelerated erosion because of the removal of protective vegetation and litter cover. Protective cover binds the soil, provides desirable surface texture for infiltration of water and air protects the surface from compaction by raindrops. Wind and water erosion on bare soil surfaces would cause more sediment offsite, creating additional soil cover damage and further increasing erosion. The total effect on erosion would be moderate overall, but significant where surface disturbances occurred on slopes greater than 30% in areas of fragile or unproductive soils (such as those in river breaks).

Soil losses would be more severe if the topsoil were not stockpiled during construction for later use. Impacts would be greatest on shallow, soils of low productivity and on the deep, fertile, highly productive soils on moderately sloping to steep landscapes.

The weight of trucks or other heavy equipment on the ground surface compacts the soil, causing spaces within the soil profile to collapse. The soil is rendered more dense, less porous and less permeable. Compaction often severely reduce the infiltration capacity of the soil, Leading to increased surface runoff and the possibility of accelerated gully and channel erosion. Compaction will also limit vegetation production.

The effects of compaction would vary with soil type, climate and the degree of the compacting potential. Effects would be most severe when soils are wet. This occurs frequently during the spring and early summer months and occasionally during the fall.

Compaction would also be affected by how often trucks or other heavy equipment passed over the surface. Impacts would be significant where access trails were use continuously, particularly during wet periods. Seismic surveys would cause significant impacts when their heavy vehicles passed along survey lines during wet periods.

A third kind of impact on soils could be caused by oil spills or the discharge of salt-enriched water from wells and treaters. These fluids might affect the soil severely in a relatively localized area. Toxic and saline concentrations from the fluids would often be capable of sterilizing the soil.

Oil spills have significant short-term impacts on vegetation, but They break down naturally with time and don't result in serious long-term erosion problems. Salt and water spills which are sometimes associated with oil production can have more serious long-term impacts.

There would be a possibility of localized, severe erosion due to loss of vegetation by oil or saltwater spills or, improper construction. These oil or saltwater spills may flow down slope into drainages.

If the lands associated with oil and gas activity are reclaimed they will reestablish with native vegetation over time. The length of time required for the lands to develop the production capability they had before oil and gas operations where spills occur, is often so great (many decades to centuries), that this is considered a long-term, moderate residual impact.

Depending upon the number of developed wells in a given area, unreclaimed lands could cause a substantial loss in land productivity. Assuming that an average drilling site, including wells, pads, storage tanks, service roads, etc., would disturb an estimated 2 acres of land surface, then, at maximum development, the amount of productive land lost to oil development would likely approximate 32 acres per square mile (5% of 640 acres), or about 6.4 acres per square mile (1% of 640 acres), for lands developed for natural gas production.

Specially, these impacts will occur within the developed oil And gas field boundaries, where impacts could be locally Significant if erosion or spills occur. Overall impacts to the Planning areas would be considered slight.

3. Water

Surface Water - Oil and gas activities could impact surface water quality as erosion and sedimentation are accelerated on disturbed areas. Mitigation outlined in current oil and gas regulations and policies will lessen these impacts. The average disturbance per well sits is estimated at 2 acres. The 995 existing wells and 525 potential wells would result in a total disturbance to approximately 3,000 acres. The cumulative impacts of any accelerated erosion on these 3,000 acres to water quality will be insignificant when compared to the erosion and sedimentation occurring on the entire 626,098 acres is the planning area.

Produced water in the planning areas has a total dissolved solids (TDS) content ranging from 3,000 parts per million (ppm) to 10,000 ppm. Water with a TDS concentration less than 7,000 ppm Is suitable for livestock use and has been used for that purpose

in several locations is the planning area. All water produced from oil and gas wells is disposed of in accordance with HTL-2B regulations.

Produced water not used for livestock is evaporated from pits. Pits may be lined if the produced water is higher in TDS concentration than the nearest aquifer. Wells producing greater than five barrels per day on a monthly average are required to inject the produced water back into the formation from which it came. EPA regulates this underground injection control program.

Accidental spills are reclaimed in accordance with existing contingency plans as are any other unforeseen accidents.

Due to existing regulations and contingency plans, cumulative impacts to surface water quality are expected be insignificant.

Ground Water – As with surface water, existing regulations governing drilling, plugging and abandoning oil and gas wells will lessen impacts to ground water quality.

Produced waters and enhanced recovery waters are injected back into the aquifers from which they came under EPA regulations.

Evaporation ponds cannot store water with TDS concentrations greater than that of the nearest aquifer unless lined. If a leak should develop in a liner, contingency plans exist which require the oil or gas company to reclaim the impacted aquifer.

Cumulative impacts to ground water quality from oil and gas activities are expected be insignificant.

Seismic Exploration – Regulations governing seismic exploration activities do not exist to the extent they do for other oil and gas activities. Impacts to surface water quality are not expected to be significant. However, impacts to ground water quality and quantity would be locally significant.

Shallow (less than 500 feet deep) stock and domestic wells have the greatest potential for being impacted by seismic activity. Underground detonations could cause cross contamination of aquifers, reduced water yields, or lowered static water levels.

Cumulative impacts from seismic activity to ground water quantity and quality is not expected to be significant, but localized significant , but localized significant impacts could occur.

4. Cultural Resources

Cultural sites could be affected by the loss of the opportunity

to examine artifacts in their true relationship with one another and the destruction of features, particularly in areas where there is a high concentration of sites. Most of these impacts are created by the surface disturbances associated with oil and gas exploration and development. Generally, the specific locations of oil and gas developments are somewhat flexible, so most impacts to cultural resources can be avoided by relocating the developments. If this is not possible, mitigation would be prescribed for significant sites in accordance with BLM policy and federal regulations.

5. Vegetation

The direct impacts to vegetation from oil and gas operations would come from destruction of the vegetation caused by construction of seismograph trails, drainage crossings, drill pads, roads, pipelines and other facilities.

Site specific impacts to vegetation would vary from moderate to significant depending on the stage of oil and gas development and site location.

Potential offsite impacts to wetland vegetation could occur because of siltation of streams from surface disturbances, increased water temperatures from treater facilities, contamination of water by oil spills and release of chemicals into surface drainages. These impacts are considered minor because stipulations applied during seismic, exploration and production phases require avoidance of sensitive areas.

Invader species and noxious plants might replace native species on some disturbed sites exposed to a seed source. The spread of invaders to offsite areas would have a negative effect on the composition of vegetation. The vehicles and equipment used during oil and gas exploration and development could spread noxious plant seeds. The rehabilitation of the area and the seeding of native specifies suitable to the soils and climate would reduce the time required to replace present plant composition if overrun by invader annuals and perennials. Despite weed control and rehabilitative seeding, noxious plants would crop up in most areas.

The length of time required for restoration of native species would depend upon the composition of the vegetation disturbed. Grassland vegetation types can usually be restored within five growing seasons, so he negative impact would be short-term. Sagebrush and other wood vegetation communities generally require more time for rehabilitation. Stable pre-disturbance vegetation communities should be present within 20-30 years.

The length of time needed for rehabilitation, in this case, would be dependent upon the condition of the site. Current disturbance Is generally found in grassland communities and the future development of 300-525 wells is expected to occur in similar areas. Thus, vegetation will sustain locally moderate impacts until sites are reclaimed. However, these impacts are considered minor overall.

6. Fire

Historically, fire occurrences in this area has been very low. Through a combination of climatic, topographic and vegetative factors, wildfires aren't a common occurrence.

Prescribed fire, being considered for this area, would not create any unreasonable problems for planned burning. Additional access Into previously unaccessible areas would help by providing access for suppression. This mineral development scenario over the next 10-15 years would have minor, if any, impact on the fire presuppression and suppression program.

7 Grazing Management

Potential offsite impacts could occur from increased erosion, resulting in increased siltation. These impacts are minor and are reduced when proper rehabilitation is accomplished.

Impacts to livestock grazing would also include a loss of forage as a result of the trampling effect of seismograph crews, surface disturbance from blading access for crews, the construction of drilling pads, and the surface disturbance resulting from construction of permanent access to developed sites. Locally moderate negative impacts would occur from surface disturbing operations until reclamation has been accomplished.

A short-term loss of 286 AUMs would occur from an anticipated average of 1,000 active unreclaimed wells throughout the life of the plan. If the current 1,000 wells and the additional 300-525 well sites all remain active and unreclaimed, this would represent a temporary loss of 429 AUMs. Some of these AUMs would be lost permanently due to the construction of permanent roads. This is considered a minor impact to grazing management.

8. Wildlife and Fisheries

All stages of oil and gas operations directly affect wildlife. Habitat destruction by the construction of drilling pads and access roads is approximately 1,990 acres (995 wells with 2 acres of disturbance each) and could increase by an additional 600 to 1,050 acres (300-525 wells) during the life of the plan, This

impact is minor considering the area contains 391,000 acres of crucial and high value habitat for numerous specifies. Not all drilling is expected to occur within the crucial and high value habitat.

The major impact of past and present development has been the disturbance of wildlife populations by oil and gas drilling crews and the opening of new, previously undisturbed areas to the public by the creation of access roads. This impact is expected to continue. However, the BLM would have the option of closing new access roads that occur in crucial and high value habitat.

a. Big Game

Habitat loss by the construction of drilling pads and access Roads would be minor. However, building roads and facilities into crucial big game habitat could increase human disturbances during crucial periods is the life cycle of the species involved (mule deer, antelope, white-tailed deer, and bighorn sheep). Crucial fawning areas and winter ranges might be avoided by game if these disturbances became intolerable. These impacts could be offset by seasonal restricts as stated in the RMP. In addition, roads into important habitat could be closed following drilling activities. The cumulative impacts from this disturbance would be minor.

b. Upland Game Birds

The breeding and nesting activities of sage grouse and sharp-tailed grouse could be disturbed during the exploration stage. Seismic activities and well drilling could disturb mating activities occurring on lakes and could also disturb nesting activities causing abandonment. Nests could also be directly destroyed by exploration rigs and construction equipment. These disturbance factors are minimized by continuing the implementation of the RMP stipulations which restrict drilling within 500 feet of known lakes and provide for special care in avoiding nesting areas between March 1 and June 30. Habitat losses based on past disturbances would be minor.

Increased access into previously undisturbed areas would increase harassment and mortality of these species. This, however, would only be during the average 3-5 day drilling period and roads could subsequently be closed for dry holes in important habitat. Overall cumulative impacts would be minor.

c. Waterfowl

Exploration and seismic activities would cause little direct mortality to waterfowl. However, these activities could disturb nesting activities, potentially causing abandonment. accidental oil spills into aquatic habitats would trap or poison birds land on the impacted bodies of water. These substances would also destroy food and cover used by waterfowl species. During development, meeting cover near aquatic habitats would be destroyed, causing a slight reduction in waterfowl populations. Reservoirs, seeps and other water sources serving as waterfowl habitat could be altered by construction. However, these impacts would be offset by the stipulations in the RMP which restrict drilling activities within 500 feet of reservoirs, lakes and ponds. Additional production would be lost if human activities discouraged nesting, which could happen during any stage of oil and gas operations. Overall, cumulative impacts would be minor.

d. Nongame

Small mammals would be killed by excavations, especially during drilling and development. Road construction and more vehicle travel through an area would result in more vehicle small mammal collisions. Indirect mortality from habitat loss would be severe on particular sites, if the entire home ranges of small mammals were destroyed. Based the small amount of acreage involved, impacts would be minor.

Bird nests and young birds would be destroyed during exploration, drilling and field development. Road kills of small birds and raptors would increase by the construction of new roads and increased vehicle traffic. Indirect mortality of nongame birds from habitat loss due to construction would occur, this loss would be in proportion to the importance and type of habitat destroyed. Persistent human activities near raptor nests could force these birds to abandon their nests and possibly their offspring. These impacts however, would be offset by the application of buffer zones as described in the "Rocky Mountain Front Raptor guidelines", (see Appendix 2.2).

Although little is known about the herpetofauna and invertebrates present in the RMP area, human disturbance habitat loss would be expected. Based on past oil and gas activities is the area, cumulative impacts to nongame species would be minor.

e. Threatened and Endangered Wildlife Species

Oil and gas operations could affect threatened and endangered species slightly. Although, there is no known ferret population in the RMP area, human disturbance from oil and gas activities could disturb potential habitat during the 3-5 day drilling period. Following that time, disturbance would be minor. The RMP stipulates no drilling could occur within 100 feet of black-tailed prairie dog towns, thereby minimizing loss of potential ferret habitat. The impacts to black-footed ferrets would be minor.

Impacts to the bald eagle and peregrine falcon would be minimal since these species' critical habitat is protected by the stipulations in the RMP. Disturbance from drilling and exploration to piping plovers could occur during the nesting period causing abandonment. The likelihood of drilling occurring in critical piping plover habitat, namely alkali wetlands and gravel shorelines of lakes and rivers, is slight. The buffer zone of 500 feet around reservoirs, lakes and ponds would also protect nesting habitat. Based on past drilling activities, impacts to T&E species would be minor.

f. Fisheries

Impacts to fisheries within the RMP area include accidental release of toxic substances into the water, accelerated erosion into fisheries habitat from construction of drilling sites and access roads, and the release of water from wells into fisheries habitat resulting in a change of water temperature to intolerable levels for some species of fish. All these could directly influence fish populations and the Aquatic organisms they eat.

To date no significant negative impacts have occurred on any fishery with the RMP area from oil and gas activities. This is primarily due to the fact that no activity is allowed within 500 feet of a known fishery, as stated in the RMP. Therefore, future impacts to fisheries by oil activities would be minor.

9. Recreation

The main recreational opportunities on public lands in the RMP area are hunting, fishing, sightseeing, dispersed off-road vehicle (ORV) use, hiking, camping and boating along the Upper Missouri National Wild and Scenic River. Current recreational opportunities range from those associated with undeveloped primitive settings in extensive recreation management areas to those found in highly roaded and developed settings in special

recreation management areas. Recreational use is expected to increase in the planning area over the next 20 years as an increasingly urbanized population seeks wildland recreation, new types of recreational equipment, more leisure time, and the number of retired people increases.

The seismic exploration stage often results in cross country travel and high blading of seismograph roads. This might lead to more ORV use by hunters and other recreationists in designated open ORV areas, a beneficial impact to ORV enthusiasts, but a negative impact to those desiring pristine, undisturbed areas. These negative impacts would be minor in the Kevin-sunburst and Cut Bank fields, moderate in the Sweet Grass Hills field and have the potential to be significant in the Leroy field and along the Upper Missouri National Wild and Scenic River.

The short-term impacts of dust from more traffic and noise from exploratory drilling would cause relatively minor disturbances , New roads would allow increased access by hunters and campers to previously remote areas. More use would cause indirect impacts, i.e, increased erosion, the greater possibility of destruction to cultural resources and increased hunting pressure. It should be noted that the effects would be of long duration.

Impacts on recreation from oil and gas activities, particularly in field development, revolve around the change in recreational opportunities from those found in a natural setting to those in a roaded industrialized setting such as may be found in oil fields with closely spaced wells, structures, access roads, pipelines, etc. These tend to be long-term impacts. The gas fields with shallower drilling depths and wider spacings would have much less impact. The impact on recreational quality would depend upon the capacity of these special recreation management areas to support the additional demand with the majority of the impacts being minor.

The major site specific impacts from oil and gas development and production would be increased recreational access, disturbance of primitive values and the possible increase in ORV use. Access roads provide corridors of use and sometimes improve hunting harvest. As can be imagine, roadless areas (whether designated wilderness study areas or not) would be affected by development. Although there are safety hazards in oil fields (noxious fumes, heavy equipment and potentially explosive chemicals), the impact would be insignificant. Intensively used areas also affect recreational uses like hunting, hiking, camping and sightseeing, which depend in some degree on solitude. These negative impacts would be most severe in special recreation management areas. Oil fields would cause more severe impacts than natural gas fields because of the need of the former for water pits, horsehead pumps, tank facilities and the closer spacing requirements.

based on the location of existing fields in relations to areas of high recreational opportunities, the cumulative impacts of past, present and future oil and gas activity on recreation would be regarding as a minor, though long-term impact.

10. Visual/Aesthetics

The possibility of either beneficial or adverse visual impacts would depend entirely on the location of the 300-525 new wells and the 2-3 new gas fields that might be developed.

If there is a decision to less portions of the UMNWSR during the life of this RMP, any exploration or field development activity within or visible from the river corridor would have a significant short or long-term negative impact, on river visitor expectations and on the natural integrity of the landscape.

The visual impacts from exploratory drilling would include the construction of roads and pads. As long as steep cuts are unnecessary, exploratory drilling would have moderate or minor impacts on the form and line of the landscape and vegetation. Steep cuts are difficult to reclaim and leave visible scars which could be a significant negative impact.

The most significant visual impacts from oil and gas operations would be from the development and production stages. The visual effects of development drilling would be significant immediately around the well. Within a known geologic structure where there is a lot of drilling, the landscape may become industrial in character, at least in the foreground. The use of visual resources management guidelines and landscape design can mitigate many of the adverse impacts. Although the field development stage would still be noticeable, it could be designed to be as unobtrusive as possible.

During the abandonment stage the landscape should be restored, the vegetation reseeded, roads may be put to bed and some production facilities removed.

Generally, the visual resources of the area would be improved after abandonment. In areas like the Missouri Breaks, however, reclamation might be a slow process. Many of the fields might not be abandoned for at least 20 years. There are currently 995 unreclaimed wells with an average disturbed area of 2 acres. The cumulative visual impact would be minor although it could be locally significant in the river corridor and the three WSA's.

11. Wilderness

There are three Wilderness Study Areas (WSAs) within the RMP area that are managed under BLM's Interim Management Policy (IMP): the Stafford WSA (4,800 acres), the Ervin Ridge WSA (10,200 acres) and the western portion of Cow Creek WSA (17,000 acres).

Wilderness values would be affected by oil and gas exploratory drilling and development on pre-FLPMA leases. Drilling rigs might cause significant negative impacts to the audible and visual values for the duration of the operations. Surface disturbances, an average of 2 acres per well, would also cause visual impacts, depending on the depth of the well and the topography of the area. These negative impacts could be mitigated by rehabilitation. The post-FLPMA leases have stipulations and mitigative requirements which would restrict or prohibit impacts which could adversely affect the wilderness values.

The Stafford WSA doesn't have any pre-FLPMA leases and only 260 acres in the post-FLPMA category. The Ervin Ridge WSA has 1,740 acres under pre-FLPMA leases (17% and 3,738 acres (37%) under post-FLPMA. The Cow Creek WSA has no pre-FLPMA leases but does have 7,230 acres under post-FLPMA category.

Seismic exploration (the presence of aircraft, vehicle tracks, shot hole cuttings, explosions, and other sounds, dust plumes from explosives, litter) would create minor impacts. These operations, resulting in an apparent loss of the natural integrity of the area and a noticeable loss of solitude, would impact wilderness values negatively for anywhere from a few seconds (in the case of noise) to several years (in the case of trash and surface disturbances).

All motorized vehicles in the WSAs are restricted to designated roads, trails, and ways. No cross-country travel is permitted except for administrative use on a case by case basis. Heavy secondary use and maintenance operations along these existing routes would create a minor negative impact.

12. Economic and Social

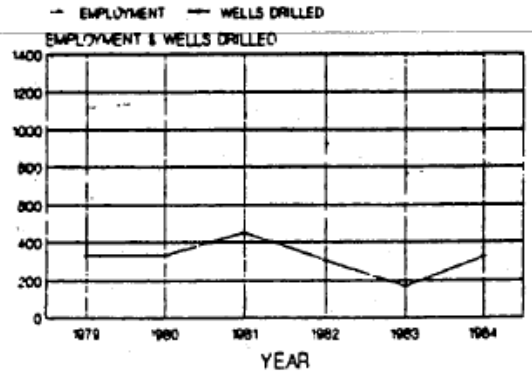
Currently, there is an established oil and gas industry in the planning area with producing oil and gas fields, support services, and one refinery in Cut Bank. All phases of oil and gas activities have occurred in the planning area (i.e., seismic exploration, exploratory drilling, field development and production, and oil refining).

Example of Reasonably Foreseeable Development Scenario and

Impact Analysis in an Area of High Oil and Gas Potential

In 1984, this industry provided 800 jobs in the oil and gas sector and an estimated 2,400 jobs in other sectors of the economy. Oil and gas production from federal leases in 1984 accounted for an estimated $72.3 million in business activity, $14.4 million in earnings and 770 jobs in the economy. Since oil and gas activity on federal mineral estate is expected to remain relatively constant, with one cycle of increased drilling activity, the economic importance of this industry should not change significantly during the next 10 to 15 years due to foreseeable development of federal minerals. Figure 11 shows the mining employment and oil/gas wells drilled in the Northern Montana Region from 1979 to 1984. Mining employment in this region is primarily in the oil and gas sector. Any increase in earnings and employment, due to oil and gas activities, would improve economic prospects. Most people and community leaders are currently trying to attract new basic industries into the area.

FIGURE 11: MINING EMPLOYMENT IN RELATION TO WELLS DRILLED IN THE NORTHERN REGION



SOURCE: REGIONAL ECONOMIC INFORMATION SYSTEM, BUREAU OF ECONOMIC ANALYSIS APRIL, 1988

The economic impacts of future oil and gas activities on the local economy are difficult to assess because of the uncertainty of the extent or spatial distribution of potential oil and gas activities. Generally, the regional economic impacts are greater than the local impacts, due to the capital intensive nature of oil and gas activities (although other social effects are more noticeable locally). Expenditures for oil and gas equipment, supplies and management skills are often made outside of the

local economy. In the case of seismic exploration and exploratory drilling, expensive equipment, managerial skills, and quite often the labor are brought in from outside the local area. When an exploratory well costing $10 million is drilled, this does not mean that all of the $10 million is circulated through the local economy. Similarly if production occurs and the oil and gas is shipped to a destination outside the local area for refining, the sales from the products are not circulated through the local economy. Only when extensive drilling occurs, or a refinery or gas plant is built locally, will the local area experience significant economic gains.

The economic and social effects of oil and gas activities might include the displacement or diversification of other economic activities. For example, earth-moving contractors may modify their operations to meet the growing demand for drill pad construction. This normally results in increased job opportunities, higher average incomes, and local population growth. Often, the social, emotional, or economic well-being of some people is enhanced while other persons are adversely affected.

Many communities will experience exploration, but relatively few will have development and production in their immediate vicinity. The range and intensity of possible effects from exploration usually occur in the vicinity of field operations. Local residents see or hear trucks, drill rigs, and construction activity. Exploration involves relatively few personnel who spend several weeks or months in any specific place. About 15 to 30 full-time workers would be associated directly with drilling operations for a single well, depending on depth and location. These workers include the drill rig crew, mud loggers and tool pushers. Local expenditures depend upon the availability of oil and gas services and support additional jobs in construction, transportation, oil/gas services, and retail trade.

Many communities in the planning area have experienced this activity in the past. This exploration phase, if moderate in scale and properly conducted, will normally produce minor economic and social impacts.

Exception to the usually low-key pattern of exploration often occur during short-term increases in drilling activity or following the discovery of a new gas field. Exploration activity will intensify as more companies send in field crews. The sounds of truck, helicopters, and explosives become more evident, as will the increased demand for motels, bars, restaurants, service stations, medical services, and other facilities.

Example of Reasonably Foreseeable Development Scenario and

Impact Analysis in an Area of High Oil and Gas Potential

Following a discovery, drilling crews will remain in one area months to years to drill additional wells, and other personnel will be needed to construct and repair equipment. Development of a new gas field (e.g., 2 to 10 wells) could result in an estimated 80 workers associated with this stage of activity and another 50 jobs in construction, transportation, oil/gas services, and retail trade. At this stage, social impacts will become more evident.

Communities experience variations in the oil industry work force, expanded local employment opportunities, increased business activity, and greater demands for housing and public services. The influx of workers and their families will induce further economic and social changes in local institutions, traditions, life-styles, and community leadership patterns, especially in rural areas.

In most situations, if a new gas field is discovered near existing oil and gas fields and support services the economic and social impacts would be minor. The exception would be a major gas discovery. If a new gas field is discovered in an area without existing oil and gas fields, the impact could be moderate to significant depending on the level of development.

Petroleum operations are viewed by some people as inconsistent with other resource uses. They wish to preserve the scenic values and diverse opportunities for outdoor recreation. Frequent reasons for supporting oil and gas activities include the legal right to extract minerals from public lands, the national energy need, and the economic boost that new development provides.

Oil and gas operations can have an impact upon land use. These effects are generally centered in the communities nearest the oil and gas fields. By occupying the land, oil and gas companies could prevent or delay the disposal of private lands and subsequent transfer of ownership. Oil and gas operations can also affect land use by taking land out of forage or agricultural production; however, the acreage is usually very small.