Inventory of Assessed Federal Coal Resources and Restrictions to Their Development

IN COMPLIANCE WITH THE ENERGY POLICY ACT OF 2005, P.L. 109-58 §437

Prepared by the
U.S. Departments of Energy, Interior and Agriculture

August 2007

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EXECUTIVE SUMMARY

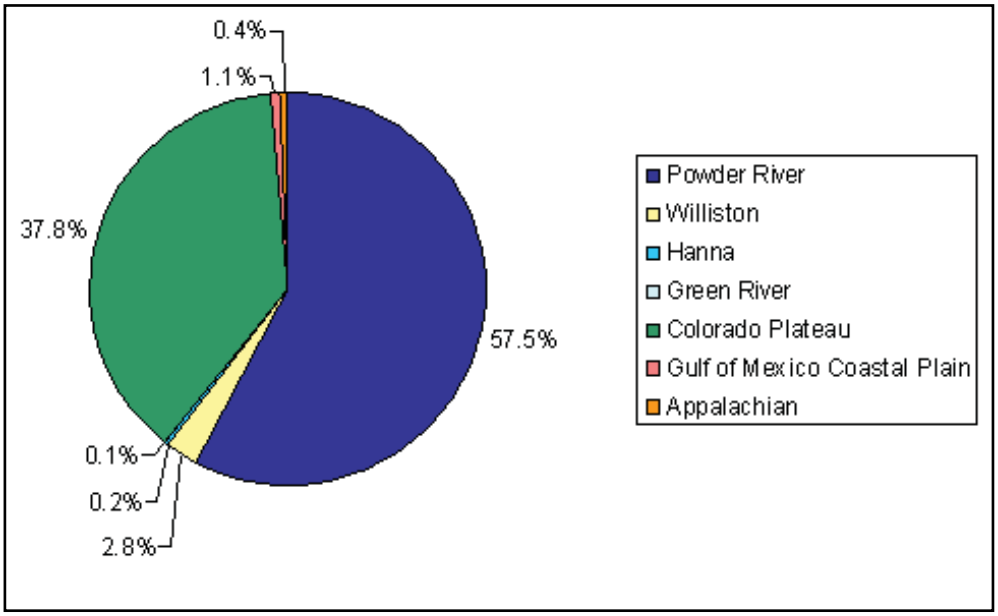
Section 437 of the Energy Policy Act of 2005 (EPAct) directs the Secretary of the Interior, in consultation with the Secretaries of Energy and Agriculture to conduct an inventory of coal resources underlying Federal lands. Further, EPAct directs the Secretary of Energy to submit a report to Congress containing the inventory and update it as the availability of data and developments in technology warrant.

Under Section 437, the Inventory shall identify Federal lands that are presently available for coal development and the extent and nature of any restrictions on the development of coal resources on those lands. Section 437 of EPAct also calls for the identification of compliant and supercompliant coal resources where sufficient data exist. Compliant and supercompliant coal resources are defined in terms of sulfur dioxide content per million British thermal units (BTU). Analysis of existing information indicates that data are either lacking or of insufficient density to facilitate a scientifically robust spatial analysis/allocation of this parameter.

Additionally, assessments in Alaska are not included in this Inventory. While Alaska has vast coal resources, much of which are Federally owned, digital data for Alaskan coal ownership are not currently available, a small fraction of the basins and fields are assessed, and planning has either not been done or coal leasing planning deferred until leasing interests are provided.

Based on recent United States Geological Survey (USGS) assessments, Federal coal resources in the United States total 957,000 million short tons (MST), as shown in Figure ES-1. The Powder River Basin (PRB or Basin) is the location of the most complete datasets needed for determining the restrictions on the development of Federal coal assessed and, as a consequence, is the focus of the effort reported herein. The Inventory will be updated as additional information from other areas becomes as complete as that of the PRB.

Figure ES-1. United States Federal Coal in USGS Assessments by Basin



The PRB contains nearly 58 percent (over 550,000 million short tons) of the total Federal resources currently assessed. In recent years, of the coal produced from Federal lands, 88 percent comes from the PRB, and the Basin is also the most active location for Federal leasing. The Bureau of Land Management received eight lease applications for 26,050 acres containing 3,400 million short tons of coal in the PRB alone in 2006 (more than three years of the national annual average consumption). A map of the PRB study area is depicted in Figure ES-2 showing Bureau of Land Management (BLM) Field Office (FO) boundaries and Forest Service (FS), Department of Agriculture areas.

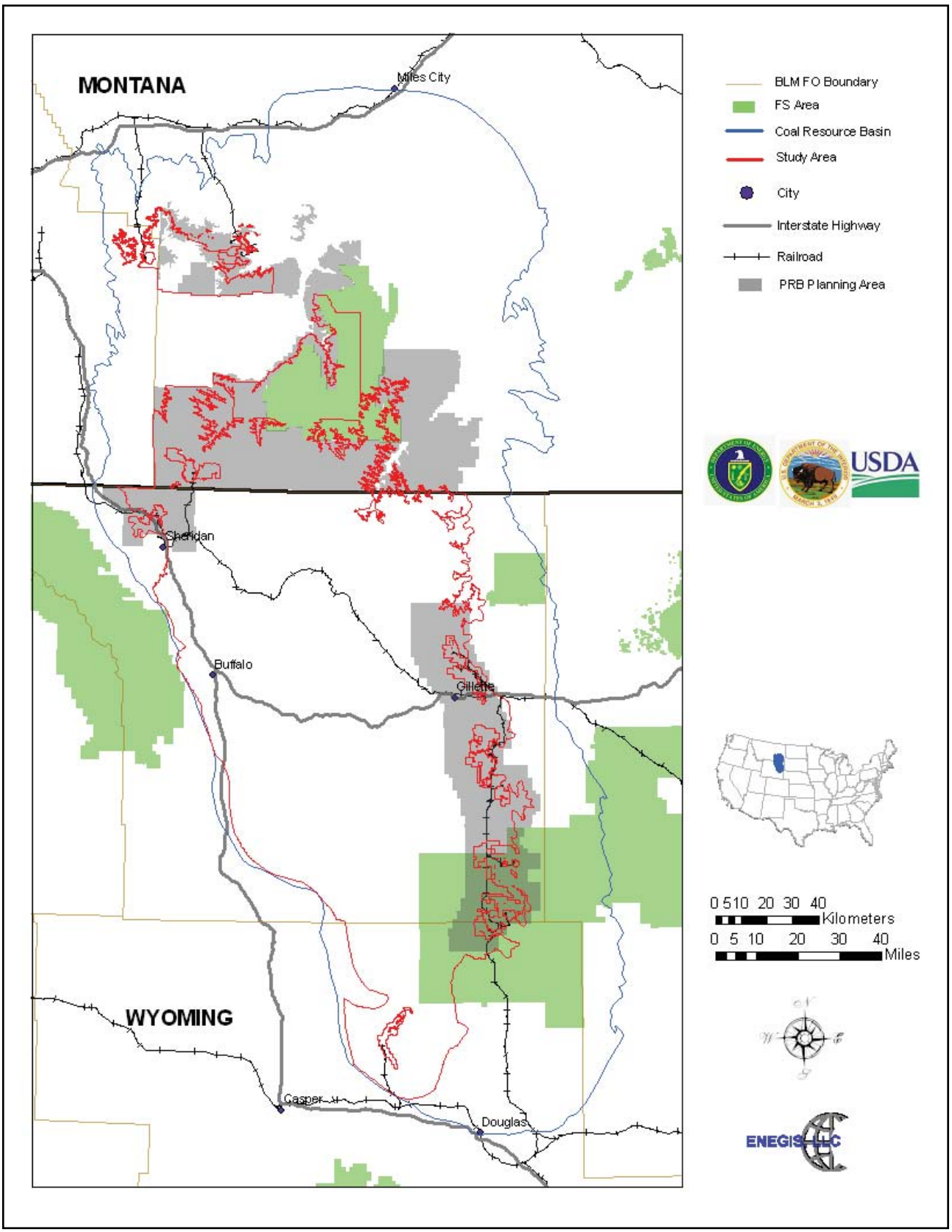
This Inventory provides information regarding the geographic relationship between coal resources and the constraints that govern their development in the Powder River Basin. It is not a reassessment of any restrictions themselves on the development of coal resources. The public's opportunity to participate in any change of restrictions on coal development activities will occur during the land use planning or legislative process. This Inventory provides some basic information for any such process. Additional information may be available from monitoring and scientific studies incorporated into adaptive management processes.

All Federal coal must be included in a land use plan prior to leasing. These coal leases, including those issued with only the standard lease terms, are subject to full compliance with all laws and regulations. These laws establish the restrictions and impediments encompassed in this Inventory and include, but are not limited to, the National Environmental Policy Act, Clean Water Act, Clean Air Act, Endangered Species Act, Surface Mining Control and Reclamation Act, Federal Coal Leasing Amendments Act of 1976, Mineral Leasing Act of 1920, and National Historic Preservation Act.

This Inventory was prepared under the lead of the Department of Energy (DOE). Senior professionals from the DOE Office of Fossil Energy (National Energy Technology Laboratory) and Energy Information Administration, Department of the Interior's Bureau of Land Management and USGS, and the Forest Service were the major contributors. The DOE provided technical expertise to guide the design and analysis process for the Inventory. USGS provided the assessment of coal resources beneath Federal lands. Field offices of the BLM and the FS contributed their land use planning information regarding coal availability and leasing requirements for the lands under their respective jurisdictions.

This Inventory is based on information that has been previously developed through the scientific and planning processes of the contributing Federal agencies. This information has in large part been provided to the public for its review and use and is the best that is commercially and scientifically available. It has been compiled and analyzed by experts from the contributing agencies. The analytical methods and protocols used in this study have been subjected to rigorous review. The study necessarily incorporates the assumptions, conditions, and limitations of the supporting scientific information as discussed in this report.

Figure ES-2. Powder River Basin Study Area



The Inventory examines the Powder River Basin, the major producing area of Federal coal in the United States. The Inventory encompasses almost 7 million acres (10,900 sq. mi.) of land in the PRB. Of this, the Federal mineral estates (Federal coal ownership) total 5.4 million acres (8,400 sq. mi.), of which 4.5 million acres (7,030 sq. mi.) underlie non-Federal surface (split estates lands).

This analysis of constraints to development centers on three factors that affect the development of coal resources on Federal lands. These factors are (1) whether the lands are statutorily available for leasing, (2) whether there has been land use planning to determine future leasing of the area, and (3) the degree of access afforded by leasing restrictions and other conditions on lands where land use planning has been completed. All coal leases are subject to a baseline level of constraint governed by statutory and regulatory requirements. These restrictions serve many purposes, ranging from the protection of environmental, mineral, social, historical, or cultural resources or values, to the payment of rentals and royalties.

To focus the analysis of constraints on coal development, the Inventory evaluates the Federal lands where: (1) leasing and development is permitted under standard lease terms and conditions; (2) leasing is permitted with varying limitations on access, from required surface mitigation to no surface operations; and (3) coal leasing and development is precluded or prohibited. The Inventory considers exceptions that may be granted to restrictions after a review of on-the-ground conditions. It also considers the potential for surface mining utilizing current technology, then designates the remaining coal resources as beyond conventional surface mining technology.

The results of this Inventory for the Powder River Basin (Table ES-1, Figure ES-3, and Figure ES-4) are summarized below. The results below exclude areas containing unmined coal currently under development (leased coal or coal resources under Lease by Application (LBA)), which comprise an estimated 11,600 million short tons, as shown in Table ES-2. The environmental work for that portion of the resource has already been performed or is under administrative review. As such, the remainder of the Inventory examines the subset of the resource base for which the final environmental work has yet to be performed.

- Total assessed Federal coal resource acreage, including split estates, total 5.4 million acres (8,400 sq. mi.).
- Undeveloped assessed coal resources total 550,000 MST.
- Approximately 1.5 percent (82,000 acres (128 sq. mi.)) of assessed Federal coal resource acreage is available for mining under standard lease terms (Figures ES-3 and ES-4, Category 7). Based on resource estimates, these lands contain 5 percent (27,000 MST) of the Federal coal.
- Less than 1 percent (12,000 acres (19 sq. mi.)) of Federal mineral estate is available for mining with mitigation measures (Figures ES-3 and ES-4, Category 6). Based on resource estimates, these lands contain 1 percent (3,000 MST) of the Federal coal.

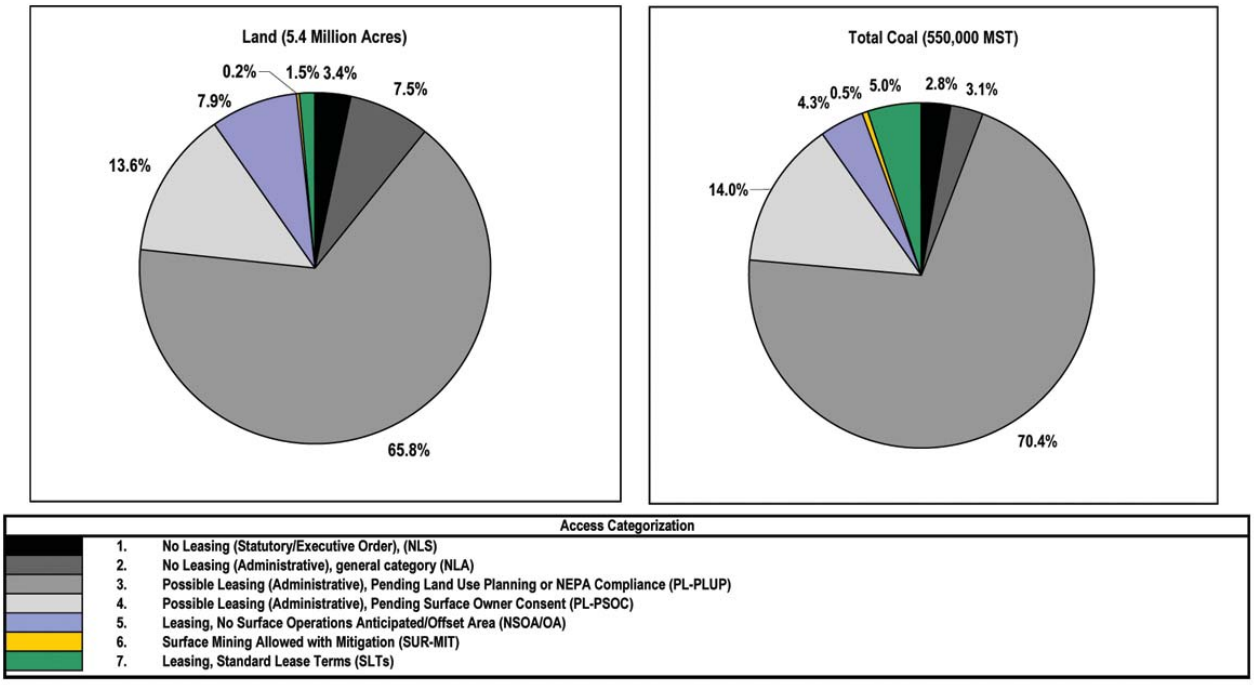
Table ES-1. Summary of Inventory Study Area—Powder River Basin Federal Land and Coal Resources by Access Category

Access Category	Area		Coal Types				Total Coal	
			Hypothetical	Inferred	Indicated	Measured		
	(Acres)	Percent of Federal	(MST)*	(MST)	(MST)	(MST)	(MST)	Percent of Federal
1. No Leasing (Statutory/Executive Order), (NLS)	184,385	3.4	245	9,636	4,524	872	15,277	2.8
2. No Leasing (Administrative), general category (NLA)	406,172	7.5	280	10,494	5,064	1,043	16,880	3.1
3. Possible Leasing (Administrative), Pending Land Use Planning or NEPA Compliance (PL-PLUP)	3,571,162	65.8	28,875	243,230	93,926	21,435	387,466	70.4
4. Possible Leasing (Administrative), Pending Surface Owner Consent (PL-PSOC)	738,827	13.6	–	29,919	37,471	9,128	77,045	14.0
5. Leasing, No Surface Operations Anticipated/Offset Area (NSOA/OA)	430,941	7.9	515	12,506	8,756	1,864	23,640	4.3
6. Surface Mining Allowed with Mitigation (SUR-MIT)	12,208	0.2	–	179	1,744	739	2,662	0.5
7. Leasing, Standard Lease Terms (SLTs)	81,962	1.5	255	9,148	14,156	3,676	27,235	5.0
Total Federal	5,425,657	100	30,696	315,113	165,641	38,757	550,206	100.0
NonFederal	1,403,858		10,589	52,881	28,135	5,875	97,480	
Total	6,829,515		41,285	367,994	193,775	44,633	647,686	

* Million Short Tons

- Approximately 8 percent (431,000 acres (673 sq. mi.)) of Federal land is accessible in areas with no surface mining anticipated or under offsets (Figures ES-3 and ES-4, Category 5). Based on resource estimates, these lands contain 4 percent (24,000 MST) of the Federal coal in the basin.
- Approximately 14 percent (739,000 acres (1,154 sq. mi.)) of Federal land is not available for leasing without Federal surface management agency or qualified surface owner consent (Figures ES-3 and ES-4, Category 4). Based on resource estimates, these lands contain 14 percent (77,000 MST) of the Federal coal in the basin.
- Land use planning screens have not been applied to approximately 66 percent (3.6 million acres (5,600 sq. mi.)) of Federal coal estate (Figures ES-3 and ES-4, Category 3). Based on resource estimates, these low current development interest (coals deeper than a 10:1 strip ratio) lands contain about 70 percent (387,000 MST) of the Federal coal assessed by the USGS.

Figure ES-3. Chart of Results, Powder River Basin Study Area—Total Federal Land and Coal Resources by Access Category

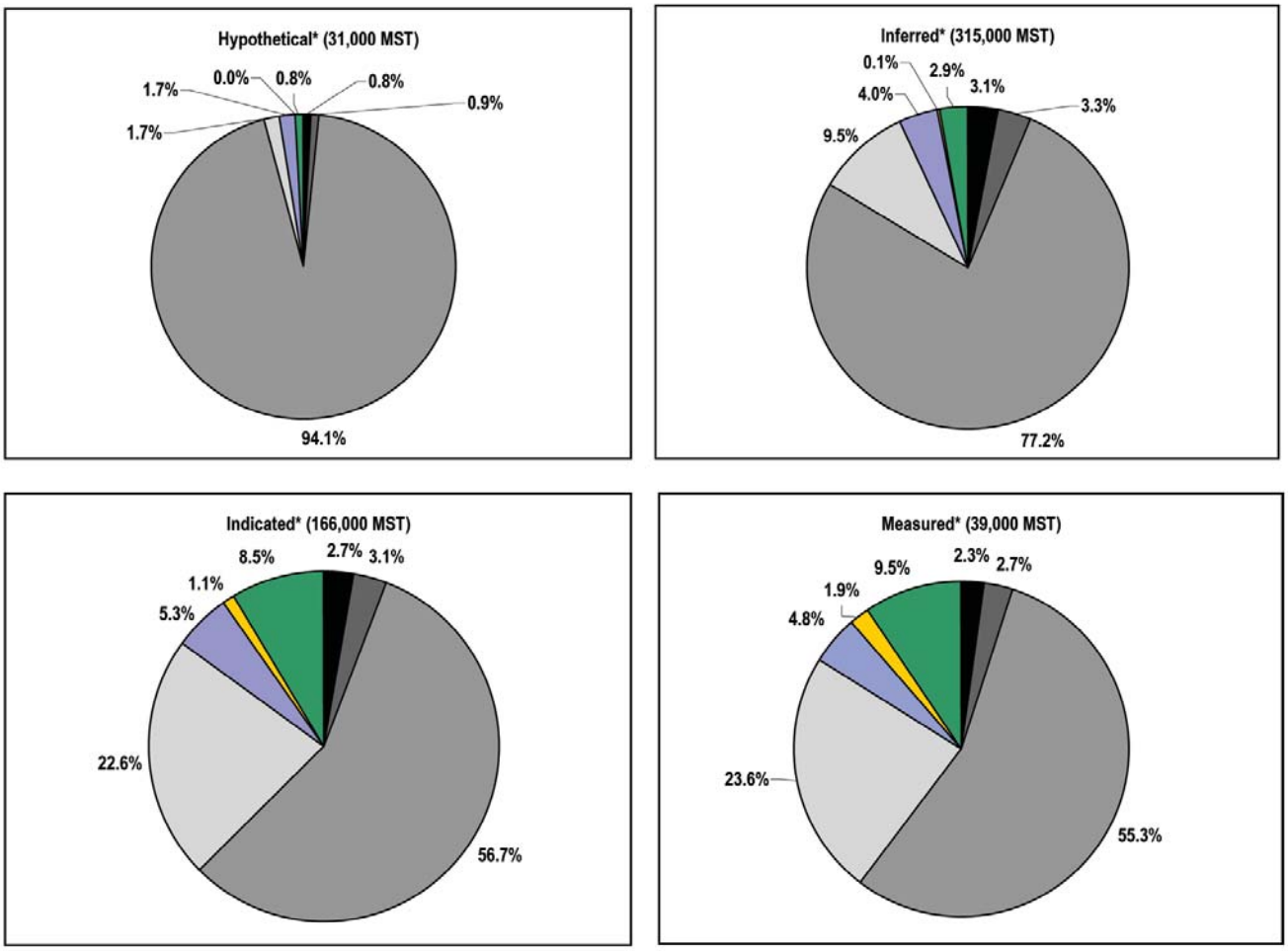


- Approximately 8 percent (406,000 acres (635 sq. mi.)) of Federal land is not being leased as a result of local land use planning decisions (Figures ES-3 and ES-4, Category 2). Based on resource estimates, these lands contain about 3 percent (17,000 MST) of the Federal coal.
- Approximately 3 percent (184,000 acres (288 sq. mi.)) of Federal land is statutorily not leasable (Figures ES-3 and ES-4, Category 1). Based on resource estimates, these lands contain about 3 percent (15,000 MST) of the Federal coal.

Table ES-2. Coal Reserves Under Lease By Application and Leased Coal Reserves Remaining to be Mined in the PRB as of September 30, 2006

Coal Development Status	Wyoming (MST)	Montana (MST)	Total (MST)
Unmined Coal Under Lease	6,476	458	6,934
Lease by Application	4,513	109	4,622
Total Unmined Coal Under Development	10,989	566	11,555

Figure ES-4. Chart of Results, Powder River Basin Study Area—Federal Coal Resources by Coal Reliability Type



** For an explanation of Hypothetical, Inferred, Indicated, and Measured resources, see Section 2.2.1*

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1.0 INTRODUCTION

As the energy demand of the nation continues to grow, the coal resources of the United States are expected to continue to help meet these needs. According to the Energy Information Administration (EIA), the United States produced approximately 1,161 MST of coal and consumed about 1,114 MST during 2006. Approximately 92 percent of the total coal consumption was used in electricity generation accounting for almost half of the nation's electricity. The Western Coal Region,[1] comprising predominately Federal resources, produced 672 MST, over half of the total coal production for the entire U.S. in 2006.[2] Production from the Western Coal Region is forecasted to increase by over 460 MST over the next 23 years (2030).[3]

Based on recent USGS assessments, Federal coal resources in the United States total 957,000 MST.[4] The Powder River Basin contains 58 percent of total Federal coal, or over 550,000 MST (Table 1-1).

Table 1-1. Assessed Federal Coal Resources

Basin/Region	Federal Coal	
	(MST)*	Percent
Powder River	550,206	57.5
Williston	27,200	2.8
Hanna	2,350	0.2
Green River	1,200	0.1
Colorado Plateau	361,860	37.8
Gulf of Mexico Coastal Plain	10,350	1.1
Appalachian	4,051	0.4
Total Coal	**957,217**	**100**

* Million Short Tons

Source: USGS (http://energy.cr.usgs.gov/regional_studies/fedlands/index.html) and BLM

1 Defined by EIA as Alaska, Arizona, Colorado, Montana, New Mexico, North Dakota, Utah, Washington, and Wyoming. The Eastern Region is defined as Alabama, Arkansas, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, Ohio, Oklahoma, Pennsylvania, Tennessee, Texas, Virginia and West Virginia.

2 Available on the EIA website: http://www.eia.doe.gov/fuelcoal.html.

3 *Ibid.*

4 Available on the USGS website: http://energy.cr.usgs.gov/regional_studies/fedlands/index.html. Note that the figures cited exclude unmined coal currently under development in the Powder River Basin.

Figure 1-1. United States Coal Production (2004-2005)

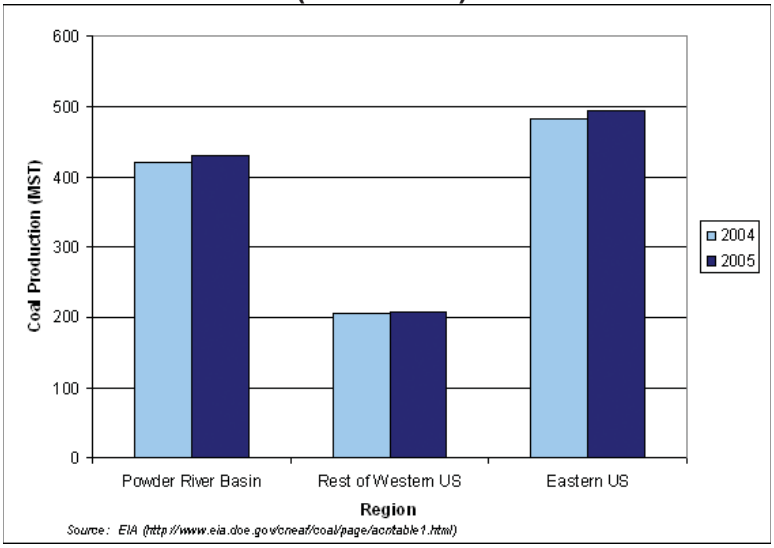
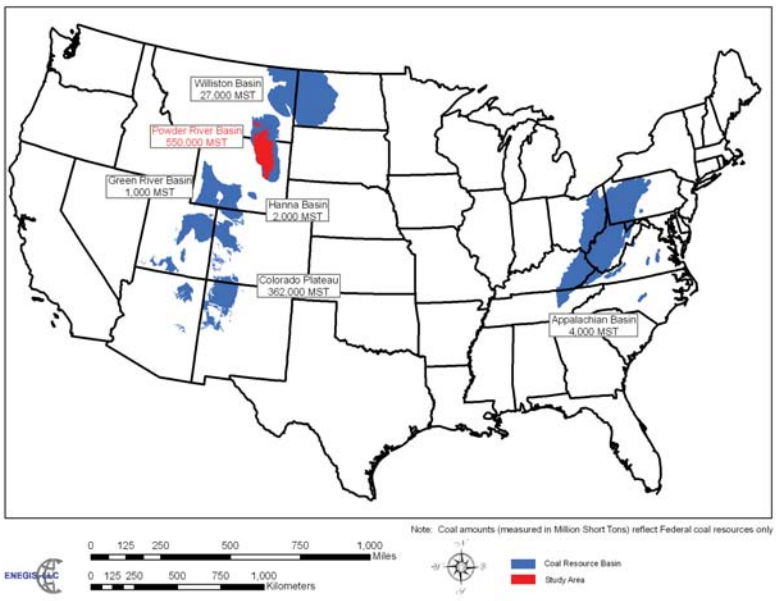


Figure 1-2. USGS Assessed Coal Basins



It is clear that Federal lands will be an important future source of energy. According to EIA data, the Powder River Basin is currently supplying 38 percent of the United States coal production (Figure 1-1), and, in recent years, 88 percent of coal production from Federal lands.

The Inventory examines the Powder River Basin, the largest producing area of Federal coal. The Inventory encompasses almost 7 million acres of land. Of this, 5.4 million acres are under Federal management, of which 4.5 million underlie non-Federal surface (split estates lands).

The coal basins assessed by the USGS are shown in Figure 1-2. The PRB study area is shown in Figure 1-3a and the PRB planning areas are shown in Figure 1-3b.

A full set of acronyms used in this report, as well as a glossary, can be found in Appendices 1 and 2, respectively.

1.1 Background

With the increasing demand for cleaner burning coals, the low-sulfur coals of the Powder River Basin in Wyoming and Montana are expected to continue to be in high demand for the foreseeable future. Developing these coal resources, while mitigating the environmental impacts and maintaining the BLM and FS's multiple use land management goals, continues to be a unique challenge.

The restrictions that constrain access to Federal lands are frequently a complex set of requirements that can preclude mining or increase costs and delay activity in order to achieve other important policy objectives, such as environmental protection and maximizing public benefit from revenues in return for rights to extract resources from Federal lands. Restrictions and impediments include areas unavailable for leasing and areas where the coal can be leased, but with no surface mining allowed. There are also limitations on activities due to a variety of environmental considerations, typically manifested as leasing restrictions.

Figure 1-3a. Powder River Basin Study Area

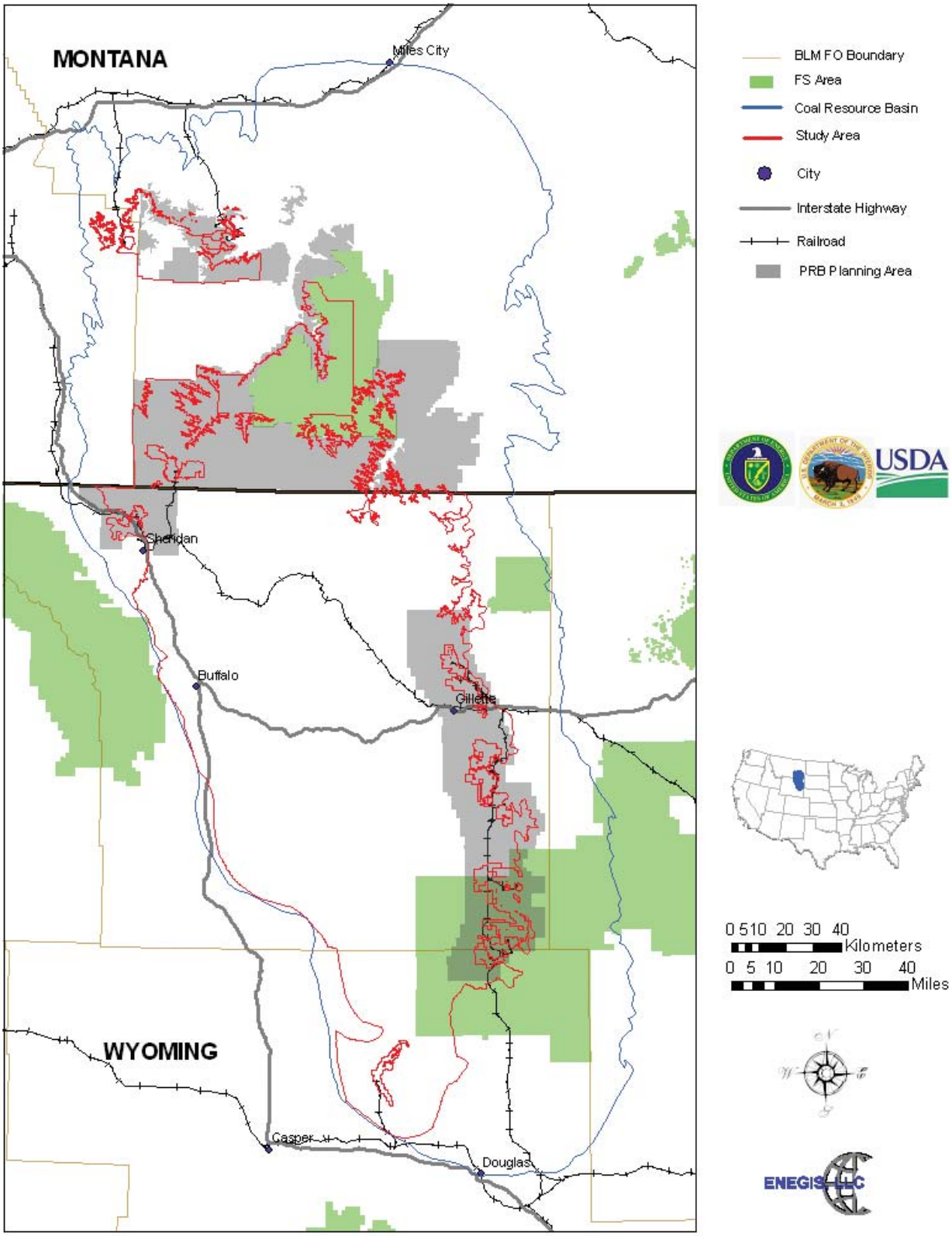
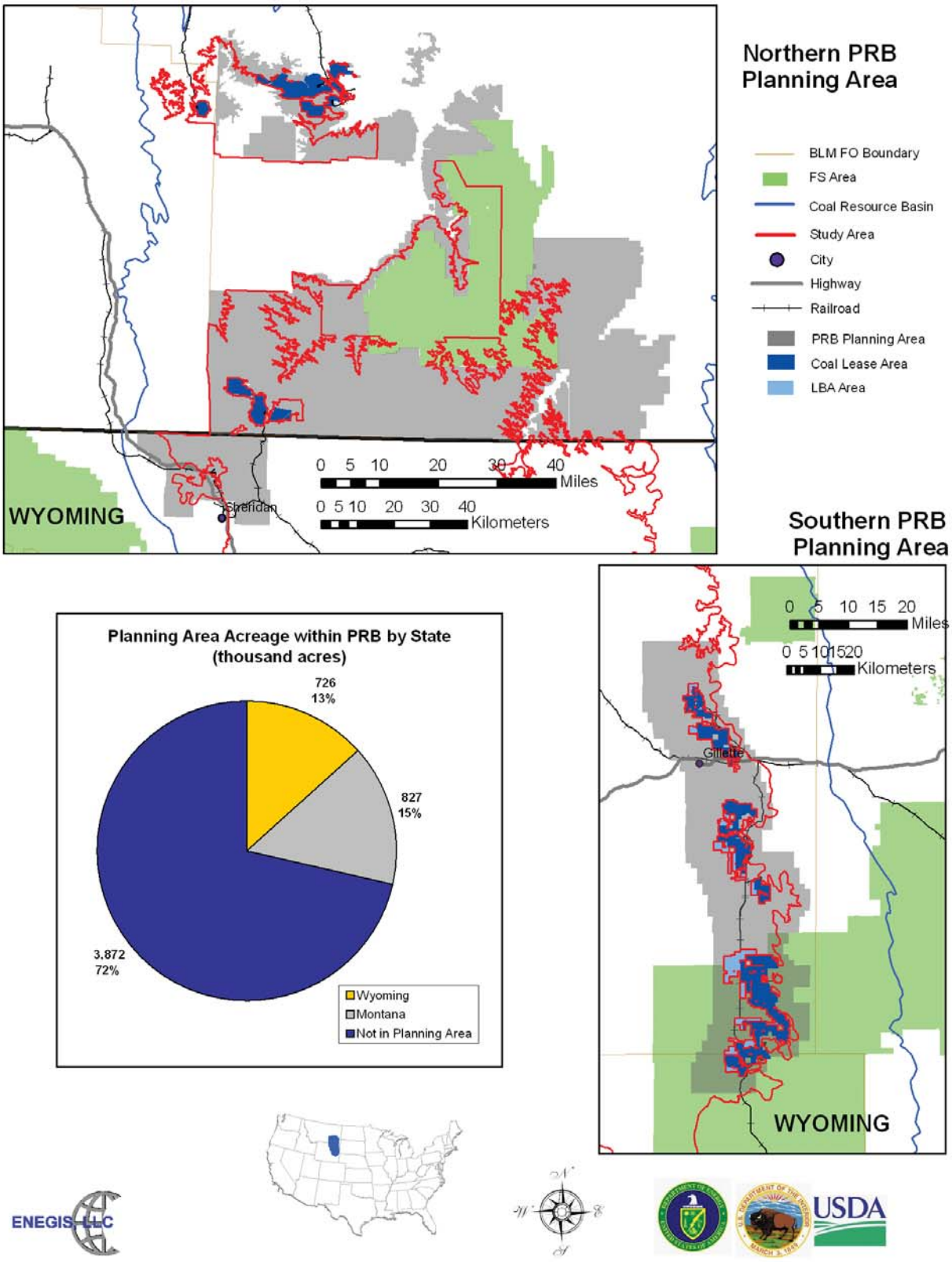


Figure 1-3b. Powder River Basin Planning Areas



Section 437 of the Energy Policy Act of 2005 required a study, as a cooperative effort between Department of Energy, Department of the Interior (DOI), and Department of Agriculture (USDA), which was to include an analysis of coal resources for Federal lands in the United States. The text of Section 437 is set forth below.

1.2 The EPAct 437 Coal Inventory

SEC. 437. INVENTORY REQUIREMENT

(a) REVIEW OF ASSESSMENTS—

(1) IN GENERAL—The Secretary of the Interior, in consultation

with the Secretary of Agriculture and the Secretary [of Energy], shall review coal assessments and other available data to identify—

(A) Federal lands with coal resources that are available for development

(B) the extent and nature of any restrictions on the development of coal resources on Federal lands identified under paragraph (1); and

(C) with respect to areas of such lands for which sufficient data exists, resources of compliant coal and supercompliant coal.

(2) DEFINITIONS—For purposes of this subsection—

(A) the term ‘‘compliant coal’’ means coal that contains not less than 1.0 and not more than 1.2 pounds of sulfur dioxide per million BTU; and

(B) the term ‘‘supercompliant coal’’ means coal that contains less than 1.0 pounds of sulfur dioxide per million BTU.

(b) COMPLETION AND UPDATING OF THE INVENTORY—The Secretary [of Energy]—

(1) shall complete the inventory under subsection (a) by not later than 2 years after the date of enactment of this Act; and

(2) shall update the inventory as the availability of data and developments in technology warrant.

(c) REPORT—The Secretary [of Energy] shall submit to the Committee on Resources of the House of Representatives and to the Committee on Energy and Natural Resources of the Senate and make publicly available—

(1) a report containing the inventory under this section, by not later than 2 years after the effective date of this section; and

(2) each update of such inventory.

1.3 Approach

A Steering Committee, comprising representatives from the participating agencies, was responsible for designing and overseeing the completion of the Inventory. The EPAct Section 437 Coal Inventory is a review of Federal coal resource assessments and the constraints on their development. This Inventory reviews coal resources within the Powder River Basin in northeast Wyoming and southeast Montana. The Powder River Basin represents 58 percent of the total Federal resources currently assessed. Further, of coal production from Federal lands, 88 percent comes from the PRB, and the Basin is also the most active location for Federal leasing. The Bureau of Land Management received eight lease applications for 26,050 acres containing 3,400 MST of coal in the PRB alone in 2006 (more than three years of the national annual average consumption). Finally, because of the focus on its coal and coalbed methane development, the PRB is the location of the most complete datasets for surface and resources information.

The study area is defined primarily by the aggregation of the USGS coal resource assessment units within the Powder River Basin (see Figure 1-3a). In this study, the coal resource, Federal land status, and coal access constraints data for this area have been incorporated into a Geographic Information System (GIS) that allows derivative mapping and statistical analysis. The results are presented in this report.

A fundamental product of this Inventory is the GIS database containing numerous layers of geographic data. While the surface data used in the Inventory are accurate, an important caution applies to the use and interpretation of the undeveloped resources data: the *precise* locations and sizes of recoverable accumulations of undeveloped coal resources on Federal lands are unknown.

The National Coal Resource Assessment (NCRA) project is a multi-year effort by the USGS Energy Resources Program to identify, characterize, and assess the coal resources that will supply a major part of the Nation's energy needs during the next few decades. Assessment results are based on known or estimated geologic input parameters provided by knowledgeable geologists. Because of the uncertainty associated with input parameters, the assessment result is reported within coal reliability categories within the assessment unit. For these reasons, this Inventory does not imply that the locations and sizes of accumulations of undeveloped coal resources are known to occur under specific land parcels.

Section 437 of EPAct calls for the identification of compliant and supercompliant coal resources where sufficient data exist. Compliant and supercompliant coal resources are defined in terms of sulfur dioxide content per million BTU. USGS information indicates that sufficient data do not exist to categorize the resources in such a manner. Where sulfur dioxide information exists, the data are highly variable. Moreover, sulfur dioxide data are sparse with respect to the undeveloped coal resources. For coal resources in the PRB,

these circumstances are clearly evidenced by the data published by the USGS.[5] Given these constraints, the coal resources were not analyzed in terms of compliant and super-compliant categories.

1.4 Roles of the Agencies Pertaining to This Inventory

Section 437 of EPAct designated responsibility for preparing the Inventory as a cooperative effort between the DOE, DOI and USDA. The Interagency Steering Committee is responsible for providing guidance for conducting the studies, recommending direction to the consulting firm retained to support the Inventory,[6] making decisions concerning critical parameters, reviewing the methods and results, and publishing the report.

The DOE is the lead agency for the Inventory and contributes its expertise and experience in guiding the design and analysis process for the Inventory.

The BLM, part of the DOI, manages all Federal leasable minerals (e.g., oil, gas and coal) and maintains the coal lease restriction information developed during land use planning for lands under its jurisdiction, and land status data for all Federally owned lands within the United States.

The USGS, also a bureau of the DOI, conducts assessments of undeveloped coal resources. The primary source of the coal resource information used in this study is the NCRA.

The Secretary of Agriculture, through the FS, provides coal restriction information developed during broad-scale analysis for leasing of lands within the National Forest System.

During the course of this study, members of the Steering Committee and personnel from the firm contracted to support the Inventory visited field offices within the Powder River Basin. BLM and FS personnel from four offices (Buffalo, WY BLM FO, Casper, WY BLM FO, Miles City, MT BLM FO, and Thunder Basin National Grassland) participated in these visits.[7] The purpose of the site visits was to inform BLM and FS officials about the study, to solicit input concerning coal leasing restrictions and other issues of concern regarding coal development, and to collect requisite information and data. As described in Section 2, parameter input from these officials was critical to the study. Data were collected before, during, and following the field visits.

5 For more information on Coal Quality in the PRB, consult USGS's Professional Paper 1625-A Resource Assessment of Selected Tertiary Coal Beds and Zones in the Northern Rocky Mountain and Great Plains Region (1999), Chapter PQ.

6 The contractor is Enegis, LLC, of Fairfax, VA. They have engaged Premier Data Services of Englewood, CO as a subcontractor.

7 Officials at Custer National Forest were consulted to verify the status of their coal leasing prior to field visits. Based on their input, a visit to the Forest office was not necessary.

1.5 Intended Use

This Inventory is designed to be useful to a wide range of interests. In a broad sense, it gives a picture of where coal resources in the Powder River Basin are estimated to occur and a quantification of statutory and administrative constraints on development.

The highly detailed Federal land status data, along with the coal resource data, are available for additional analyses by Congress, industry, environmental organizations, and other interested parties. Land withdrawals and coal lease requirements protect or mitigate adverse impacts to other valuable land resources.

2.0 METHODS

The EPAct Section 437 Coal Inventory assesses the issue of access to Federal coal by calculating the areas and coal tonnages associated with Federal lands (including non-Federal surface interests overlying Federal coal mineral estates [split estates]) in each of several access categories in an access constraint hierarchy. The Inventory quantifies coal resources underlying the Federal lands in each access category, while at the same time accounting for restriction exceptions and the accessibility of resources utilizing underground extraction techniques. A complex geospatial model, termed the EPAct coal model, has been created to support the DOE, BLM, USGS, and FS in their efforts to fulfill Public Law (P.L.) 109-58, Section 437 (Energy Policy Act of 2005), Inventory Requirement.

The study area of the Inventory is delineated by aggregating the areas of the three USGS coal assessment units located within the PRB of Wyoming and Montana. The Inventory involves the compilation and geographic analysis of three independent datasets:

1. Federal surface and coal mineral estates;

2. Coal leasing and mining access restraints, as defined at 43 Code of Federal Regulations (CFR) 3420.1-4, and coal planning screens in applicable BLM and FS land use plans, and discussions in Environmental Assessments (EAs) and Environmental Impact Statements (EISs); and

3. Coal resource data published in the NCRA—Rocky Mountains and Great Plains.[8]

It should be noted that this Inventory is a “snapshot” in time and depicts the regulatory status at the time the study was completed. For example, it is recognized that wildlife habitat patterns continually change, and that restrictions may have to be reevaluated at the time site-specific National Environmental Policy Act (NEPA) analysis is conducted for a coal lease application. As planning efforts continue and new data become available, the PRB can be updated in future assessments.

2.1 Procedures for Collecting and Preparing Land Status and Coal Development Restrictions

2.1.1 Federal Land Status

2.1.1.1 Sources of Land Status Data

The primary source of Federal land status data is the BLM’s Legacy Rehost-2000 (LR 2000) Status Dataset.

2.1.1.2 Land Status Data Preparation

These data, which can be stored in alphanumeric format, were converted for this Inventory into a GIS theme by using commercially available CarteView software. The software inter-

8 USGS Professional Paper 1625-A. 1999 Resource Assessment of Selected Tertiary Coal Beds and Zones in the Northern Rocky Mountains and Great Plains Region.

polates the legal descriptions contained in the Status Dataset against a public land survey GIS theme derived from either the BLM's Geographic Coordinate Database (GCDB) or other sources such as digitized USGS 7-1/2 minute quadrangle maps.

- In this effort, assisted by Premier Data Services of Denver, Colorado, data obtained from the Federal government covering the geography of Federal lands and Federal coal estates in the defined extent of the PRB were collected, converted and incorporated with ownership data into up-to-date maps. Where possible, the Federal lands status was converted from the BLM LR-2000 Data Bases. Federal mineral estate data includes split estates, where available, and all land patents, exchanges or acquired lands where the U.S. retained all minerals and coal only.

A map of the Federal land status for the study area is presented in Figure 2-1.

2.1.1.3 Land Status Data – Related Caveats

The following precautions are advised when reviewing this Inventory:

- The land status data are generally spatially accurate down to 40 acres.
- The GIS files, created using the processes described in detail in Appendix 3, were interpolated from the legal land descriptions contained in the BLM's LR-2000 database. If a legal description referenced a small survey lot or tract by number, a nominal location was mapped through a process that referenced the Legal Land Description dataset. This dataset is limited to a 40-acre description and therefore carries a minor degree of generalization in complex areas. Isolated parcels of less than 40 acres were not included in the Inventory.
- This mapping process uses public land survey data derived from various sources. The spatial location of the land status parcels so derived matches the accuracy of the survey data.
- Some land status GIS data are restricted from the public domain by agency request. Such data were used in the analyses presented in this report, but are not contained in the public datasets.

For purposes of this Inventory, Federal lands include split estates. This Inventory includes over 4.5 million acres of split estate land. In cases of split estates where the Federal government holds a partial interest in the mineral estate, the Federal government was assumed to hold the total mineral interest for purposes of the analysis.[9]

9 Note that areas do exist within PRB that have Federal surface with private mineral ownership. Although these areas are included in the analysis, they are very small in area and cannot be seen in Figure 2-1.

Figure 2-1. Federal Land Status Map, Powder River Basin Study Area

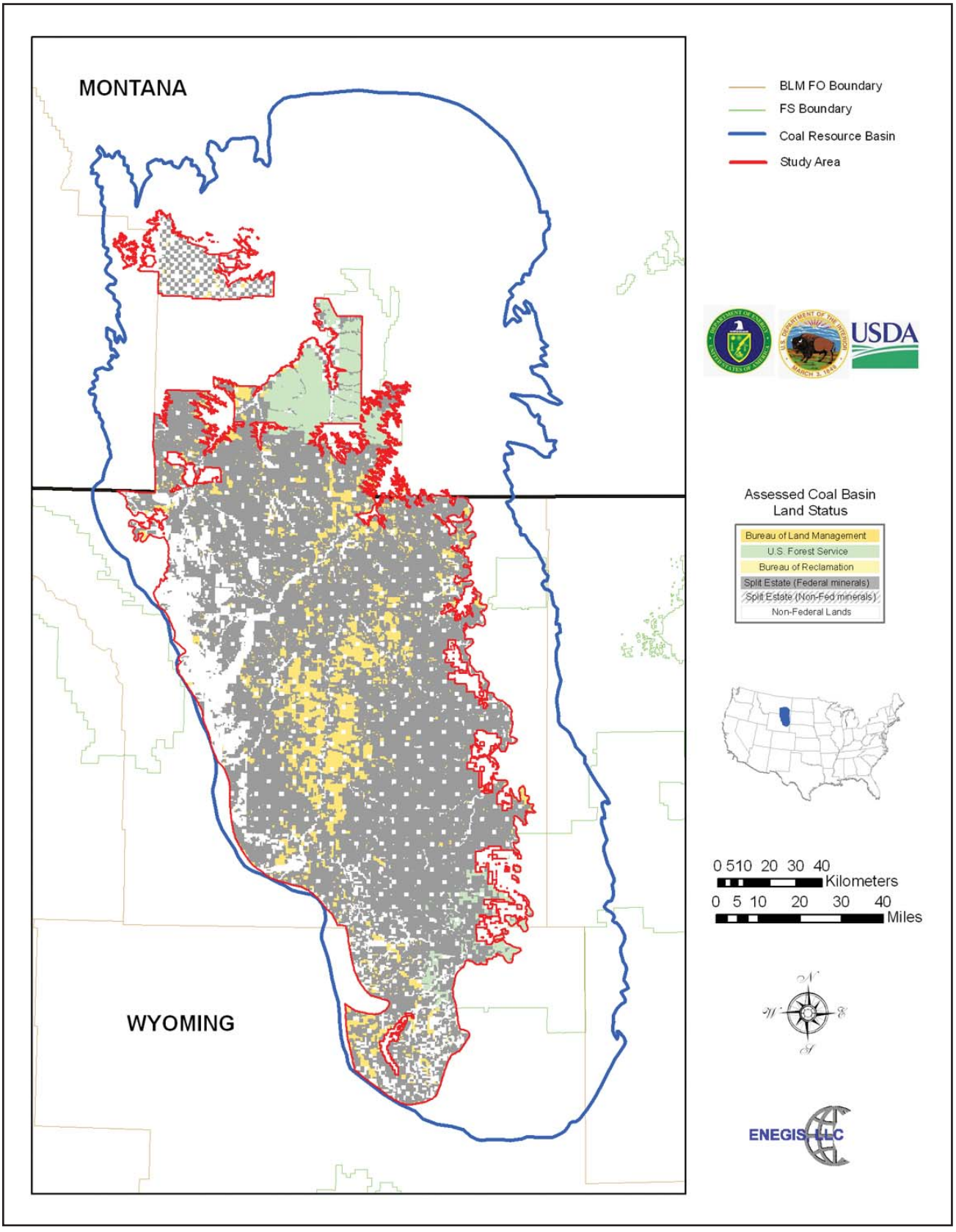


Table 2-1. Federal Land Acreage by Management Agency

Federal Surface Management Agency	Inventory Acreage
Bureau of Land Management	4,815,192
Federal surface/Federal mineral ownership	*628,425*
Non-Federal surface/Federal mineral ownership	*4,186,679*
Federal surface/Non-Federal mineral ownership	*88*
USDA Forest Service	610,395
Federal surface/Federal mineral ownership	*347,536*
Non-Federal surface/Federal mineral ownership	*259,532*
Federal surface/Non-Federal mineral ownership	*3,327*
Bureau of Reclamation	70
Federal surface/Federal mineral ownership	*70*
Total Federal Land	5,425,657

2.1.2 Federal Coal Lease Requirements

2.1.2.1 Coal Leasing Decisions

Leasing decisions for Federal coal are guided by Resource Management Plans (RMPs) and Forest Plans (FPs), where the goal is to determine areas acceptable for further consideration for coal leasing.

The regulations that govern land use planning for coal are found in 43 CFR 3420.1-4(e), which state: “The major land use planning decision concerning the coal resource shall be the identification of areas acceptable for further consideration for leasing, which shall be identified by the screening process…”

There are four planning screens that must be applied as described below.

1. Determine areas of Federal coal with development potential (43 CFR 3420.1-4(e)(1)). A *Call for Coal Resource and Other Resource Information* is issued to encourage companies, State and local governments, and general public to submit data (43 CFR 3420.1-2). Ideally, this occurs early in the scoping process for the land use plan and can be combined with a *Notice of Intent* to conduct land use planning or issue identification. Based on the response to the call and other available coal publications, and exploration and development data, the BLM defines the area considered to have development potential within the life of the land use plan. The BLM uses economics in its decision to focus in on the areas with most potential for development. The BLM is not required to include all areas with Federal coal simply because they meet USGS classification criteria as a coal resource.

2. Apply unsuitability criteria (43 CFR 3420.1-4 (e)(2) and 43 CFR 3461). There are 20 unsuitability criteria as listed in 43 CFR 3461. The criteria mostly come from Sec. 522 (a, b, and e) of the Surface Mining Control and Reclamation Act (SMCRA),

which prohibits or conditions mining of certain lands in order to protect other resources. The 20 unsuitability criteria are listed in Table 2-2. The criteria have specific exemptions and exceptions that may allow for leasing while still stipulating protection of the resource (see Section 2.6). Some resources, however, remain unsuitable for leasing by law. The criteria only apply to "surface coal mining operations" as defined in 43 CFR 3400.0-5 (mm) and 43 CFR 3461.1, which defines surface coal mining operations as "activities conducted on the surface of lands in connection with a surface coal mine or surface operations and surface impacts incident to an underground mine". The criteria either can be applied during the general land use plan or the National Environmental Policy Act assessment for a specific lease application.

3. Apply multiple use conflict analysis (43 CFR 3420.1-4 (e)(3)). The regulations state that this screen "shall place particular emphasis on protecting" air and water quality, wetlands, riparian areas, sole source aquifers, units of National Park System, National Wildlife Refuge System, National System of Trails, National Wild and Scenic Rivers System, and other important or unique resource values. Examples may include: oil and gas conflicts (such as stipulations for Coalbed Natural Gas conflict administration zones), values identified in Sec. 522(a)(3) of SMCRA, areas incompatible with State or local land use plans, and fragile or historic lands where operations could significantly damage important historic, cultural, scientific, and esthetic values (e.g., paleontological sites).

4. Consult with qualified surface owners (43 CFR 3420.1-4 (e)(4)). This regulation applies only to surface mining associated with split estates. Criteria in 43 CFR 3400.0-5 are used to determine if surface owners are qualified (i.e., hold title to surface, have their principal place of residence on the land, personally conduct farm or ranching operations on the land or receive directly a significant portion of income from those operations, and have met these conditions for at least three years). If a "significant" number of surface owners in an area express preference against mining, the area will be considered unacceptable for surface mining and only minable by underground techniques, unless no acceptable alternative areas are available to meet a regional leasing level (there are currently no regional leasing levels in the Powder River Basin and leasing is conducted under the lease-by-application process). It should be noted that the consultation process is not the same as surface owner consent, which provides a qualified surface owner over a split estate with a veto power over whether or not to allow a surface coal mining operations lease (43 CFR 3427) be issued; in effect, consultation is a "pre-screen."

After the unsuitability, multiple use, and surface owner consultation screens are applied to the Federal coal with development potential and affected areas are deleted, the remaining Federal coal lands are carried forward in the land use plan as "acceptable for further consideration for leasing" in accordance with 43 CFR 3420.1-8 (a).

Table 2-2. Coal Leasing Unsuitability Criteria

Unsuitability Criterion	Description
1	Federal Land Systems and Federal lands in incorporated towns
2	Federal lands within rights-of-way or easements on federally-owned surface (such as railroads)
3	Buffer zones for public roads, cemeteries, schools, churches, public buildings and parks, and occupied dwellings
4	Wilderness study areas
5	Scenic lands designated Class I by Visual Resource Management (VRM) analysis
6	Lands being used for scientific studies
7	Lands on the National Register of Historic Places
8	Designated natural areas and National Natural Landmarks
9	Habitat for Federal threatened and endangered plant and animal species
10	Habitat for State threatened and endangered plant and animal species
11	Bald and golden eagle nests and buffer zones
12	Bald and golden eagle roost and concentration areas
13	Falcon cliff nesting sites and buffer zones
14	High priority habitat for migratory bird species of high Federal interest
15	Essential habitat for animal and plant species of high interest to State (such as sage grouse strutting grounds)
16	100-year floodplains that pose a substantial threat of loss of life or property if mined
17	Municipal watersheds
18	Natural Resource Waters plus a ¼ mile buffer zone from outer banks
19	Alluvial valley floors (AVFs) where mining would interrupt, discontinue or preclude farming. Includes areas outside AVFs where mining would materially damage water quantity or quality in surface or underground water systems supplying AVFs.
20	Criteria proposed by a State or Tribe and adopted by DOI

2.1.2.2 Sources of Lease Restriction Data

The coal leasing and mining access constraints that derive from the CFRs are applied through the Federal surface management agency's land use plans, e.g., RMPs for the BLM and FPs for the Forest Service. These plans are produced and maintained by their respective agencies on a field office jurisdictional basis (in the case of the BLM), or on a National Forest/ Grassland basis (in the case of the FS). Land use planning documents are revised every ten to fifteen years, or on an as-needed basis, but may be amended to address specific land use issues.[10] The documents applicable to the Inventory are listed in Table 2-3.

10 In certain instances, an RMP or FP may be in the revision process, but the management agency already imple-ments restrictions on a *de facto* level prior to becoming part of the official management document. Therefore, certain restrictions on coal leasing are included in this Inventory on office advisement.

Table 2-3. Land Use Plans in the EPAct 437 Coal Inventory

Jurisdiction	Land Use Plan	Year Published
Buffalo, WY BLM	Buffalo RMP Record of Decision (plus 2001 Buffalo RMP Amendment)	1985
Casper, WY BLM	RMP and EIS for the Casper Field Office Planning Area – Draft (on office advisement)	2006
	Little Thunder Record of Decision (ROD)	2004
	North Antelope/Rochelle (NARO) North ROD	2004
	North Antelope/Rochelle (NARO) South ROD	2004
	West Antelope ROD	2004
	West Roundup ROD	2004
Miles City, MT BLM	Powder River Resource Area Management Plan (RAMP) – Maintenance Version (plus 1994 Miles City Oil & Gas Amendment)	1985
Thunder Basin NG	Thunder Basin National Grassland Land and RMP	2001

Hardcopy and digital data showing the mapped access constraint areas were collected from BLM and FS offices within the study area. Much of the lease data are maintained by the agencies as GIS data layers (digital map files). Some offices, particularly where the planning effort pre-dated the widespread availability of GIS technology, maintain this information in the form of hardcopy maps or AutoCAD files. For the Inventory, these maps were converted to a GIS.

2.1.2.3 Lease Requirements Data Preparation

Most of the lease restriction data preparation consisted of digitizing and compiling the gathered data into multi-layered digital map files. Federal Geographic Data Committee Standards (FGDC)-compliant supporting documentation (metadata) for the resulting GIS layers was also created.

This Inventory concerns only Federal lands within the aggregate resource assessment unit boundaries of the study area, which are based on geology as defined in the USGS NCRA. Consequently, the land status and restriction digital map files, which correspond to Federal land management agency jurisdiction boundaries, were clipped using GIS to fit within each of the study area boundaries. Data contained within the compiled digital map files were then queried for unique leasing restriction values. The results were saved as separate map files. Each digital map file represents a unique restriction value.

For a description of the specific data preparation steps, see Appendix 3.

2.1.2.4 Lease Requirements Data – Related Caveats

The following precautions are advised when reviewing this study:

- All restrictions for which GIS data were available from the Federal land management agencies were used in the analysis. Most of the restrictions within the study areas were available in GIS data formats, but not all. Any inaccuracies that may come from incomplete GIS data are considered minor in terms of the scope of the Inventory.
- Many restrictions not available in GIS format were digitized. Any resulting inaccuracies due to this process are likely to have insignificant impacts upon the analysis.

  - Neither hardcopy nor digital maps were available for some restrictions. A total of 3 restrictions, or 1.8 percent, of the 165 total restrictions did not have GIS data available (see Section 2.3.1.1 for further discussion). In the absence of the data, this impact cannot be quantified, but is believed to be small.

- The lease restriction data are generally accurate to a minimum of 40 acres.
- Some lease restriction GIS data are restricted from the public domain by agency request. Such data were used in the analysis but are not contained in the public datasets.

2.2 Procedures for Collecting and Preparing Coal Resource Data

2.2.1 Sources of Coal Resource Data

The USGS 2000 National Coal Resource Assessment was the source of data for this Inventory. The assessment units represent the three most significant coal zones within the PRB that are readily accessible for extraction.

GIS data for the coal resources have been provided to the project by the USGS in the form of GIS isopach and overburden thickness themes for the following three assessment units (AUs) within the Power River Basin:

1. Wyodak-Anderson
2. Knobloch
3. Rosebud-Robinson

Figure 2-2 shows a map of the PRB and the three AUs, including overlap areas between the Knobloch and Wyodak-Anderson AUs. Note that areas currently under development (leased coal or coal resources under Lease by Application through 2006), which comprise an estimated 11,600 MST, as shown in Table 2-4, are excluded from the Inventory. These resources are excluded because the environmental work for that portion of the resource has already been performed or is under administrative review. As such, the Inventory examines the subset of the resource base for which the final environmental work has yet to be performed.

Figure 2-2. USGS Assessment Units in the Powder River Basin

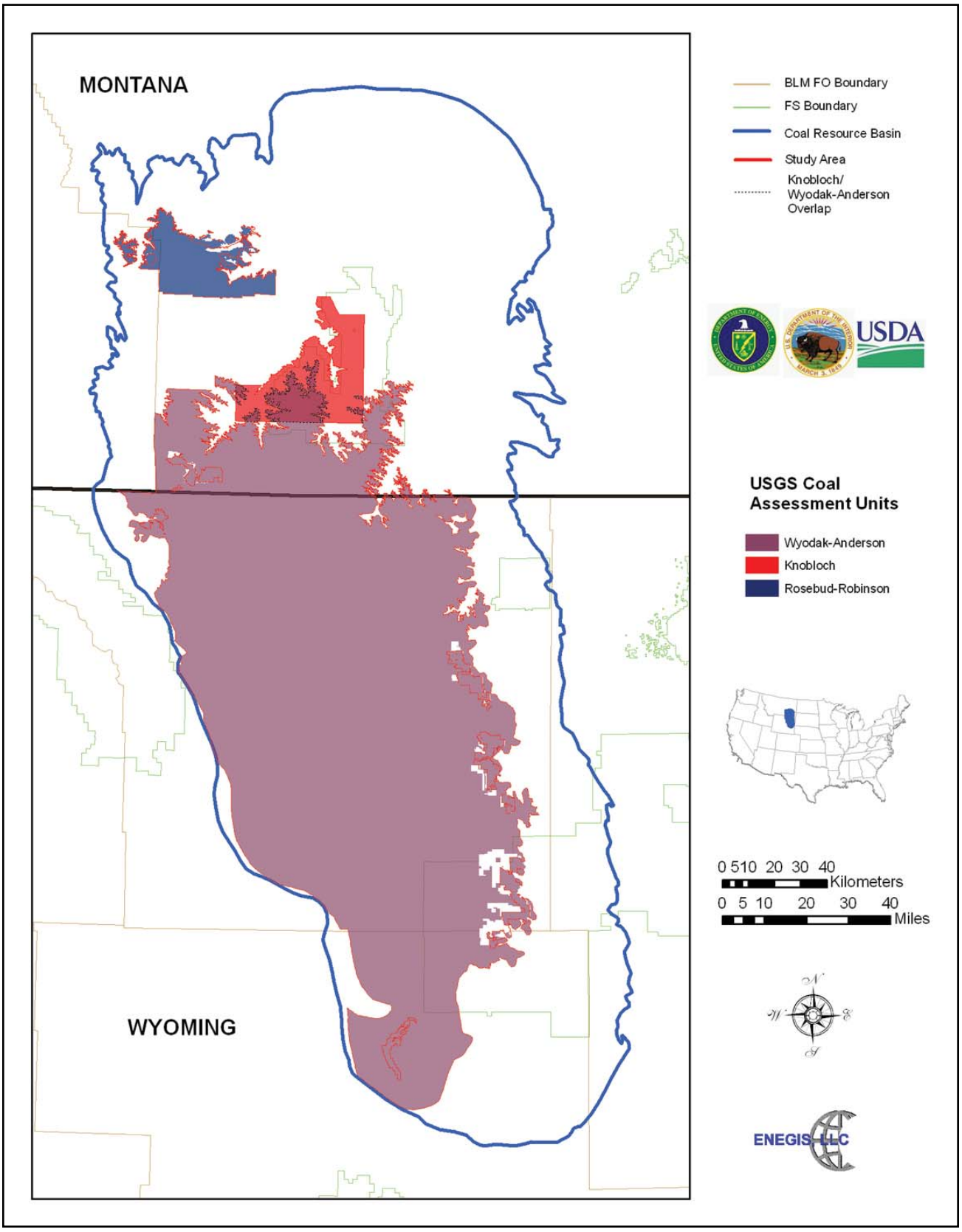


Table 2-4. Coal Reserves Under Lease By Application and Leased Coal Reserves Remaining to be Mined in the PRB as of September 30, 2006

Coal Development Status	Wyoming (MST)	Montana (MST)	Total (MST)
Unmined Coal Under Lease	6,476	458	6,934
Lease by Application	4,513	109	4,622
Total Unmined Coal Under Development	10,989	566	11,555

In addition to these geographic data, USGS has provided detailed resource totals in the form of total MST of coal within each category of coal thickness, within each category of overburden thickness, and by county, for all three assessment units. The USGS Coal Resources Assessment data are shown in Table 2-5, and the accompanying maps showing overburden[11] and coal thickness are shown in Figures 2-3 and 2-4.

Table 2-5. Powder River Basin Coal Resources Table

Wyodak-Anderson Coal Resources

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Montana	POWDER RIVER	0-100 ft	2.5-5 ft	0.42	1	19	4	25
			5-10 ft	2.3	15	110	13	140
			10-20 ft	59	260	450	32	800
			20-40 ft	220	930	670	93	1,900
			>40 ft	200	730	760	40	1,700
		0-100 ft total		490	1,900	2,000	180	4,600
		100-200 ft	2.5-5 ft	0	0	3.8	0.52	4.3
			5-10 ft	0.55	6.6	39	4.3	51
			10-20 ft	2.0	47	140	14	200
			20-40 ft	30	180	370	50	630
			>40 ft	130	730	730	7.1	1,600
		100-200 ft total		160	970	1,300	75	2,500
		200-500 ft	2.5-5 ft	0	0	0.7	0	0.70
			5-10 ft	0	2.0	8.9	1.4	12
			10-20 ft	0	3.4	27	9.2	40
			20-40 ft	9.5	88	180	24	300
			>40 ft	200	1,100	2,200	0	3,500
		200-500 ft total		210	1,100	2,400	34	3,800
		>500 ft	>40 ft	0	0.53	0	0	0.53
		>500 ft total		0	0.53	0	0	0.53
	POWDER RIVER total			860	4,100	5,700	290	11,000
	ROSEBUD	0-100 ft	2.5-5 ft	0.38	0.47	6.3	1.5	8.6
			5-10 ft	11	31	66	30	140
			20-40 ft	29	120	180	0	320
			>40 ft	62	330	220	0	610
		0-100 ft total		120	590	610	56	1,400

11 Note that where coal zones overlap the map depicts the depth to the shallower zone.

Table 2-5. Powder River Basin Coal Resources Table (continued)

Wyodak-Anderson Coal Resources

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Montana	ROSEBUD	100-200 ft	2.5-5 ft	0	0.46	4.2	0.094	4.8
			5-10 ft	2.4	15	24	8.3	50
			10-20 ft	7.2	34	79	16	140
			20-40 ft	9.4	89	110	0	210
			>40 ft	75	340	340	0	750
		100-200 ft total		94	470	560	25	1,200
		200-500 ft	2.5-5 ft	0	0	0.61	0	0.61
			5-10 ft	0.097	6.2	9.6	4.0	20
			10-20 ft	0	20	61	7.0	89
			20-40 ft	3.4	3.9	19	0	26
			>40 ft	11	82	27	0	120
		200-500 ft total		15	110	120	11	250
	ROSEBUD total			230	1,200	1,300	92	2,800
Montana total				4,700	20,000	17,000	380	42,000
Wyoming	CAMPBELL	0-100 ft	2.5-5 ft	3.6	9.6	57	12	83
			5-10 ft	24	36	83	33	180
			10-20 ft	140	140	300	32	620
			20-40 ft	380	780	1,100	0	2,300
			>40 ft	1,900	4,400	2,900	420	9,600
		0-100 ft total		2,500	5,300	4,500	490	13,000
		100-200 ft	2.5-5 ft	1.1	5.4	14	0.58	21
			5-10 ft	6.9	32	31	5.6	76
			10-20 ft	55	180	140	2.7	380
			20-40 ft	290	880	660	3.3	1,800
			>40 ft	3,200	6,800	1,800	0	12,000
		100-200 ft total		3,500	7,900	2,600	12	14,000
		200-500 ft	2.5-5 ft	3.5	9.5	5.3	0.73	19
			5-10 ft	31	49	23	0.96	100
			10-20 ft	120	360	200	0	680
			20-40 ft	540	1,400	830	0	2,800
			>40 ft	9,300	29,000	11,000	20	49,000
		200-500 ft total		10,000	30,000	12,000	22	52,000
		>500 ft	2.5-5 ft	0.25	3.8	9.0	0	13
			5-10 ft	2.30	18	59	0	79
			10-20 ft	1.30	37	160	0	200
			20-40 ft	120	390	1,400	49	1,900
			>40 ft	13,000	57,000	120,000	6,900	200,000
		>500 ft total		13,000	58,000	130,000	6,900	200,000
	CAMPBELL total			29,000	100,000	140,000	7,500	280,000
	CONVERSE	0-100 ft	2.5-5 ft	0.10	0.36	1.8	190	200
			5-10 ft	1.6	21	80	620	720
			10-20 ft	41	280	570	380	1,300
			20-40 ft	92	440	650	22	1,200
			>40 ft	46	100	280	0	430
		0-100 ft total		180	850	1,600	1,200	3,800
		100-200 ft	2.5-5 ft	0.33	1.1	15	30	46
			5-10 ft	1.4	17	89	120	230
			10-20 ft	47	230	370	54	700

Table 2-5. Powder River Basin Coal Resources Table (continued)

Wyodak-Anderson Coal Resources

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Wyoming	CONVERSE		20-40 ft	76	360	440	88	960
			>40 ft	65	270	100	0	440
		100-200 ft total		190	880	1,000	300	2,400
		200-500 ft	2.5-5 ft	1.6	7.3	92	92	190
			5-10 ft	20	97	290	710	1,100
			10-20 ft	70	350	960	530	1,900
			20-40 ft	41	260	730	230	1,200
			>40 ft	150	480	230	0	860
		200-500 ft total		280	1,200	2,300	1,600	5,300
		>500 ft	2.5-5 ft	2.3	14	16	2.4	35
			5-10 ft	20	120	430	430	1,000
			10-20 ft	22	150	590	1,000	1,800
			20-40 ft	1.3	20	350	340	710
			>40 ft	0	0	190	0	190
		>500 ft total		45	300	1,600	1,800	3,700
	CONVERSE total			700	3,200	6,500	4,900	15,000
	JOHNSON	0-100 ft	2.5-5 ft	0	2.3	3.3	10	16
			5-10 ft	0	5.6	13	9.9	28
			10-20 ft	5.4	15	52	26	99
			20-40 ft	33	62	42	10	150
			>40 ft	32	82	150	0	270
		0-100 ft total		71	170	260	56	560
		100-200 ft	2.5-5 ft	0	2.3	2.0	10	15
			5-10 ft	0	4.0	4.3	12	20
			10-20 ft	2.0	5.3	17	8.5	33
			20-40 ft	9.2	42	100	7.9	160
			>40 ft	30	130	220	0	380
		100-200 ft total		41	180	350	39	610
		200-500 ft	2.5-5 ft	0	2.9	4.7	36	44
			5-10 ft	0.036	7.0	17	85	110
			10-20 ft	5.6	25	74	38	140
			20-40 ft	23	72	440	23	560
			>40 ft	32	310	1,300	16	1,600
		200-500 ft total		61	410	1,800	200	2,500
		>500 ft	2.5-5 ft	1.6	6.6	33	88	130
			5-10 ft	5.7	49	500	420	970
			10-20 ft	20	130	1,500	1,200	2,900
			20-40 ft	85	620	5,000	3,200	9,000
			>40 ft	6,800	32,000	96,000	7,700	140,000
		>500 ft total		6,900	33,000	100,000	13,000	160,000
	JOHNSON total			7,100	34,000	110,000	13,000	160,000
	SHERIDAN	0-100 ft	2.5-5 ft	0.053	8.2	2.2	22	33
			5-10 ft	12	40	11	37	100
			10-20 ft	36	170	120	40	370
			20-40 ft	45	230	420	5.5	700
			>40 ft	100	350	740	0	1,200
		0-100 ft total		200	790	1,300	110	2,400

Table 2-5. Powder River Basin Coal Resources Table (continued)

Wyodak-Anderson Coal Resources

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Wyoming	SHERIDAN	100-200 ft	2.5-5 ft	1.4	4.1	2.0	15	23
			5-10 ft	4.6	11	14	51	81
			10-20 ft	22	62	90	54	230
			20-40 ft	98	410	660	46	1,200
			>40 ft	290	620	850	81	1,800
		100-200 ft total		420	1,100	1,600	250	3,400
		200-500 ft	2.5-5 ft	1.4	8.1	7.6	16	33
			5-10 ft	6.7	23	20	49	98
			10-20 ft	34	160	530	180	910
			20-40 ft	260	1,100	3,400	370	5,100
			>40 ft	840	3,700	6,500	220	11,000
		200-500 ft total		1,100	4,900	11,000	840	17,000
		>500 ft	2.5-5 ft	0.51	3.0	4.7	87	95
			5-10 ft	4.9	33	73	580	690
			10-20 ft	23	140	760	1,600	2,500
			20-40 ft	120	790	7,800	5,200	14,000
			>40 ft	310	1,800	8,600	1,300	12,000
		>500 ft total		450	2,700	17,000	8,700	29,000
	SHERIDAN total			2,200	9,600	31,000	9,900	52,000
Wyoming total				39,000	150,000	290,000	35,000	510,000
Grand total (MST)				44,000	170,000	300,000	36,000	550,000

Knobloch Assessment Unit

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Montana	POWDER RIVER	0-100 ft	10-20 ft	1.8	7.8	10.0	0.0	20.0
			20-30 ft	33.0	88.0	100.0	0.0	220.0
			30-40 ft	23.0	21.0	17.0	0.0	61.0
			40-50 ft	20.0	44.0	8.4	0.0	73.0
			50-100 ft	110.0	360.0	140.0	0.0	610.0
		0-100 ft total		190.0	520.0	280.0	0.0	980.0
		100-200 ft	10-20 ft	0.27	0.0	34.0	2.0	36.0
			20-30 ft	17.0	46.0	52.0	0.0	110.0
			30-40 ft	14.0	20.0	18.0	0.0	52.0
			40-50 ft	43.0	56.0	49.0	0.0	150.0
			50-100 ft	310.0	720.0	260.0	0.9	1,300.0
		100-200 ft total		380.0	840.0	410.0	2.9	1,600.0
		200-300 ft	10-20 ft	0.0	0.0	35.0	0.11	35.0
			20-30 ft	6.7	14.0	39.0	0.0	59.0
			30-40 ft	0.0	11.0	12.0	0.0	23.0
			40-50 ft	6.7	23.0	72.0	0.0	100.0
			50-100 ft	170.0	460.0	210.0	0.0	840.0
		200-300 ft total		180.0	510.0	370.0	0.11	1,100.0
		300-400 ft	10-20 ft	0.0	1.4	37.0	0.0	38.0
			20-30 ft	1.7	5.9	15.0	1.5	24.0
			30-40 ft	0.0	2.2	4.9	0.0	7.1

Table 2-5. Powder River Basin Coal Resources Table (continued)

Knobloch Assessment Unit

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Montana	POWDER RIVER		40-50 ft	0.0	0.67	11.0	0.0	12.0
			50-100 ft	9.3	64.0	140.0	0.0	220.0
		300-400 ft total		11.0	75.0	210.0	1.5	300.0
		400-500 ft	10-20 ft	0.0	0.0	16.0	0.0	16.0
			20-30 ft	1.6	0.41	6.0	0.082	8.1
			30-40 ft	0.0	0.0	0.29	0.0	0.29
			40-50 ft	0.0	0.0	2.9	0.0	2.9
			50-100 ft	0.0	6.0	66.0	0.0	72.0
		400-500 ft total		1.6	6.4	92.0	0.082	100.0
		500-1000 ft	10-20 ft	0.0	2.1	24.0	0.0	26.0
			20-30 ft	0.0	0.0	0.74	0.0	0.74
			40-50 ft	0.0	0.0	12.0	0.0	12.0
			50-100 ft	0.0	0.4	16.0	0.0	17.0
		500-1000 ft total		0.0	2.4	53.0	0.0	55.0
	POWDER RIVER total			770.0	1,900.0	1,400.0	4.6	4,100.0
	ROSEBUD	0-100 ft	5-10 ft	0.19	0.30	0.0	0.0	0.48
			10-20 ft	12.0	56.0	35.0	0.0	100.0
			20-30 ft	26.0	61.0	0.0	0.0	87.0
			30-40 ft	5.7	22.0	9.8	0.0	38.0
			40-50 ft	13.0	29.0	12.0	0.0	53.0
			50-100 ft	11.0	81.0	130.0	0.0	230.0
		0-100 ft total		68.0	250.0	190.0	0.0	510.0
		100-200 ft	2.5-5 ft	0.0	0.30	0.0	0.0	0.3
			5-10 ft	1.1	8.3	7.8	0.0	17.0
			10-20 ft	21.0	53.0	24.0	0.0	98.0
			20-30 ft	32.0	39.0	4.4	0.0	76.0
			30-40 ft	2.7	14.0	0.2	0.0	17.0
			40-50 ft	5.2	5.9	0.6	0.0	12.0
			50-100 ft	31.0	82.0	28.0	0.0	140.0
		100-200 ft total		93.0	200.0	64.0	0.0	360.0
		200-300 ft	2.5-5 ft	0.24	0.06	0	0	0.3
			5-10 ft	0.4	8.8	17.0	0.0	26.0
			10-20 ft	9.4	46.0	59.0	0.0	110.0
			20-30 ft	3.2	17.0	2.1	0.0	22.0
			30-40 ft	2.1	17.0	0.61	0.0	20.0
			40-50 ft	0.0	0.35	0.0	0.0	0.4
			50-100 ft	17.0	78.0	15.0	0.0	110.0
		200-300 ft total		32.0	170.0	94.0	0.0	290.0
		300-400 ft	2.5-5 ft	0.078	0.56	0.12	0.0	0.75
			5-10 ft	2.8	9.6	38.0	0.0	50.0
			10-20 ft	4.1	29.0	61.0	0.0	94.0
			20-30 ft	0.98	11.0	1.7	0.0	14.0
			30-40 ft	0.0	3.7	2.5	0.0	6.2
			50-100 ft	4.4	24.0	3.3	0.0	32.0
		300-400 ft total		12.0	78.0	110.0	0.0	200.0
		400-500 ft	2.5-5 ft	0.42	1.7	0.74	0.0	2.9
			5-10 ft	1.9	11.0	26.0	0.0	39.0

Table 2-5. Powder River Basin Coal Resources Table (continued)

Knobloch Assessment Unit

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Montana	ROSEBUD		10-20 ft	1.3	17.0	60.0	0.0	78.0
			20-30 ft	0.0	2.9	1.9	0.0	4.8
			30-40 ft	0.0	0.44	2.2	0.0	2.6
			50-100 ft	1.2	9.3	0.0	0.0	11.0
		400-500 ft total		4.8	42.0	91.0	0.0	140.0
		500-1000 ft	2.5-5 ft	0.10	0.79	0.076	0.0	0.97
			5-10 ft	1.0	20.0	120.0	0.042	140.0
			10-20 ft	2.3	22.0	180.0	4.2	210.0
			20-30 ft	0.37	2.0	3.0	0.0	5.4
			30-40 ft	0.0	0.0	0.18	0.0	0.18
			50-100 ft	0.0	0.66	0.0	0.0	0.66
		500-1000 ft total		3.8	45.0	300.0	4.2	360.0
		1000-1500 ft	5-10 ft	0.0	0.0	20.0	0.0	20.0
			10-20 ft	0.0	0.16	4.4	0.0	4.5
			20-30 ft	0.0	0.0	2.2	0.0	2.2
		1000-1500 ft total		0.0	0.16	26.0	0.0	27.0
	ROSEBUD total			210.0	780.0	880.0	4.2	1,900.0
	Grand total (MST)			980.0	2,700.0	2,300.0	8.8	6,000.0

Rosebud-Robinson Assessment Unit

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Montana	BIGHORN	0-100 ft	2.5-5 ft	1.30	2.90	0.02	0.00	4.10
			5-10 ft	14.00	36.00	6.90	0.00	57.00
			10-20 ft	11.00	110.00	91.00	0.00	210.00
			20-40 ft	13.00	150.00	100.00	0.00	260.00
		0-100 ft total		39.00	290.00	200.00	0.00	530.00
		100-200 ft	2.5-5 ft	0.09	0.00	0.00	0.00	0.09
			5-10 ft	4.40	5.70	0.32	0.00	10.00
			10-20 ft	9.90	39.00	5.30	0.00	54.00
			20-40 ft	70.00	310.00	92.00	0.00	470.00
		100-200 ft total		85.00	350.00	97.00	0.00	540.00
		200-500 ft	5-10 ft	0.68	0.34	0.00	0.00	1.00
			10-20 ft	21.00	61.00	4.50	0.00	87.00
			20-40 ft	250.00	890.00	110.00	0.00	1,300.00
		200-500 ft total		270.00	950.00	120.00	0.00	1,300.00
		500-1000 ft	5-10 ft	2.30	13.00	99.00	17.00	130.00
			10-20 ft	34.00	200.00	290.00	0.00	520.00
			20-40 ft	28.00	340.00	560.00	0.00	930.00
		500-1000 ft total		64.00	560.00	950.00	17.00	1,600.00
		>1000 ft	5-10 ft	0.00	0.00	9.40	0.00	9.40
			20-40 ft	0.00	0.00	200.00	0.00	200.00
		>1000 ft total		0.00	0.00	210.00	0.00	210.00
	BIGHORN total			460.00	2,200.00	1,600.00	17.00	4,200.00
	ROSEBUD	0-100 ft	5-10 ft	2.00	3.60	0.26	0.00	5.80
			10-20 ft	11.00	7.50	16.00	1.00	36.00
			20-40 ft	0.06	0.23	0.00	0.00	0.29

Table 2-5. Powder River Basin Coal Resources Table (continued)

Rosebud-Robinson Assessment Unit

State	County	Overburden thickness	Net coal thickness	Reliabity categories (distance from control point)				Total (MST)
				Measured (<1/4 mi)	Indicated (1/4-3/4 mi)	Inferred (3/4-3 mi)	Hypothetical (>3 mi)	
Montana	ROSEBUD	0-100 ft total		13.00	11.00	16.00	1.00	42.00
		100-200 ft	5-10 ft	3.90	2.60	25.00	22.00	54.00
			10-20 ft	12.00	33.00	150.00	27.00	220.00
			20-40 ft	1.10	0.46	0.00	0.00	1.60
		100-200 ft total		17.00	36.00	180.00	49.00	280.00
		200-500 ft	5-10 ft	9.40	77.00	320.00	130.00	540.00
			10-20 ft	67.00	430.00	1,600.00	230.00	2,300.00
			20-40 ft	88.00	410.00	300.00	0.00	800.00
		200-500 ft total		160.00	920.00	2,200.00	360.00	3,600.00
		500-1000 ft	5-10 ft	6.20	30.00	79.00	42.00	160.00
			10-20 ft	22.00	78.00	950.00	310.00	1,400.00
			20-40 ft	16.00	190.00	980.00	35.00	1,200.00
		500-1000 ft total		44.00	300.00	2,000.00	380.00	2,700.00
		>1000 ft	10-20 ft	0.00	0.00	39.00	5.80	45.00
			20-40 ft	0.00	0.00	410.00	7.70	420.00
		>1000 ft total		0.00	0.00	450.00	14.00	460.00
	ROSEBUD total			240.00	1,300.00	4,800.00	810.00	7,100.00
	TREASURE	0-100 ft	5-10 ft	2.00	30.00	19.00	0.00	51.00
			10-20 ft	0.00	5.10	1.20	0.00	6.40
			20-40 ft	2.70	15.00	1.70	0.00	19.00
		0-100 ft total		4.70	50.00	22.00	0.00	76.00
		100-200 ft	5-10 ft	13.00	34.00	9.60	0.00	56.00
			10-20 ft	24.00	46.00	7.20	0.00	77.00
			20-40 ft	22.00	88.00	5.60	0.00	120.00
		100-200 ft total		58.00	170.00	22.00	0.00	250.00
		200-500 ft	5-10 ft	0.36	3.60	0.00	0.00	4.00
			10-20 ft	15.00	150.00	94.00	0.00	260.00
			20-40 ft	55.00	210.00	210.00	0.00	470.00
		200-500 ft total		70.00	370.00	300.00	0.00	740.00
		500-1000 ft	10-20 ft	0.26	3.20	9.40	0.00	13.00
			20-40 ft	0.81	7.20	210.00	0.00	210.00
		500-1000 ft total		1.10	10.00	220.00	0.00	230.00
	TREASURE TOTAL			130.00	600.00	560.00	0.00	1,300.00
	Grand total (MST)			830.00	4,000.00	6,900.00	830.00	13,000.00

Source: USGS 1999 National Coal Resource Assessment of Selected Tertiary Coal Beds and Zones in the Northern Rocky Mountains and Great Plains Region, Prof. Paper 1625-A

Figure 2-3. Overburden Thickness above Assessed Coal Zones in the Powder River Basin

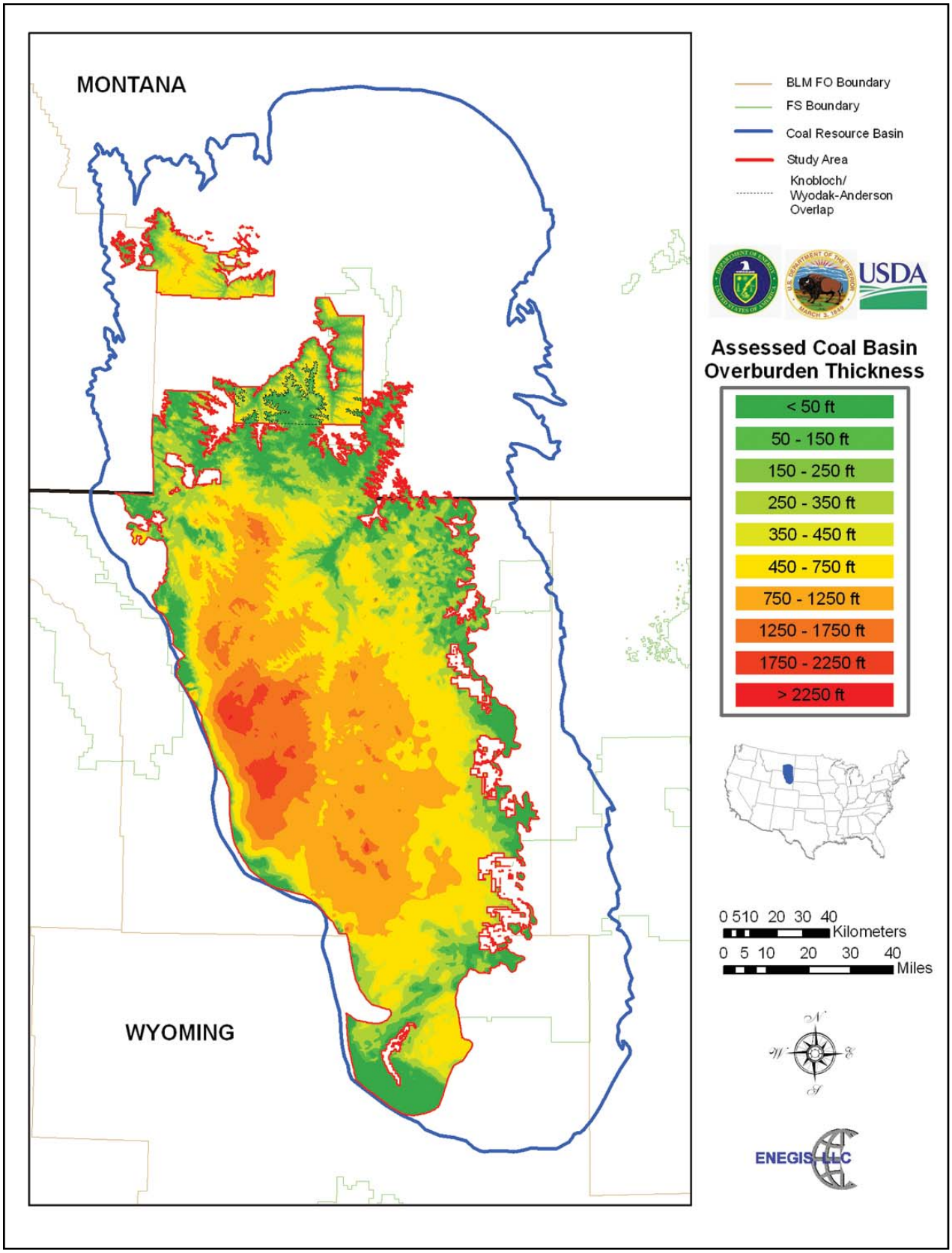
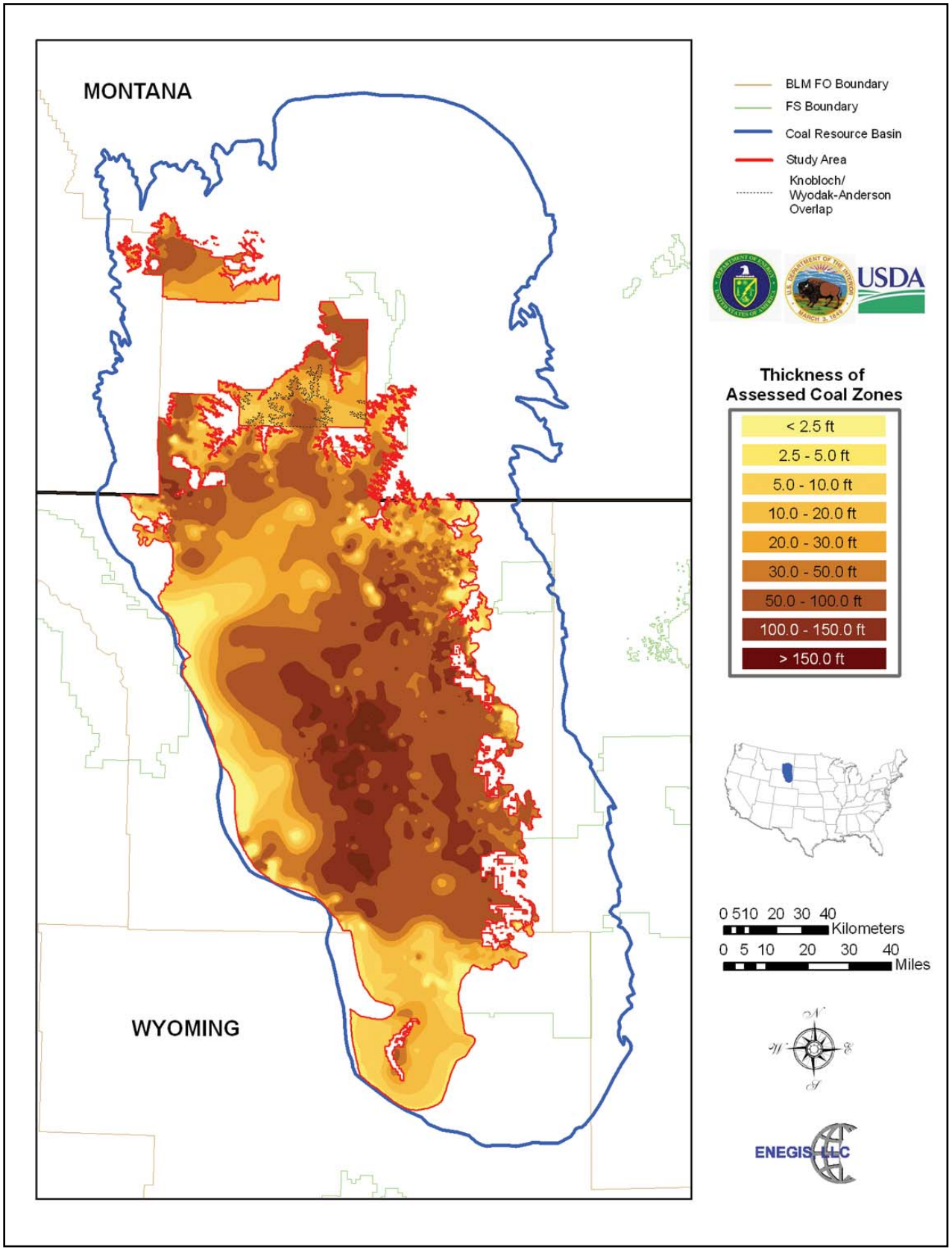


Figure 2-4. Thickness of Assessed Coal Zones in the Powder River Basin



The USGS coal resource data are reported in accordance with varying levels of reliability, based on an area's proximity to the nearest data point.[12] A discussion of the reliability categories is below, followed by a map showing the coal reliability categories in the PRB (Figure 2-5):

Measured Resources. Identified bodies of coal having a high degree of geologic assurance. This includes virgin coal that lies between 0 and 1/4 mile (0.4 km) from a known point of coal thickness.

Indicated Resources. Identified bodies of coal having a moderate degree geologic assurance. This includes virgin coal that lies between 1/4 mile (0.4 km) and 3/4 mile (1.2 km) from a known point of coal thickness.

Inferred Resources. Identified bodies of coal having a low degree of geologic assurance. This includes virgin coal that lies between 3/4 mile (1.2 km) and 3 miles (4.8 km) from a known point of coal thickness.

Hypothetical Resources: Coal occurrences having a very low degree of geologic assurance. Tonnage estimates for this category of resources are based on assumed continuity geographically beyond inferred resources (coal beyond a radius of 3 miles or 4.8 km from a known point of coal thickness).

2.3 Data Integration and Spatial Analysis

The EPAct coal model is a customized GIS and database utility that manages all geographic and tabular inputs, performs all required geoprocessing functions, calculates all required database fields, and compiles the Inventory results. The model was created using Environmental Systems Research Institute (ESRI) ArcGIS v 9.2 and Microsoft Access 2002 functionality. All geographic data are in the form of ESRI 9.2 Geodatabases, and are projected in Universal Transverse Mercator (UTM) Zone 13, North American Datum (NAD) 83 datum. FGDC-compliant metadata are provided for all GIS themes. All tabular input data exist in Access tables within the geodatabases. Results are also reported in Microsoft Excel spreadsheets.

2.3.1 Categorization of Coal Access Constraints

Once all available access constraint GIS data were compiled, the discrete data were spatially overlain into a seamless polygon GIS theme. This geoprocessing component of the model involves unioning individual access constraint themes together one-by-one, progressively combining the geographies and associated data of each theme. Once all access constraints were incorporated, the resultant Model Master theme consisted of geographically unique polygons containing data identifying the individual access constraints present in that geography. The model then calculates the cumulative effect of the overlapping access constraints within an access categorization hierarchy. The access categorization hierarchy used in this Inventory is listed in Table 2-6, ordered from most to least restrictive.

12 See USGS Circular 891, "Coal Resource Classification System of the U.S. Geological Survey", by Wood, G.H., Kehn, T.M., Carter, M.D., and Culbertson, W.C., 1983, 65 pages.

Figure 2-5. Assessed Coal Resource Reliability Map

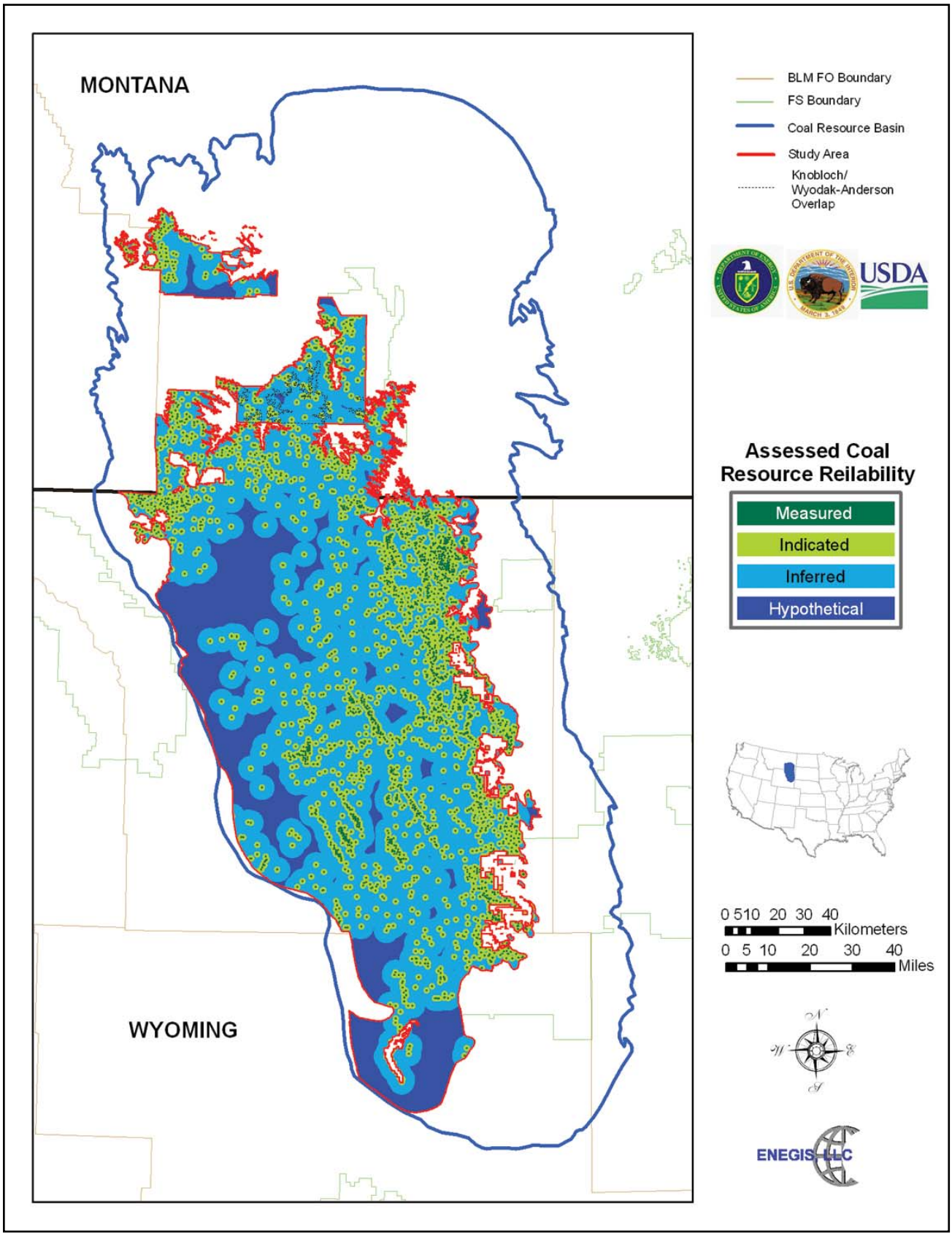


Table 2-6. Access Categorization Hierarchy

Level	Access Category	Comments
1	No Leasing (Statutory/Executive Order), (NLS)	Accessibility determined by Law or Executive Order; mining prohibited
2	No Leasing (Administrative), general category (NLA)	Accessibility determined by Federal surface management agency; no leasing
3	Possible Leasing (Administrative), Pending Land Use Planning (PL-PLUP)	Status set by Federal surface management agency; no leasing pending planning
4	Possible Leasing (Administrative), Pending Surface Owner Consent (PL-PSOC)	Status set by Federal surface management agency consent or no leasing pending qualified surface owner consent
5	Leasing, No Surface Operations Anticipated/Offset Area (NSOA/OA)	No surface mining operations anticipated due to current technological limitations, or coal reserve areas "sterilized" by offsets
6	Surface Mining Allowed with Mitigation (SUR-MIT)	Mining permitted, specialized mitigation plan required (i.e., Conflict Administration Zones in the PRB etc)
7	Leasing, Standard Lease Terms (SLTs)	Mining permitted, mitigation plan required; see Appendix 5 for Standard Restrictions

The categorization hierarchy was developed under Steering Committee guidance and comes, in part, from the Federal Coal Screening process, (the four Land Use Planning (LUP) Screens discussed previously in Section 2.1.2.1 (Table 2-7)). Each planning screen comprises a specific step in the planning process, and an area cannot be considered for leasing until all four planning screens are complete. Each planning screen identifies areas that are unsuitable for coal leasing. Lands that have not yet completed the screening process are not considered available for leasing, but could be leased in the future. Land use planning screens have not been applied to these areas because during the land use planning process, no interest was expressed in leasing coal in these areas during the current twenty-year planning horizon. These lands are categorized as Possible Leasing, Pending Land Use Planning (PL-PLUP) in the Inventory. Table 2-7 cross-references the LUP screens with the categorization hierarchy. Note, category differences occur between surface and subsurface mining, as discussed in Section 2.5.

Table 2-7. Coal Land Use Planning Screens with EPAct Categorization

Coal Land Use Planning Screen	Criteria	EPAct Coal Inventory Categorization	
		Surface Categorization	Subsurface Categorization
LUP Screen 1	Identify areas with coal development potential	Areas available for leasing	
LUP Screen 2	Apply the coal unsuitability criteria	See Table 2-8	
LUP Screen 3	Assess multiple land use conflicts	2	5
LUP Screen 4	Consult with qualified surface owners concerning surface mining of underlying Federal coal	2	5

Category 4 lands (PL-PSOC) include areas of split estate where qualified surface owner consent has not yet been given, but have been through the other planning screens.

Within LUP Screen 2, 20 unsuitability criteria related to environmental, cultural, physical, and biological values are specifically addressed. The criteria can be found in Table 2-8, where they are also cross-referenced with the categorization hierarchy.

Table 2-8. Coal Unsuitability Criteria with EPAct Categorization

Unsuitability Criterion	Description	EPAct Coal Inventory Categorization	
		Surface Categorization	Subsurface Categorization
1	Federal Land Systems and Federal lands in incorporated towns	1	1*
2	Federal lands within rights-of-way or easements on federally-owned surface (such as railroads)	2	5
3	Buffer zones for public roads, cemeteries, schools, churches, public buildings and parks, and occupied dwellings	2	5
4	Wilderness study areas	1	1
5	Scenic lands designated Class I by VRM analysis	2	5
6	Lands being used for scientific studies	2	5
7	Lands on the National Register of Historic Places	2	5
8	Designated natural areas and National Natural Landmarks	2	5
9	Habitat for Federal threatened and endangered plant and animal species	2	5
10	Habitat for State threatened and endangered plant and animal species	2	5
11	Bald and golden eagle nests and buffer zones	2	5
12	Bald and golden eagle roost and concentration areas	2	5
13	Falcon cliff nesting sites and buffer zones	2	5
14	High priority habitat for migratory bird species of high Federal interest	2	5
15	Essential habitat for animal and plant species of high interest to State (such as sage grouse strutting grounds)	2	5
16	100-year floodplains that pose a substantial threat of loss of life or property if mined	2	5
17	Municipal watersheds	2	5
18	Natural Resource Waters plus a ¼ mile buffer zone from outer banks	2	2
19	AVFs where mining would interrupt, discontinue or preclude farming. Includes areas outside AVFs where mining would materially damage water quantity or quality in surface or underground water systems supplying AVFs.	2	5
20	Criteria proposed by a State or Tribe and adopted by DOI	2	5

* Except National Forests which are Category 2

One of the primary objectives for the development of the categorization is to achieve geographic independence for a given parcel of land subject to overlapping access constraints (hence the use of a hierarchy where that parcel of land or resources would be subject to a single category). The unsuitability criteria listed in 43 CFR 3461 only apply to surface mining or surface impacts of underground mining. Thus the nature of access required for surface and subsurface mining differs. This creates the need for separate access categories for coal resources accessible by surface and sub-surface mining.

2.3.1.1 Data Integration and Spatial Analysis – Related Caveats

- Based on Steering Committee guidance, a constant offset of 1,500 feet around No Lease Areas was used. A full explanation of the application of the offset area is found in Appendix 3. Use of this constant, rather than a variable distance, is anticipated to have less than one-half of one percent impact on the results.

2.4 Analytical Modeling of Federal Lands and Resources

The three principal datasets, Federal Land Status, USGS Coal Resources, and Coal Access Constraints were spatially unioned using a method analogous to that used to geoprocess the individual access constraints. In the resultant Model Master, each geographically unique GIS polygon was analyzed to determine the total amount of coal tonnage found within each access category by Federal land type. This represents the Inventory base case. This breakdown of resource reflects the Access Categorization. Resources are categorized purely by the category of the surface polygon overlying them and take the regulatory dataset (the access constraints) at face value.

To more closely model reality, the Inventory takes into account how access constraints are implemented in practice by Federal land managers by considering underground mining and the anticipated frequency with which exceptions/waivers/modifications to the access constraints are granted as described below. A further discussion of exception factors can be found in Section 2.6 below.

2.5 Consideration of Resources Beyond Conventional Surface Mining Technology

Solely for the purposes of this analysis, coal resources beyond the extraction capabilities of conventional surface mining technology were assumed using a generalized “strip ratio” for PRB coals. This ratio relates the overburden thickness and thickness of coal to propose a point at which surface mining would become infeasible. Based upon guidance from the Steering Committee, the proposed strip ratio beyond which surface mining is not considered feasible is 10:1. Areas with a strip ratio of 10:1 or higher are placed in the NSOA/OA access category (see Table 2-6) because no surface mining operations are anticipated given the current mining technology.

In the Inventory, restrictions were appropriately given separate access categories for surface and sub-surface mining; because unsuitability criteria only apply to surface mining and surface impacts of subsurface mining. Thus an area affected by a coal restriction may be categorized differently depending on the type of mining. As a practical matter, coals at an appropriate depth can be underground-mined for some distance from the mine opening without surface disturbance, thereby making the resources accessible. The map showing assessed coal resources in the PRB beyond conventional surface mining technology is shown in Figure 2-6.

2.6 Considertion of Exception Factors as a Secenario to the Base Case

Exceptions (including waivers, exemptions and modifications) to access constraints are often granted with respect to coal mining. For example, a golden eagle nest exception may be granted if the nest is found to be unoccupied or can be moved (see 43 CFR 3461, Criteria 11 and 12). Because complete records of exceptions to access constraints are not available, the Inventory uses an approach based on experienced conjecture of field personnel. BLM and FS field personnel were asked to propose, based on their experience, which access constraints should be granted exception for mining and to what degree. The field personnel were asked to surmise a long-term scenario (measured in decades that coal development would take place) in which virtually all mining requests in the affected habitat asked for exceptions. The professionals were then asked to provide an informed judgment as to the proportion of requests for which exceptions would be granted, which was then used as the exception factor for the restriction.

These hypotheticals were then used with the EPAct coal model to suggest how much coal resource would shift from category to category if a particular access constraint was granted an exception “x” percent of the time. Tabulation of these exception factors were made by restriction by office.

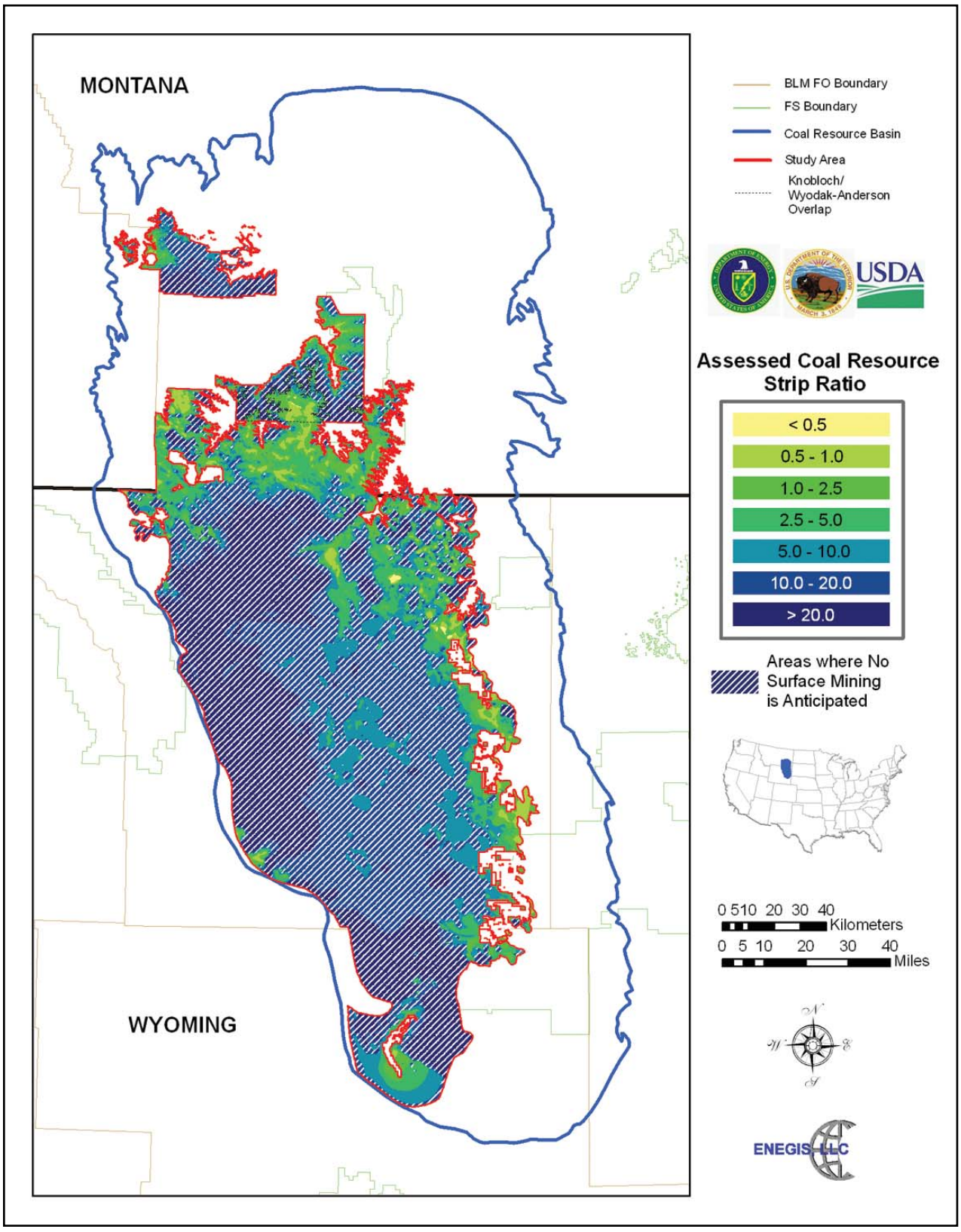
In the modeling, for each discrete GIS polygon, compilation of base case and scenario case (driven by exception factors) are determined to estimate the lands and resources according to the categorization hierarchy. Additional information regarding Exception Factors can be found in Appendix 3 (Table A3-3 depicts the exception factors used in the modeling).

2.7 Consideration of Conflict Administration Zones

Coalbed natural gas (CBNG) development in the PRB is a maturing form of energy development. Due to the inherent nature of coal mining, conflicts between CBNG development and coal mining operations arise over resource extraction timetables. In an effort to mitigate these conflicts, the BLM and cooperating state agencies have identified Conflict Administration Zones (CAZs) with the intent to allow development of both resources.

Due to current litigation in Montana, the CAZs are currently not in effect for the state, and therefore are not modeled. CBNG drilling in Montana currently is relatively limited. In Wyoming, where significant CBNG drilling occurs, CAZs have been identified by the BLM, and were included in the model.

Figure 2-6. Resources beyond Conventional Surface Mining Technology in the Powder River Basin



CAZs are reviewed annually and are changed accordingly. It is useful to note that a CAZ is established for all areas of Federal coalbed natural gas development where mining of Federal coal is anticipated in the next ten years. The Inventory is a snapshot in time; however, a CAZ is a constantly moving target. As the mines advance, the CAZs will move ahead of them. Almost all unleased Federal coal that will be mined will eventually fall into a CAZ. Conflict Administration Zones have been established after the coal screen updates for the land use plans were compiled; therefore, they are not part of the coal screening process.

Appendices 3 and 4 provide further discussion on CAZs, including a BLM Instruction Memorandum on the subject. The current CAZs are modeled under Category 6 in the hierarchy.

2.8 Quality Control

A rigorous quality control (QC) check was instituted for the Inventory. During processing, the study area generated more than 360,000 discrete GIS polygons, each with unique characteristics in terms of land status, coal resources, access constraints and exception factors. As such, imprecision in GIS data that are insignificant for individual polygons can be amplified in the aggregate. Such imprecision is a direct function of the quality of the data received from the various sources contributing to the Inventory. To the extent that data received for the project are imprecise, error is magnified. A significant portion of the geoprocessing effort is dedicated to mitigating this imprecision.

For QC purposes, input coal resource totals and land areas were compared to outputs. The quality of the EPAct coal model output is high.

The model's land output data differs by less than 0.1 percent from the input data on an aggregate basis. This is a measure of the precision with which the EPAct coal model is functioning. To measure accuracy, a comparison of the modeled output of coal resources relative to input data (provided by the USGS) was made. For coal resources, model output data differs by 1.5 percent from the input data on an aggregate basis, which is within the Steering Committee's guidance for a 5 percent tolerance.[13]

2.9 Reporting of Results

Model results are presented in the form of tables, maps, and pie charts of both acres of land and coal resources within each of the seven access categories. Detailed tables and charts show results by coal probability category for each access category. This information is contained in Section 3 of the report.

13 The USGS assessment includes confidential data that were not made available for this study, which contribute to differences between the Inventory's coal resources and the USGS assessment.

3.0 RESULTS

The results of the Inventory are presented below, summarized by access category for land area and resources. Table 3-1 shows the results for the Powder River Basin. The tables show the results for Federal access category by land area and coal resources. Figures 3-1 and 3-2 show the corresponding pie charts depicting the seven-category access hierarchy (see Table 2-6) and the breakdown by coal-reliability category. Figures 3-3a, 3-3b and 3-4 show the Federal land access category[15] and the corresponding undeveloped coal resources on Federal lands, respectively.

3.1 Study Area Features

Given its coal resource endowment and quality, activity, land and mineral ownership characteristics, the Powder River Basin is unique in terms of its Federal land and resources accessibility. Noteworthy observations are presented below.

- Approximately 1.5 percent (82,000 acres) of assessed Federal coal resource acreage is available for mining under standard lease terms (Figures 3-1 and 3-2, Category 7). Based on resource estimates, these lands contain 5 percent (27,000 MST) of the Federal coal.
- Less than 1 percent (12,000 acres) of Federal mineral estates are available for mining with mitigation measures (Figures 3-1 and 3-2, Category 6). Based on resource estimates, these lands contain 1 percent (3,000 MST) of the Federal coal.
- Approximately 8 percent (431,000 acres) of Federal land is accessible in areas with no surface mining anticipated or under offsets (Figures 3-1 and 3-2, Category 5). Based on resource estimates, these lands contain 4 percent (24,000 MST) of the Federal coal in the basin.
- Approximately 14 percent (739,000 acres) of Federal land is not available for leasing without Federal surface management agency or qualified surface owner consent (Figures 3-1 and 3-2, Category 4). Based on resource estimates, these lands contain 14 percent (77,000 MST) of the Federal coal in the basin.
- Land use planning screens have not been applied to approximately 66 percent (3.6 million acres) of Federal coal estate (Figures 3-1 and 3-2, Category 3). Based on resource estimates, these low current development interest (deep coal) lands contain about 70 percent (387,000 MST) of the Federal coal assessed by the USGS.
- Approximately 8 percent (406,000 acres) of Federal land is not being leased as a result of local land use planning decisions (Figures 3-1 and 3-2, Category 2). Based on resource estimates, these lands contain about 3 percent (17,000 MST) of the Federal coal.

15 Note that the map displays surface access conditions only and does not depict the impact of exceptions, which is accounted for in the modeling.

- Approximately 3 percent (184,000 acres) of Federal land is statutorily not leasable (Figures 3-1 and 3-2, Category 1). Based on resource estimates, these lands contain about 3 percent (15,000 MST) of the Federal coal.

With respect to reliability, as expected, a greater degree of land use planning is associated with areas of higher coal resource certainty, as shown on Figure 3-2.

- Of the hypothetical resources (coal occurrences having a very low degree of geologic assurance), 94 percent display the highest requirement for land use planning, followed by inferred resources (77 percent).
- Of the indicated coal resources, 57 percent still require additional land use planning, while 9 percent are available under standard lease terms.
- Of the measured resources, which have the highest reliability, 55 percent of the resources still require land use planning, while 10 percent are currently available under standard lease terms.

Table 3-1. Summary of Inventory Study Area—Federal Land and Coal Resources by Access Category

Access Category		Area		Coal Types				Total Coal	
				Hypothetical	Inferred	Indicated	Measured		
		(Acres)	Percent of Federal	(MST)*	(MST)	(MST)	(MST)	(MST)	Percent of Federal
1.	No Leasing (Statutory/ Executive Order), (NLS)	184,385	3.4	245	9,636	4,524	872	15,277	2.8
2.	No Leasing (Administrative), general category (NLA)	406,172	7.5	280	10,494	5,064	1,043	16,880	3.1
3.	Possible Leasing (Administrative), Pending Land Use Planning or NEPA Compliance (PL-PLUP)	3,571,162	65.8	28,875	243,230	93,926	21,435	387,466	70.4
4.	Possible Leasing (Administrative), Pending Surface Owner Consent (PL-PSOC)	738,827	13.6	527	29,919	37,471	9,128	77,045	14.0
5.	Leasing, No Surface Operations Anticipated/ Offset Area (NSOA/OA)	430,941	7.9	515	12,506	8,756	1,864	23,640	4.3
6.	Surface Mining Allowed with Mitigation (SUR-MIT)	12,208	0.2	–	179	1,744	739	2,662	0.5
7.	Leasing, Standard Lease Terms (SLTs)	81,962	1.5	255	9,148	14,156	3,676	27,235	5.0
Total Federal		5,425,657	100	30,696	315,113	165,641	38,757	550,206	100.0
NonFederal		1,403,858		10,589	52,881	28,135	5,875	97,480	
Total		6,829,515		41,285	367,994	193,775	44,633	647,686	

* Million Short Tons

Figure 3-1. Chart of Results, Powder River Basin Study Area—Total Federal Land and Coal Resources by Access Category

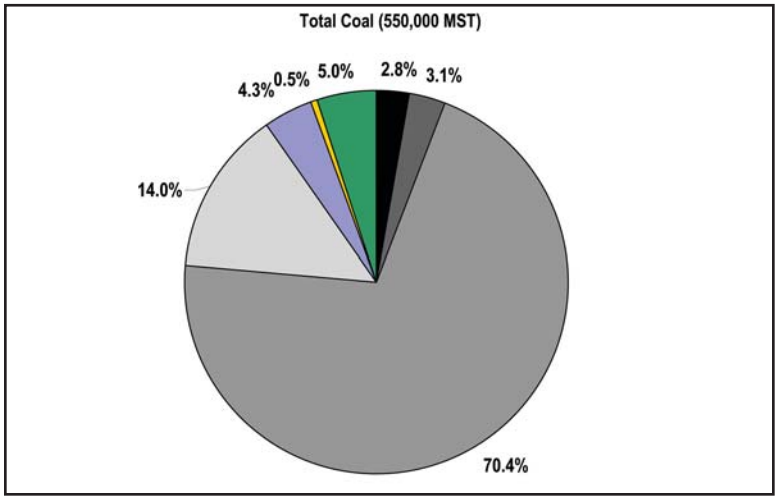
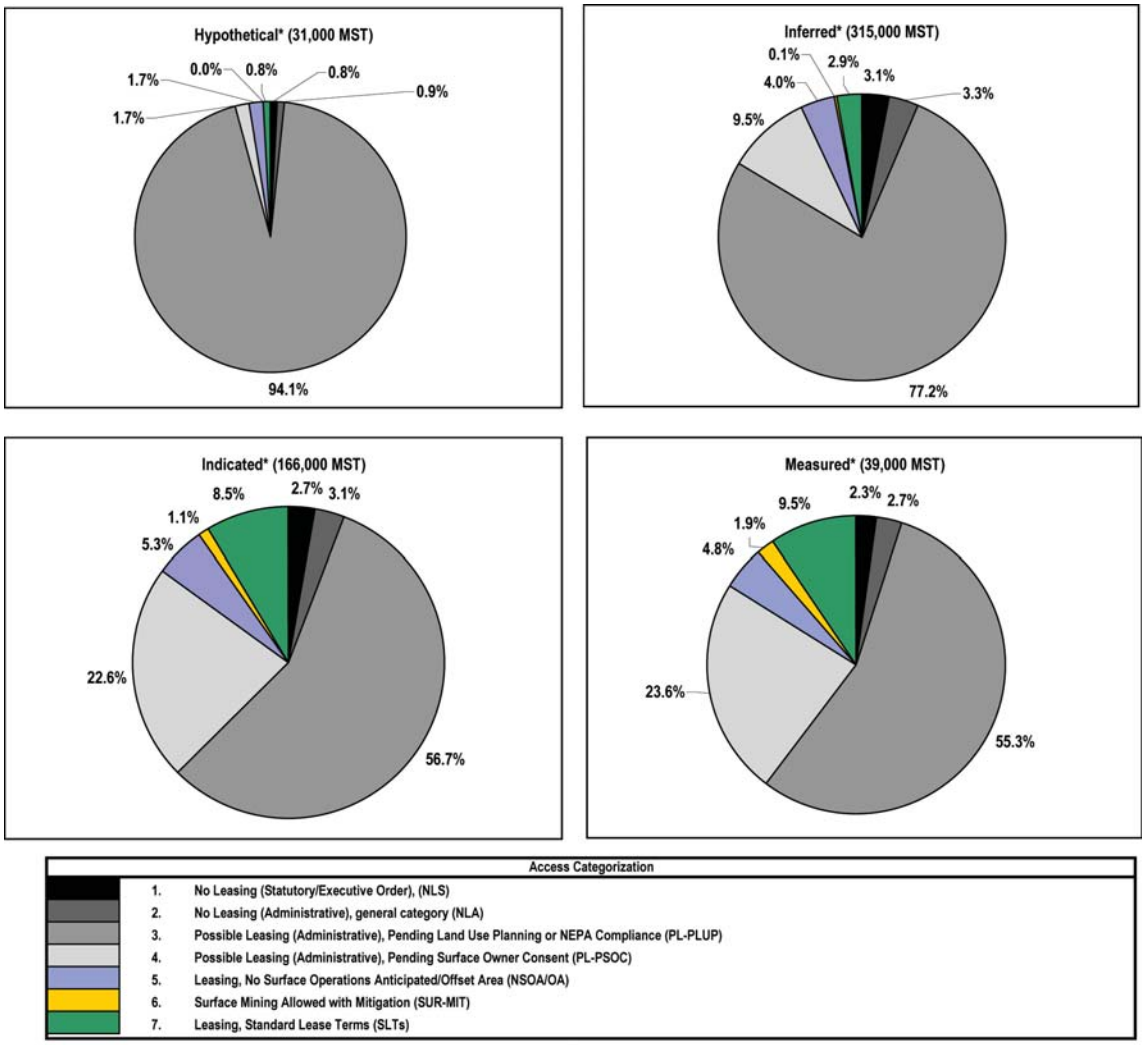


Figure 3-2. Chart of Results, Powder River Basin Study Area—Federal Coal Resources by Coal Reliability Type



** For an explanation of Hypothetical, Inferred, Indicated, and Measured resources, see Section 2.2.1*

Figure 3-3a. Federal Land Access Categorization Map, Northern Powder River Basin Study Area

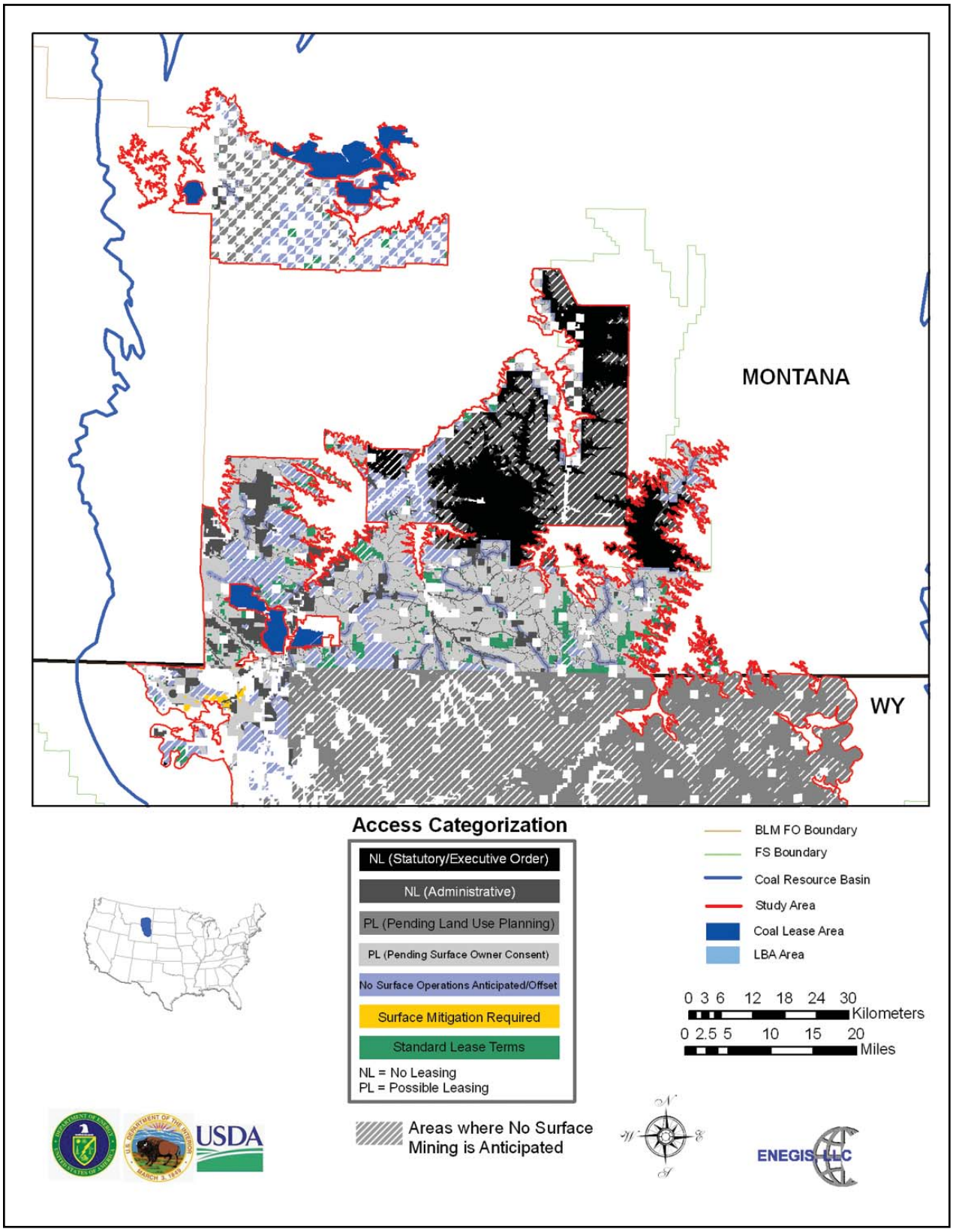


Figure 3-3b. Federal Land Access Categorization Map, Southern Powder River Basin Study Area

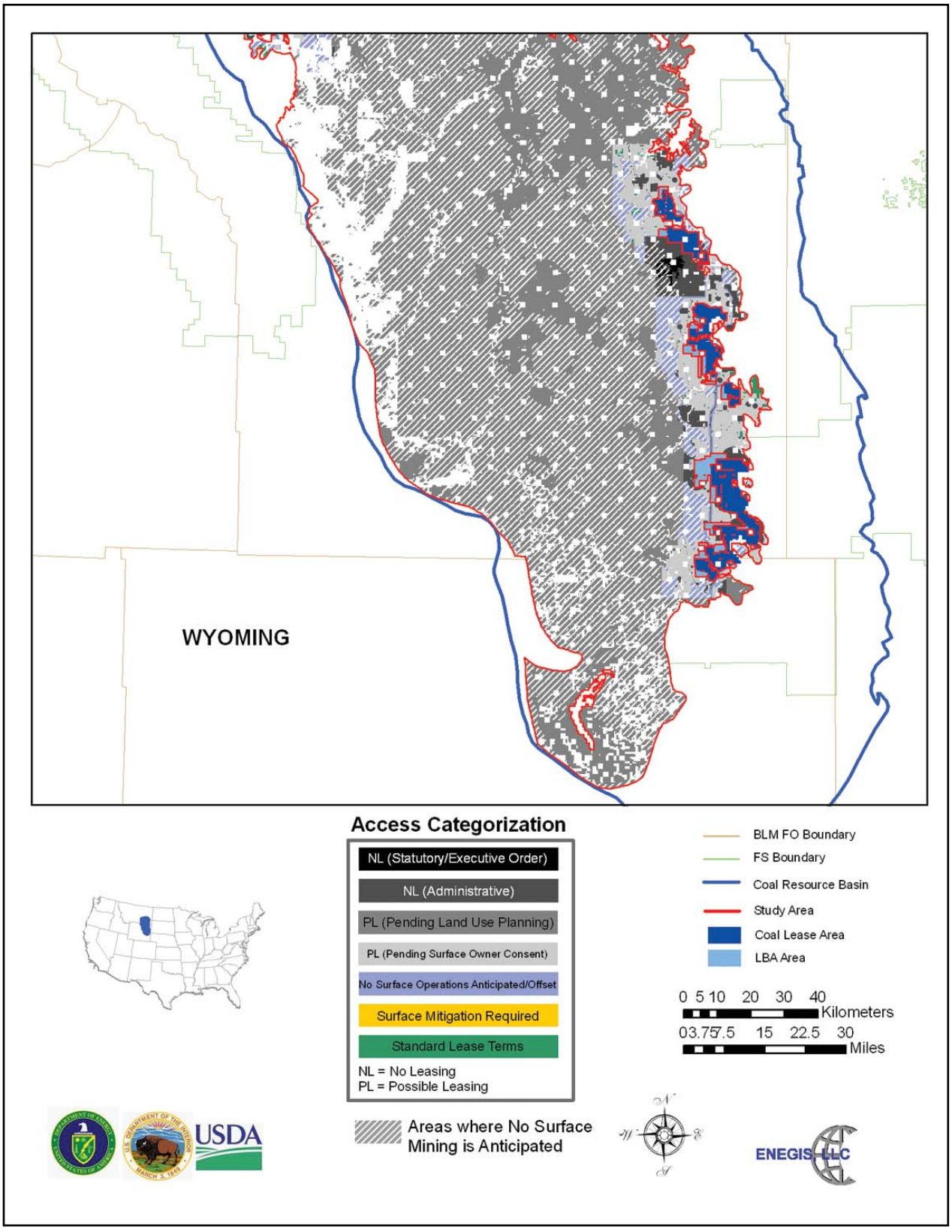
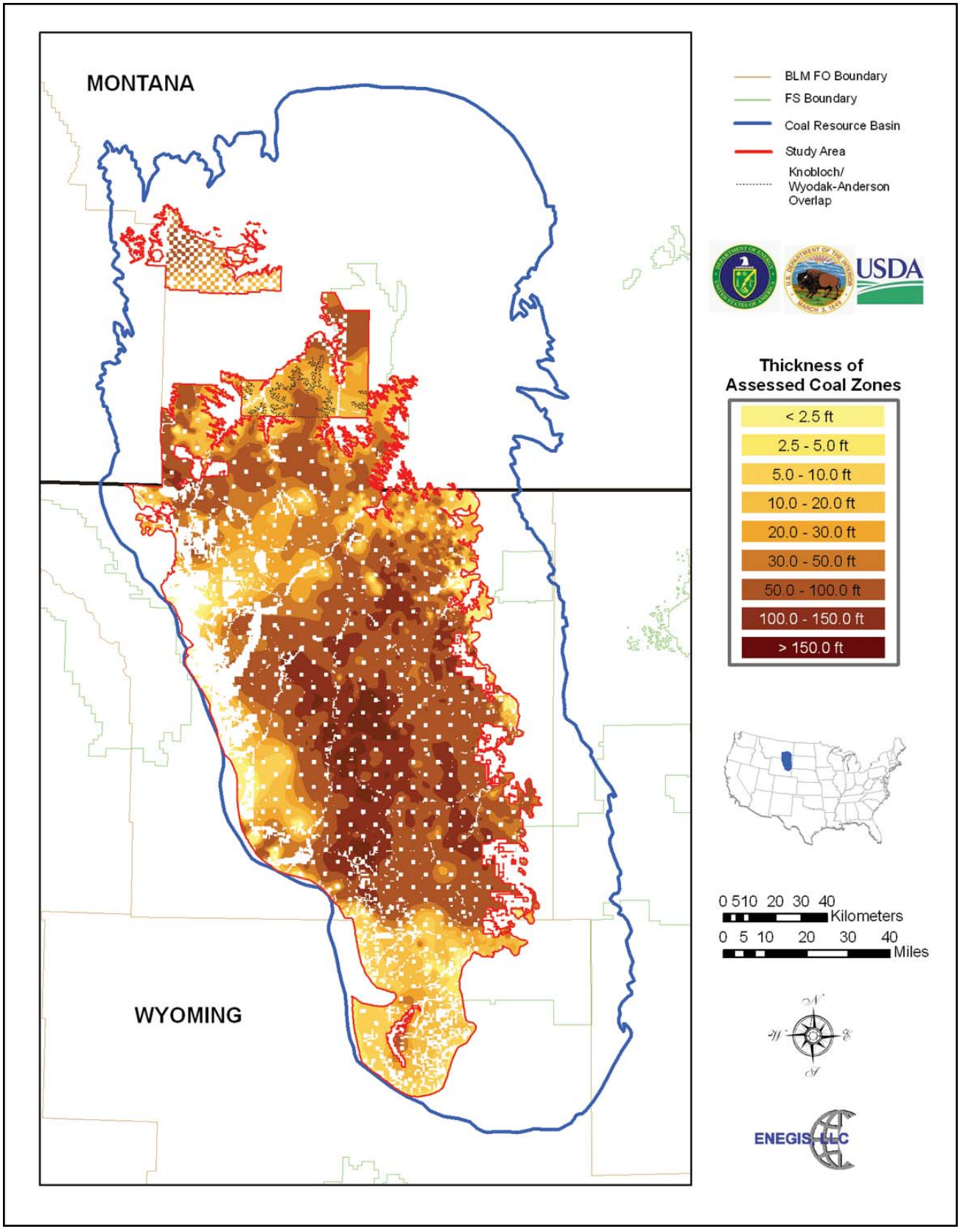


Figure 3-4. Federal Coal Thickness, Powder River Basin



APPENDIX 1

ACRONYMS AND ABBREVIATIONS

AO	Authorized Officer
APD	Application for Permit to Drill
AU	Assessment Unit
AVF	Alluvial Valley Floor
BLM	Bureau of Land Management
BST	Billion Short Tons
BTU	British Thermal Unit
CAZ	Conflict Administration Zone
CBNG	Coalbed Natural Gas
CFR	Code of Federal Regulations
CX	Categorical Exclusion
DEQ	Department of Environmental Quality
DNA	Documentation of NEPA Adequacy
DOE	Department of Energy
DOI	Department of the Interior
EA	Environmental Assessment
EF	Exception Factor
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EPAct	Energy Policy Act of 2005
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
FEIS	Final Environmental Impact Statement
FGDC	Federal Geographic Data Committee
FlorRs	Federal Lands or Resources
FO	Field Office
FONSI	Finding of No Significant Impact

FP	Forest Plan
FS	United States Department of Agriculture-Forest Service
GCDB	Geographic Coordinate Database
GIS	Geographic Information System
IM	Instruction Memorandum
ITCs	Incorporated Towns and Cities
LAC	Land Access Categorization
LBA	Lease-by-Application
LLD	Legal Land Description
LR	Legacy Rehost
LUP	Land Use Plan
MST	Millions of Short Tons
MT	Montana
NAD	North American Datum
NCRA	National Coal Resource Assessment (2000)
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NF	National Forest
NLA	No Leasing, Administrative
NLS	No Leasing, Statutory or Executive Order
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NSOA/OA	No Surface Operations Anticipated/Offset Area
OSM	United States Department of Interior Office of Surface Mining
PRB	Powder River Basin
PL-PLUP	Possible Leasing, Pending Land Use Planning
PL-PSOC	Possible Leasing, Pending Surface Owner Consent
PL	Public Law

PLSS	Public Land Survey System
QC	Quality Control
RAMP	Resource Area Management Plan
RMA	Resource Management Area
RMP	Resource Management Plan
RNA	Research Natural Area
ROD	Record of Decision
SEIS	Supplemental Environmental Impact Statement
SLT	Standard Lease Terms
SMA	Surface Management Agency
SMCRA	Surface Mining Control and Reclamation Act
SUB-DPTH	Subsurface Mining Only Due to Coal Depth
SUR-MIT	Surface Mitigation Required (Leasing Allowed)
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VRM	Visual Resource Management
WY	Wyoming

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APPENDIX 2

GLOSSARY OF TERMS

-A-

Acquired Lands: Lands in Federal ownership that were obtained by the Government through purchase, condemnation, or gift; or by exchange. Acquired lands constitute one category of public lands (See public lands).

Affected Environment: Surface or subsurface resources (including social and economic elements) within or adjacent to a geographic area that could potentially be affected by coal activities; the environment of the area to be affected or created by the alternatives under consideration (40 CFR 1502.15).

Alluvial Valley Floor: The unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits formed by unconcentrated runoff or slope wash, together with talus, or other mass-movement accumulations, and windblown deposits, as defined in 30 CFR Chapter VII.

Application: A written request, petition, or offer to explore for coal or lease lands for coal mining, in accordance with the regulations found in Title 43 Part 3400.

Archeological/historic site: A site that contains either objects of antiquity or cultural value relating to history and/or prehistory that warrant special attention.

Assessment Unit: An area containing coal resources that includes the in-place tonnage estimates determined by summing the volumes for identified and undeveloped deposits of coal of a minimum thickness and under less than a certain depth in a specified coal bed or zone.

-B-

Basin: (1) An area largely enclosed by higher lands. (2) A low in the Earth's crust of tectonic origin in which sediments have accumulated.

Big Game: Larger species of wildlife that are hunted, such as elk, deer, bighorn sheep, and pronghorn antelope.

Big Game Winter Range: An area available to and used by big game (large mammals normally managed for sport hunting) through the winter season.

Buffer Zone: (1) An area between two different land uses that is intended to resist, absorb, or otherwise preclude developments or intrusions between the two use areas. (2) A strip of undisturbed vegetation that retards the flow of runoff water, causing deposition of transported sediment.

Bureau of Land Management: An agency within the United States Department of the Interior that administers 264 million surface acres of America's public lands, located primarily in 12 Western States. The BLM sustains the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. The BLM also manages 699 million subsurface acres for mineral leasing and development.

-C-

Candidate Species: (1) A species for which substantial biological information exists on file to support a proposal to list it as endangered or threatened, but for which no proposal has yet been published in the Federal Register. The list of candidate species is revised approximately every two years in the Notice of Review. (2) Any species not yet officially listed, but undergoing a status review or proposed for listing according to Federal Register notices published by the Secretary of the Interior or the Secretary of Commerce.

Coalbed: A layer of coal.

Coal production – The coal that is severed, stored, or sent to markets.

Coal reserves: Measured tonnages of coal that have been calculated to occur in a coal seam within a particular property. The United States has the world's largest known coal reserves, over 260 billion short tons.

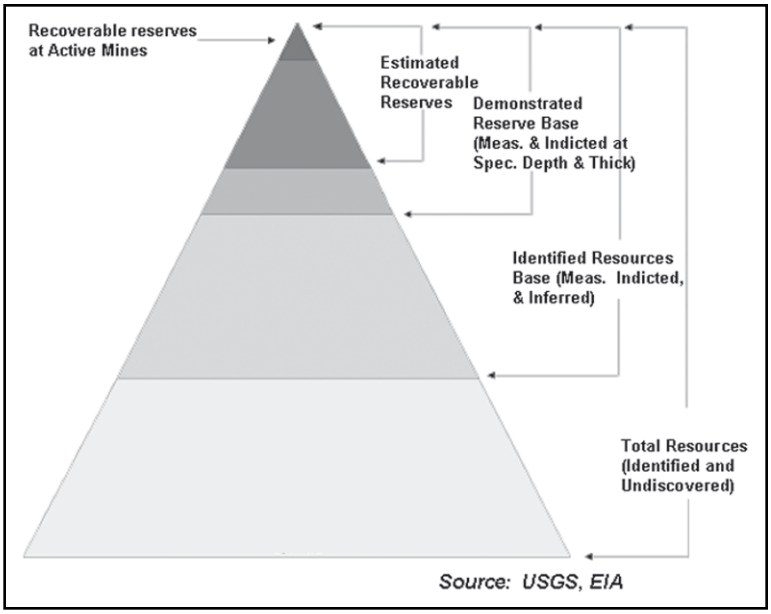
Coal Resources: Naturally occurring concentrations or deposits of coal in the Earth's crust. The various types of coal resources are shown in Figure A2-1. (*Also see Hypothetical, Identified, Indicated, Inferred, and Demonstrated Resources).*[16]

Coal thickness: The thickness of the coalbed.

Coal zone: Closely associated layers of coal within a defined stratigraphic interval. These layers may merge with or split off from each other, or be interrupted by channeling, faulting, or erosion.

Coalbed Natural Gas: Natural gas found in coalbeds. Also termed "coalbed methane" or "coalbed gas". Coalbed methane extraction involves drilling into the coal and pumping water from the coal in an attempt to lower the hydrostatic head on the coal. This lower pressure will cause the release of gas which is adsorbed onto the

Figure A2-1. United States Coal Resources and Reserves



16 See USGS Circular 891, Coal Resource Classification System of the U.S. Geological Survey for more information.

coal. The gas production begins slowly and generally increases as the pressure drops over the years.

Compliant coal: Coal that contains not less than 1.0 and not more than 1.2 pounds of sulfur dioxide per million BTU, as defined in the EPAct 2005.

Conflict Administration Zone: An area established by the BLM around an active coal mine or Lease-By-Application area that has a potential conflict with Coalbed Natural Gas development within the next ten years. In Conflict Administration Zones, BLM will provide timely notice to the coal and CBNG lessees or operators of the need for prevention and resolution of such conflict.

Council on Environmental Quality (CEQ): An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Cultural Resources: Those fragile and nonrenewable physical remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, burial mounds, petroglyphs, and natural features that were of importance in past human events. These resources consist of (1) physical remains; (2) areas where significant human events occurred, even though evidence of the event no longer remains; and (3) the environment immediately surrounding the resource. Cultural resources are commonly discussed in terms of prehistoric and historic values; however, each period represents a part of the full continuum of cultural values from the earliest to the most recent.

-D-

Decision Record: A document required by NEPA that is separate from, but associated with, an environmental assessment. The Decision Record publicly and officially discloses the responsible official's decision that will be implemented.

Demonstrated Resources: Measured plus Indicated resource categories combined.

-E-

Endangered Species: As defined in the Federal Endangered Species Act, any species that is in danger of extinction throughout all or a significant portion of its range. For terrestrial species, the United States Fish and Wildlife Service determines endangered status.

Environmental Assessment (EA): A public document for which a Federal agency is responsible that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a finding of no significant impact; (2) help an agency comply with the NEPA when no EIS is necessary; and (3) facilitate the preparation of an EIS when one is necessary. An EA includes brief discussions of the need for the proposal and of the environmental impacts of the proposed action and other alternatives.

Environmental Impact Statement (EIS): A written analysis of the impacts on the natural, social, and economic environment of a proposed project or resource management plan with potentially significant environmental impacts.

Energy Policy Act (EPAct) Section 437 Coal Inventory: This Inventory provides information regarding the geographic relationship between coal resources and the constraints that govern their development in the Powder River Basin. It is not a reassessment of any restrictions themselves on the development of coal resources. Additional information may be available from monitoring and scientific studies incorporated into adaptive management processes.

-F-

Federal Land: 43 CFR 3400.0-5(o) defines *Federal lands* as lands owned by the United States, without reference to how the lands were acquired or what Federal agency administers the lands, including surface estate, mineral estate and coal estate, but excluding lands held by the United States in trust for Indians, Aleuts or Eskimos.

Finding of No Significant Impact (FONSI): A document prepared by a Federal agency showing why a proposed action would not have a significant impact on the environment and thus would not require preparation of an Environmental Impact Statement. A FONSI is based on the results of an environmental assessment.

Forest Plan (FP): A land use plan for a unit of the National Forest system.

Forest Service (FS): An agency of the United States Department of Agriculture that manages 193 million acres of public lands in national forests and grasslands.

-G-

Geographic Information System (GIS): A computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e., data identified according to their locations.

Geospatial: Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. This information may be derived from remote sensing, mapping, and surveying technologies, or from other sources.

-H-

Habitat: A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

Hypothetical Resources: Coal occurrences having a very low degree of geologic assurance. Tonnage estimates for this category of resources are based on assumed continuity geographically beyond inferred resources (coal beyond a radius of 3 miles or 4.8 km from a known point of coal thickness).

-I-

Identified Resources: Resources whose location and quantity are known or estimated from specific geologic evidence. This includes virgin coal that lies ¼ mile or less from a known point of coal thickness (such as a drill hole or outcrop measurement).

Indicated Resources: Identified bodies of coal having a moderate degree geologic assurance. This includes virgin coal that lies between 1/4 mile (0.4 km) and 3/4 mile (1.2 km) from a known point of coal thickness

Inferred Resources: Identified bodies of coal having a low degree of geologic assurance. This includes virgin coal that lies between 3/4 mile (1.2 km) and 3 miles (4.8 km) from a known point of coal thickness

-J-

-K-

-L-

Land Use Planning (LUP) Screen: As mandated by 43 CFR part 3420.1-4, all Federal lands must be screened as part of the basis for coal leasing decisions and planning efforts. The coal screens are a four-part process involving identifying areas with coal development potential, applying the coal unsuitability criteria, assessing multiple land use conflicts and consulting with qualified surface owners.

Lease (Coal): An authorization to use Federal coal issued under the Mineral Leasing Act of February 25, 1920, as amended (30 U.S.C. 181, et seq.); the Act of August 7, 1947 (30 U.S.C. 351, et seq.); the Federal Coal Leasing Amendments Act of 1976 (90 Stat. 1083-1092); the Federal Lands Policy and Management Act of 1976 (43 USC 1701 et seq.); the Surface Mining Control and Reclamation Act of 1977 (30 USC 1201 et seq.), or the Act of November 16, 1981 (PL 97-98, 95 Stat. 1070).

Lease-by-application: Federal regulations under 43 CFR 3425 for decertified coal regions where discrete projects are evaluated at the lease application stage and management decisions are made on a case-by-case basis. Evaluations of potential lease tracts are triggered by applications from industry rather than by regional planning.

-M-

Measured Resources: Identified bodies of coal having a high degree of geologic assurance. This includes virgin coal that lies between 0 and 1/4 mile (0.4 km) from a known point of coal thickness.

Mineral: Organic and inorganic substances occurring naturally, with characteristics and economic uses that bring them within the purview of mineral laws; a substance that may be obtained under applicable laws from public lands by purchase, lease, or pre-emptive entry.

Mitigation: Includes the following:

(1) Avoiding an impact altogether by not taking a certain action or parts of an action.

(2) Minimizing impacts by limiting the degree of magnitude of the action and its implementation.

(3) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

(4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(5) Compensating for the impact by replacing or providing substitute resources or environments.

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting resource management objectives.

Multiple Land Use Concerns: The BLM and FS are multiple use agencies, and sometimes multiple resource customers compete for the use of the surface for a different purpose. If multiple minerals are leased, appropriate stipulations are attached to the leases to allow for staged development.

-N-

National Environmental Policy Act (NEPA): An Act to establish a national policy for the environment, to provide for the establishment of a Council on Environmental Quality, and for other purposes. The law requires the assessment and documentation of the environmental and social impacts of Federal actions. (PL 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by PL 94-52, July 3, 1975, PL 94-83, August 9, 1975, and PL 97-258, § 4(b), Sept. 13, 1982)

National Forest (NF): Created by an act of Congress in 1892, National Forests are Federal land reservations that are administered by the United States Department of Agriculture-Forest Service for multiple uses, including grazing, logging, minerals, and recreation.

National Register of Historic Places (NRHP): A Federal Government list of "... districts, sites, buildings, structures, and other objects significant in American history, architecture, archeology, and culture." The National Register is maintained by the National Park Service, United States Department of the Interior, and is published in its entirety in the Federal Register each year in February.

National Register of Natural Landmarks: A nationally significant natural area that has been designated by the Secretary of the Interior. An example is a type of biological community or geological feature in its physiographic province that illustrates the geological and ecological character of the United States.

No Surface Occupancy (NSO): An area where no surface-disturbing activities of any nature or for any purpose are allowed. For example, construction or the permanent or long-term placement of structures or other facilities would be prohibited. It is also used as a mitigation requirement for controlling or prohibiting selected land uses or activities that would conflict

with other activities, uses, or values in a given area. When used in this way, the NSO mitigation requirement is applied to prohibit one or more specific types of land and resource development activities or surface uses in an area, while other—perhaps even similar—types of activities or uses (for other purposes) would be allowed. For example, protecting important rock art relics from destruction may require closing the area to the staking of mining claims and surface mining, off-road vehicle travel, construction or long-term placement of structures or pipelines, power lines, general purpose roads, and livestock grazing. Conversely, the construction of fences (to protect rock art from vandalism or from trampling or breakage by livestock), an access road or trail, and other visitor facilities to provide interpretation and opportunity for public enjoyment of the rock art would be allowed. Additionally, if there were potential and interest for leasing and consequent mineral development in the area, then leases for coal, gas and oil, etc., could be issued with a NSO mitigation requirement for the rock art site, which would still allow access to the minerals from adjacent lands and underground. The term “no surface occupancy” has no relationship or relevance to the presence of people in an area.

Notice: The communication of a pending Federal action; the notification to parties of Federal actions about to be taken. This is a part of due process.

-O-

Offset Area: The area outside of a No Leasing area used to account for the average distances for construction of benches associated with the perimeters of surface mines.

Operator: An individual, group, association, or corporation authorized to conduct coal mining on public lands.

Overburden: The layers of soil and rock above the coal bed to be mined.

-P-

Proposed Species: A species of plant or animal formally proposed by the United States Fish and Wildlife Service (USFWS) to be listed as threatened or endangered under the Endangered Species Act.

Public Domain Lands: Original public domain lands that have never left Federal ownership; also, lands in Federal ownership that were obtained by the Government in exchange for public domain lands or for timber on public domain lands. Public domain lands constitute one category of public lands (See public lands).

Public Lands: Any land and interest in land owned by the United States that are administered by the Secretary of the Interior through the BLM, without regard to how the United States acquired ownership, except for (1) lands located on the Outer Continental Shelf and (2) lands held for the benefit of American Indians and Alaskan Natives; includes public domain and acquired lands (see definitions). Vacant, unappropriated, and unreserved public lands, or public lands withdrawn by Executive Order 6910 of November 26, 1934, as amended, or by Executive Order 6964 of February 5, 1935, as amended, and not otherwise withdrawn or reserved, or public lands within grazing district established under Section 1 of the Act of June 28, 1934 (48 Stat. 1269), as amended, and not otherwise withdrawn or reserved. Any

land and interest in land owned by the United States that are administered by the Secretary of the Interior through the BLM, without regard to how the United States acquired ownership, except for (1) lands located on the Outer Continental Shelf and (2) lands held for the benefit of Indians, Aleuts, and Eskimos; includes public domain and acquired lands (see definitions). Vacant, unappropriated, and unreserved public lands, or public lands withdrawn by Executive Order 6910 of November 26, 1934, as amended, or by Executive Order 6964 of February 5, 1935, as amended, and not otherwise withdrawn or reserved, or public lands within grazing district established under Section 1 of the Act of June 28, 1934 (48 Stat. 1269), as amended, and not otherwise withdrawn or reserved.

-Q-

Qualified Surface Owner: The natural person or persons (or corporation, the majority stock of which is held by a person or persons otherwise meeting the requirements of 43 CFR 3427 who: (1) Hold legal or equitable title to the surface of split estate lands; (2) Have their principal place of residence on the land, or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations; or receive directly a significant portion of their income, if any, from such farming and ranching operations; and (3) Have met the conditions of criteria (1) and (2) of this section for a period of at least three years, except for persons who gave written consent less than three years after they met the requirements of both criteria (1) and (2). In computing the three year period the authorized officer shall include periods during which title was owned by a relative of such person by blood or marriage if, during such periods, the relative would have met the requirements of this section.

-R-

Record of Decision: A document required by NEPA that is separate from, but associated with, an environmental impact statement. The Record of Decision publicly and officially discloses the responsible official's decision that will be implemented.

Resource Management Plan (RMP): A land use plan that provides the basic, general direction and guidance for BLM-administered public lands within a specific administrative area.

Restriction: Resource use, unsuitability criteria, coal development potential, legal restrictions, or surface owner conflicts that either prevent a parcel of Federal coal from being leased or require special lease stipulations and management prescriptions to mitigate the conflict.

Right-of-Way: A permit or easement which authorizes the use of public land for certain specified purposes, commonly for pipelines, roads, telephone lines, etc.; also, the lands covered by such an easement or permit. It does not grant an estate of any kind, only the right of use. May also include a site.

Riparian Areas: The vegetation along the banks of rivers and streams and around springs, bogs, wet meadows, lakes, and ponds.

-S-

Shapefile: GIS file format usable with ESRI (such as ArcView) and other commercial GIS software. It is a nontopological data structure that does not explicitly store topological relationships. However, unlike other simple graphic data structures, one or more rings represent shapefile polygons. A ring is a closed, non-self-intersecting loop. This structure can represent complex structures, such as polygons, that contain "islands." The vertices of a ring maintain a consistent, clockwise order so that the area to the right, as one "walks" along the ring boundary, is inside the polygon, while the area to the left is outside the polygon.

Short Ton: Unit of mass equal to 2,000 pounds.

Split Estate: Federal mineral estate administered by the BLM, which is under either private lands, state lands, or lands administered by another Federal agency. On split estate lands, the surface owner or managing agency controls the surface uses but the mineral estate is the dominant estate, subject to qualified surface owner consent. The BLM coordinates with surface owners on mineral leasing and development. In a few cases, the BLM administers the surface, but the minerals are owned by the state or a private entity.

Strip Ratio: The ratio between the overburden thickness and the coal thickness. The strip ratio is used to determine where surface mining becomes uneconomic and underground mining becomes the only feasible method of extraction. The strip ratio used in this study to determine the limit of surface mining in the Powder River Basin is 10:1.

Study Area: In this study, areas underlain by certain coal zones in the Powder River Basin, which was selected as the geologic province for this inventory. It comprises the area underlain by known or postulated coal resources in the Wyodak-Anderson, Knobloch, and Rosebud-Robinson coal zones based upon the USGS assessment in Professional Paper P-1625A.

Subbituminous coal: Coal that typically contains between 35 and 45% carbon. Over 40% of the coal produced in the United States is subbituminous, with Wyoming as the leading source.

Supercompliant coal: Coal that contains less than 1.0 pounds of sulfur dioxide per million BTU, as defined by the EPAct 2005.

Surface Management Agency: The Federal agency with jurisdiction over the surface of Federally owned lands containing coal deposits, and, in the case of private surface over Federal coal, the Bureau of Land Management, except in areas designated as National Grasslands, where it means the Forest Service.

Surface Coal Mining Operations: Activities conducted on the surface of lands in connection with a surface coal mine or surface operations and surface impacts incident to an underground mine, as defined in section 701(28) of Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1291(28)).

Surface Mining: Method used to produce coal that is relatively shallow in depth. Earth-moving equipment is used to remove the topsoil and layers of rock to expose the coal.

Surface Owner Consent: The right of a qualified surface owner to prohibit leasing on split estate Federal coal under 43 CFR 3427.

Surface Ownership Consultation: Part of the Land Use Planning screen under 43 CFR 3420.1-4(e)(4). Prior to designating an area as acceptable for leasing, BLM and FS consult with surface owners to determine if they are for or against mining. If a significant portion of surface owners express a preference against mining, the area may not be considered acceptable for further consideration for leasing for surface mining.

-T-

-U-

Underground Mining: Method used to produce coal that is buried too deeply to mine by surface methods. Common underground mining techniques are room-and-pillar and longwall.

Unsuitability Criteria: Established by the Surface Mining Control and Reclamation Act of 1977 and expanded in 43 CFR 3461, the criteria evaluate cultural and environmental resources which may be affected by mining. Application of the criteria result in a classification as: suitable for further consideration for coal leasing, suitable pending further study due to insufficient or outdated data, suitable after application of exceptions or exemptions, or unsuitable for further consideration for leasing.

-V-

-W-

Wilderness: A Congressionally designated area of undeveloped Federal land retaining its primeval character and influence, without permanent improvement or human habitation, that is protected and managed so as to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and, (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Withdrawal: An action that restricts the disposition of public lands and that holds them for specific public purposes; also, public lands that have been dedicated to public purposes (for example, recreation sites, office or warehouse sites, etc.).

-X-

-Y-

-Z-

APPENDIX 3

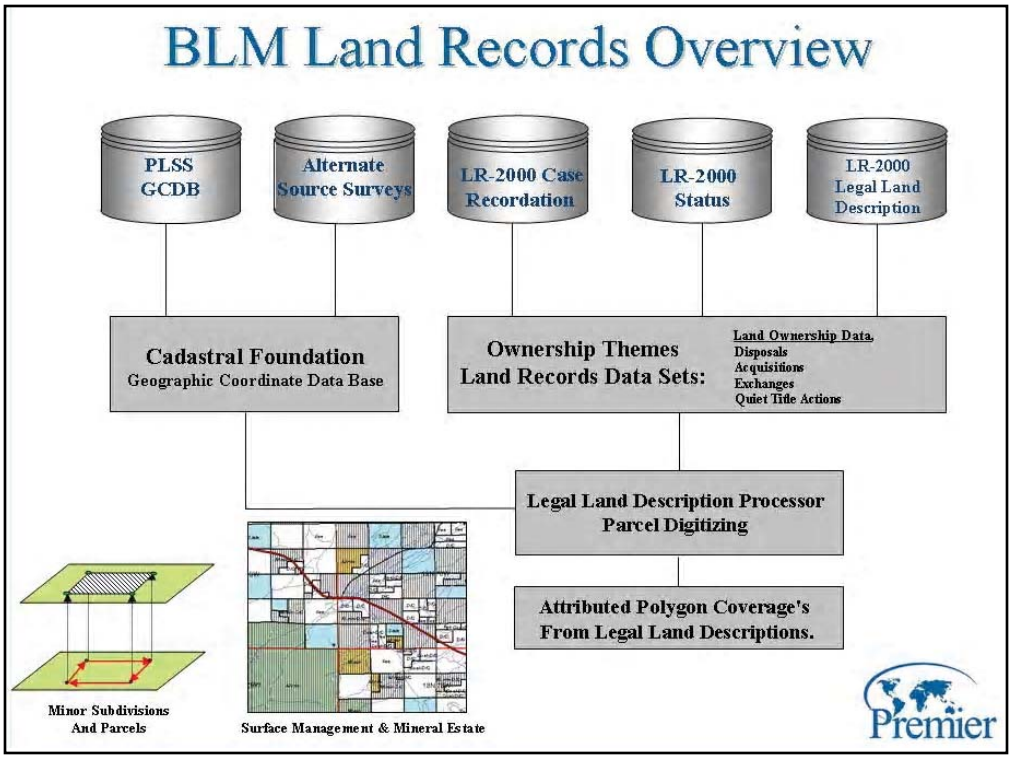
GIS DATA PREPARATION AND METHODOLOGY

A3.1 Federal Land Status Preparation

A3.1.1 Sources of Data

Federal lands mapping for the Inventory was completed based upon detailed research of multiple sources of information that describe the nature and extent of Federal surface and mineral interests. Spatial data themes were created that define various ownership characteristics and categories for lands within the study area boundaries. The final data sets were rendered to delineate both surface and subsurface United States rights. Ownership cases were extracted from the BLM's LR-2000 Data-base, processed, and used to create polygon themes for the project. The primary digital datasets processed and mapped include LR-2000 Status, Case Recordation, Legal Land Description, and existing Federal coal leases and LBAs. Digital land title records were supplemented with paper maps, land ownership ledgers, resource management plans, and other miscellaneous real property records. The primary BLM land record databases are shown on the following schematic in Figure A3-1.[17]

Figure A3-1. Schematic of BLM's Primary Land Records Databases



In the Public Land Survey System (PLSS) in the PRB, the BLM's Geographic Coordinate Data Base, where available, was utilized as the survey framework to create Federal land ownership and parcel boundaries. In areas where GCDB was not available, alternate sources were used to establish the positions of PLSS corners and subdivisions. Geographic coordinates were not available in all cases and, therefore, may be somewhat generalized.

17 Information is available at http://www.geocommunicator.gov which provides searching, accessing and dynamic mapping of data for Federal land stewardship, land and mineral use records, and land survey information. It also provides spatial display for land and mineral cases from BLM's LR2000 system.

A3.1.2 Data Preparation

Polygon themes were created for individual ownership cases within the study areas that were extracted from the BLM's LR-2000 Database.

The Surface Management Agency (SMA) and ownership polygon boundaries reflect parcel geometry as described by the legal land description maintained in the electronic records. All land descriptions were processed, including minor subdivisions where available, down to and including 2.5 acres. Lands described by lot, tract, or special surveys where GCDB was not available were processed against the BLM Legal Land Description (LLD) file to convert the lot references to nominal aliquot descriptions. Depending on the actual survey type and special survey geometry, the resulting polygon may contain a degree of generalization. Additionally, the BLM record systems do not contain individual records for public domain lands. The location of these lands was determined through various subtractive polygon-processing steps.

The primary information that defines U.S. ownership are data elements associated with various title transactions and business events recorded and maintained within the LR-2000 Database. Case records that fall within the following four general categories were extracted and mapped.

1. **Land Disposals,** including patents, grants, deeds, land sales and all other transactions that conveyed ownership rights in lands from the Federal government.
2. **Acquired Lands,** including lands that were re-acquired by the United States under various legal authorities.
3. **Land Exchanges,** including lands exchanged between the Federal government and other parties.
4. **Quiet Title Cases,** including all records established to cure title and quiet adverse claims.

These four major categories formed the basis to extract the desired records from the BLM's databases. The four queries were processed against both the Status and Case Recordation datasets. Due to formatting differences between the two databases, the resulting polygon attributes contained in the GIS shape files varied slightly. Additionally, in some records extracted from the Case Recordation system, United States Rights were not readily available but were determined as accurately as possible through interpretation from land records obtained at BLM state and field offices.

The following attribute fields shown in Table A3-1 lists the data elements contained in the shape files produced from each of the LR-2000 datasets:

The data simplification process was completed through numerous steps that combined data associated with each of the four broad record categories described above.

A general discussion of the processing steps is described below:

1. The GCDB or alternate source PLSS data was used as the cadastral reference framework. The PLSS grid contains data elements and coordinates that define both townships, sections, and 1/16 subdivisions. Where legal descriptions described parcels less than 40 acres, CartéView software was used to map the minor aliquot parts down to 2.5 acres or smaller.[18]

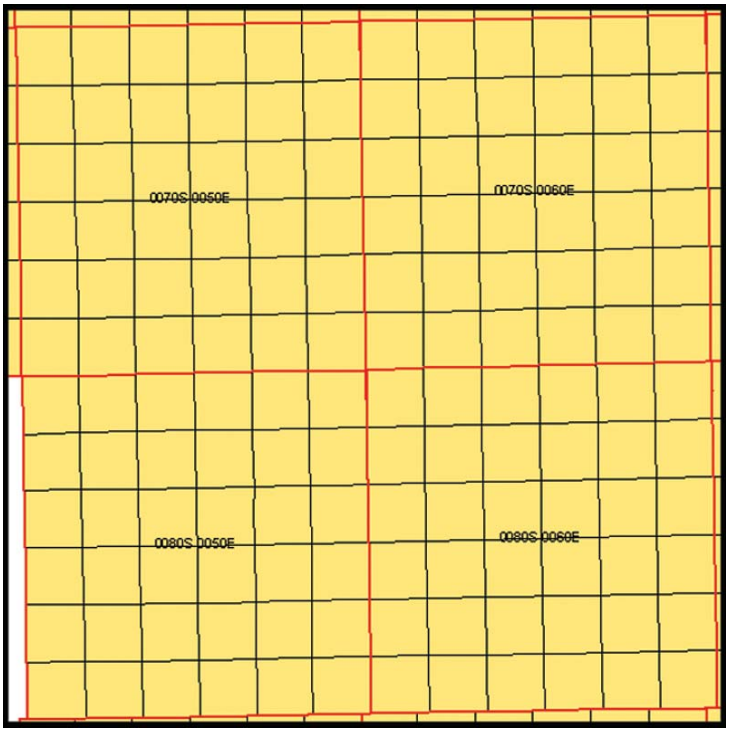
Table A3-1. Polygon Attributes from the LR-2000 Datasets

Status Attributes	Case Recordation Attributes
Shape Meridian Township Range Section Survey Type Aliquot Adminagenc County State Serialnumb Docid Patent_num Case_type Usright1 Usright2 Usright3 Usright4 Patentissu (mm/dd/yy) Patentiss1 (year) Acres Patentee Id	Meridian Township Range Section Surveytype Aliquot Serialnumb Surveynumb Name Percentint Price Acres Dispositio Casetype Commodity Expiredate Expireyear Effectdate Royaltyrt Geoname Hbp Or Id

Note: Data fields will be populated if data are entered in the Status dataset. If U.S Rights are recorded in the U.S Rights field, they will be included in the Commodity field.

Note: Data fields will be populated if data are entered in the Case Recordation dataset. If US Rights are entered, they will be included in the Commodity field.

Figure A3-2. Master Polygon



2. After the PLSS base was loaded, a master polygon (Figure A3-2) was created to represent the original U.S. land purchases and annexations.

3. The next step involved processing textual legal land descriptions against the PLSS framework file by subdividing according to the survey rules embedded in the CartéView software. The data shown in Table A3-2 shows a typical input file.

4. After the records from the Status and Case Recordation datasets were processed, the resulting polygon themes were re-attributed to facilitate merging them together. These polygons were then overlaid on the Master Polygon to establish the location of lands where ownership left the Federal

18 CartéView is the proprietary software of Premier Data Services, Englewood, CO.

Table A3-2. Typical CarteView Input File

Status Meridian	Generic Township	USRight1 Range	Serial Number		Aliquot	County	State	Serial Number	DocID	Case Type	USRight1
			Section	SurveyTy							
6	0160N	0920W	28	T	NWNW,NWSW,SWNW	7	WY	WYC 0001269	165770	HE ORIGINAL	Coal
6	0160N	0920W	29	T	NENE,NESE,NWNE,NWSE, SENE,SW	7	WY	WYC 0001269	165770	HE ORIGINAL	Coal
6	0160N	0920W	20	T	NESE,NWSE,SESE,SWSE	7	WY	WYC 0001270	163248	HE ORIGINAL	Coal
6	0160N	0920W	21	T	NWSW,SWSW	7	WY	WYC 0001270	163248	HE ORIGINAL	Coal
6	0160N	0920W	28	T	NWNW	7	WY	WYC 0001270	163248	HE ORIGINAL	Coal
6	0160N	0920W	29	T	NENE,NWNE	7	WY	WYC 0001270	163248	HE ORIGINAL	Coal

government by virtue of patent, grant, or other title transfer authority. The resulting coverages are represented in the following graphic, Figure A3-3.

The yellow polygons shown on the above map represent lands in the public domain where surface and subsurface rights are managed by the BLM.

5. The next step involved constructing a series of queries of the United States rights data associated with lands that were disposed through various title transfers. This query process (Figure A3-4) involved a very complex analysis against the attribute tables in the spatial datasets. The results of these processes delineate all lands where subsurface coal mineral rights are owned by the United States.

   Figure A3-5 illustrates the distribution of split estate mineral ownership within a four township area. The parcels shaded gray represent patented lands where the United States retained rights to the coal mineral estate.

Figure A3-3. Public Domain Lands

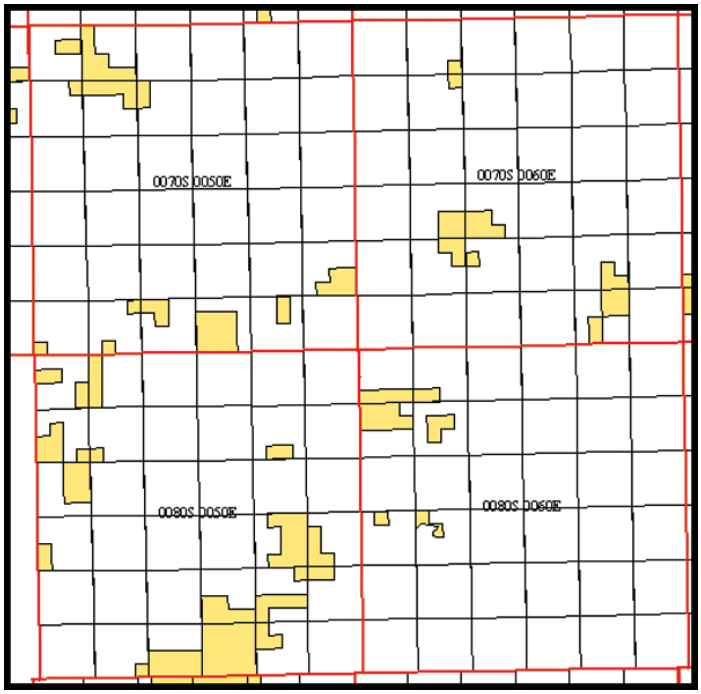
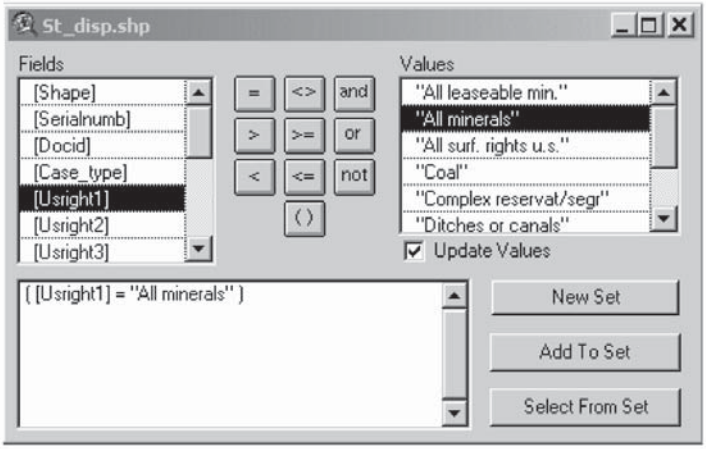


Figure A3-4. Query of U.S. Rights Data



6. The last step in the spatial query and overlay process was to define any other Federal management agencies or state surface ownership. These determinations were made by completing a series of queries against the ownership fields in the parcel base. The results of this query are shown in Figure A3-6.

7. The final processing step was to dissolve the individual parcels into ownership categories that define the surface and mineral estates. The view in Figure A3-7 shows the surface management agencies and how land ownership is distributed within an area of the Powder River Basin.

   In contrast to the surface management view, the mineral estate in the view shown in Figure A3-8 covers the same area and yields a much different picture. The yellow areas represent lands where the Federal government manages coal rights.

A3.1.3 Data Limitations

The data sets created from the processes described above reflect the legal land descriptions contained in the BLM databases. There was no attempt to analyze and review all of the error logs that were generated from the parcel generation process. If legal land descriptions were not properly entered and formatted according to BLM's published LR-2000 standards, an error log was generated.

Figure A3-5. Federal Split Estates Coal Ownership

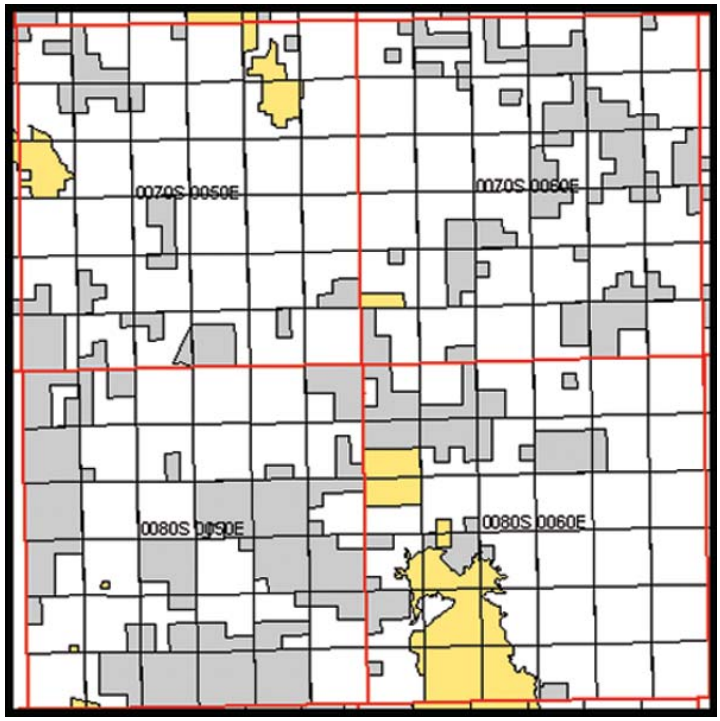


Figure A3-6. Defining Ownership

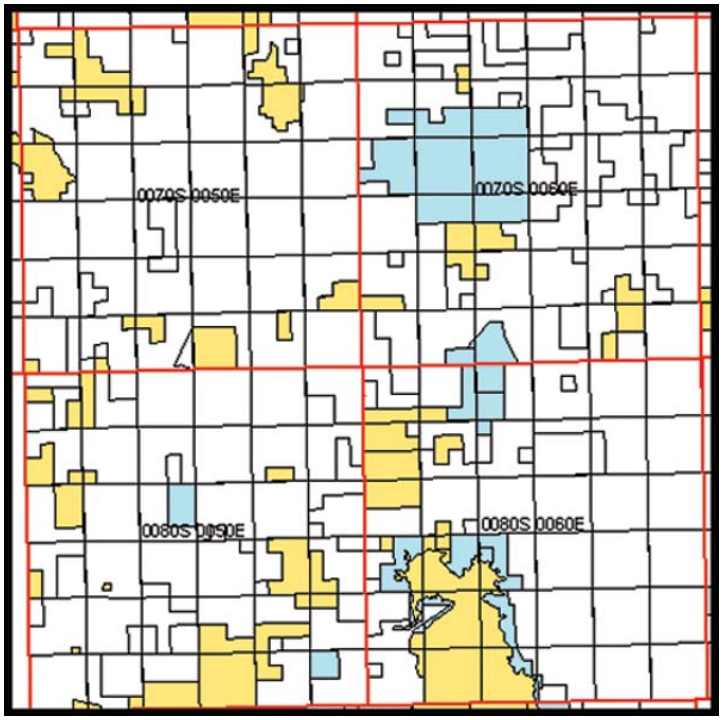


Figure A3-7. Surface Management View

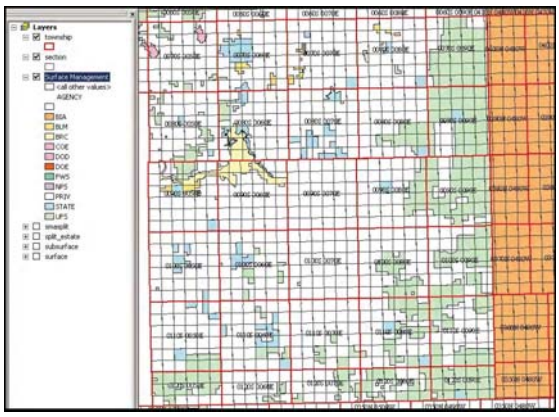
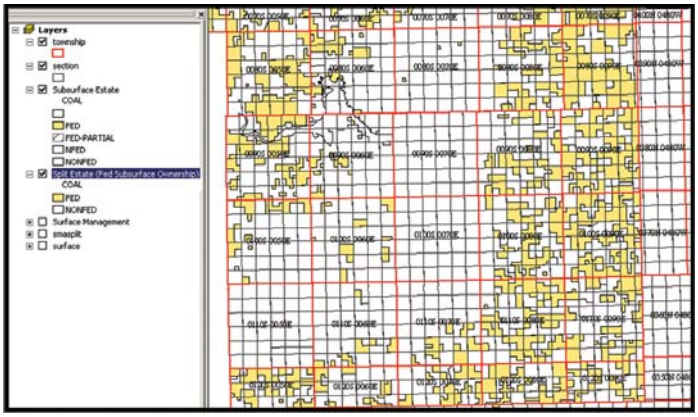


Figure A3-8. Subsurface Coal Ownership View



Other limitations:

- The BLM Case Recordation System is not consistently populated with United States Rights data. The split estate ownership generated from LR-2000 was verified by contacting BLM State and Field Offices. These data may carry a minor degree of generalization.
- The PLSS data were not edge matched across state boundaries.

A3.1.4 Merging Datasets

Merging of datasets for Federal surface and subsurface ownership followed three basic rules in order of priority:

- Data extrapolated from deed records were considered to have the highest confidence level.
- Newer data and map publication dates were used over older sources.
- Verbal verification by agency was obtained.

A3.2 Federal Coal Lease Restriction Data Preparation

The bulk of the data preparation for lease restrictions consisted of data gathering, digitization, and compilation in a multi-layered ArcGIS 9.2 format (ESRI shapefile or geodatabase feature classes). FGDC-compliant metadata for the resulting GIS layers were also created.

Where necessary, the data obtained from the Federal land management agencies were processed using ArcGIS software by matching specific leasing restrictions found in the guidance documents.

This Inventory is limited to those Federal lands within the Powder River Basin study area boundary, which is based on occurrence of specific coal zones in specific areas as defined in the USGS NCRA. The land status and restriction data, which correspond to Federal land

management agency jurisdiction boundaries, were "clipped" using the GIS to the appropriate study boundary. The attribute tables of the compiled shapefile were then queried for unique leasing restriction values. The query results were saved as separate polygon shapefiles. Each shapefile represents a unique restriction value.

1. The first step entails loading the study area (resource assessment units) boundary shapefile and the compiled restriction shapefile into ArcGIS (Figure A3-9).

   The next step in this process is to "clip" or cut the compiled restriction shapefile to the study boundary. Figure A3-10 shows the GIS coverage after it has been clipped.

2. The compiled restriction shapefile is then queried for unique restriction attributes values as shown in the ArcGIS Query Builder (Figure A3-11). For this example, all polygons covered by the leasing restriction "bufflo004, Wilderness Study Areas" were selected. The highlighted rows in the attribute table (Figure A3-12) show which records are selected.[19]

Figure A3-9. Restriction Polygons and Study Area Boundary

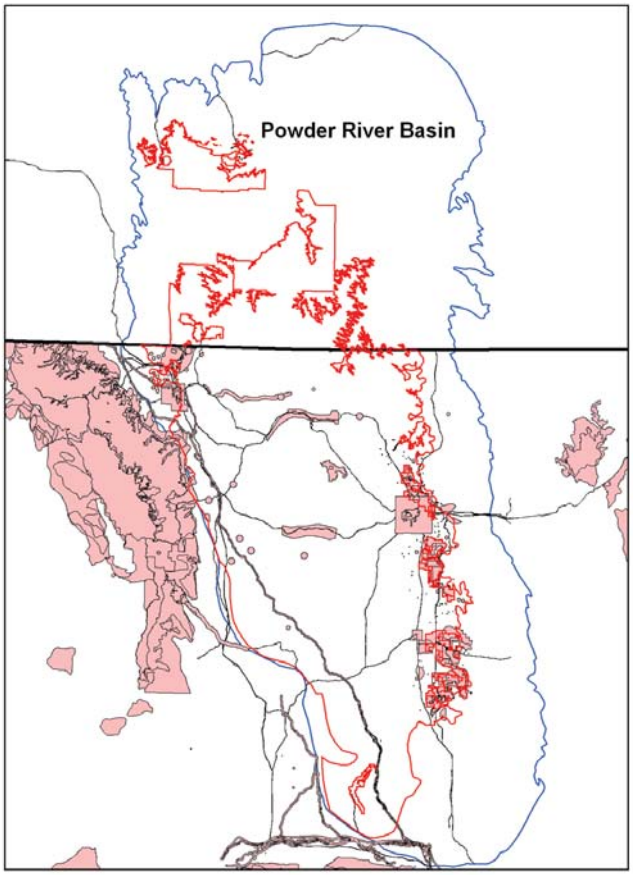
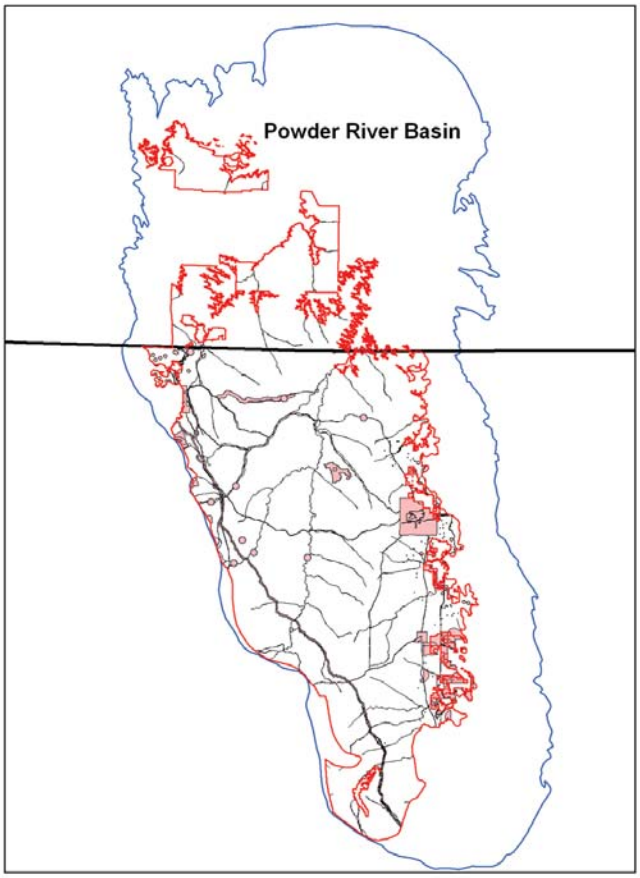


Figure A3-10. Example of Polygons after Clipping to Study Area Boundary



19 See Appendix 4 for a complete listing of restriction codes for Land Use Plans in the Powder River Basin.

Figure A3-11. Query in ArcGIS for all "Wilderness Study Area" Restrictions

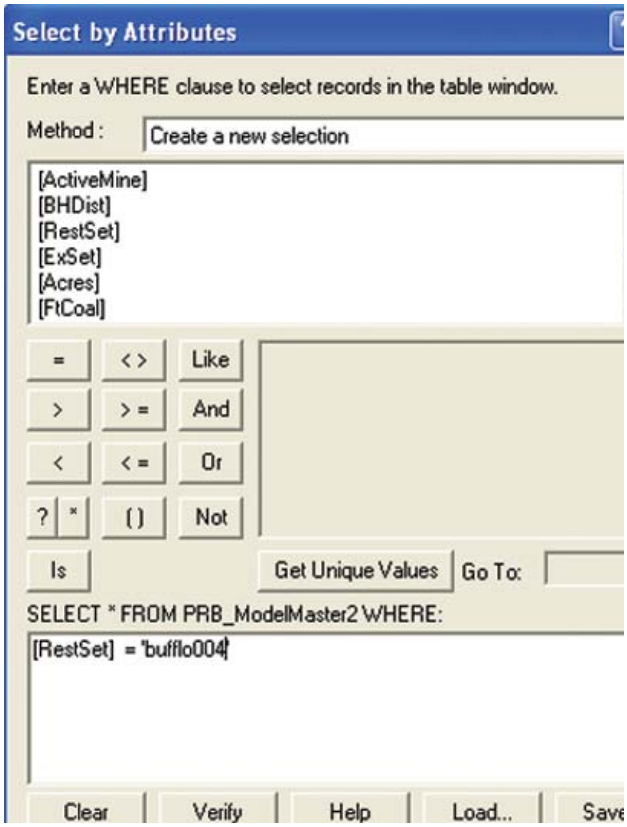
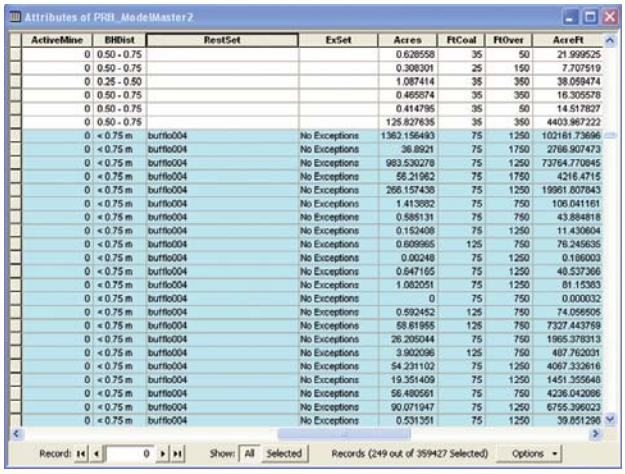


Figure A3-12. Attribute Table Showing "Wilderness Study Area" Polygons



3. Using the ArcGIS function "Create layer from Selected Features," a new shapefile is created that contains only polygons labeled with the attribute "Wilderness Study Area". Figure A3-13 shows the new shapefile that is created.

A3.3 GIS Methodology

Following are further descriptions of how Federal lands were assigned into the seven categories referred to in Table 2-4 and a detailed description of the GIS methodology used.

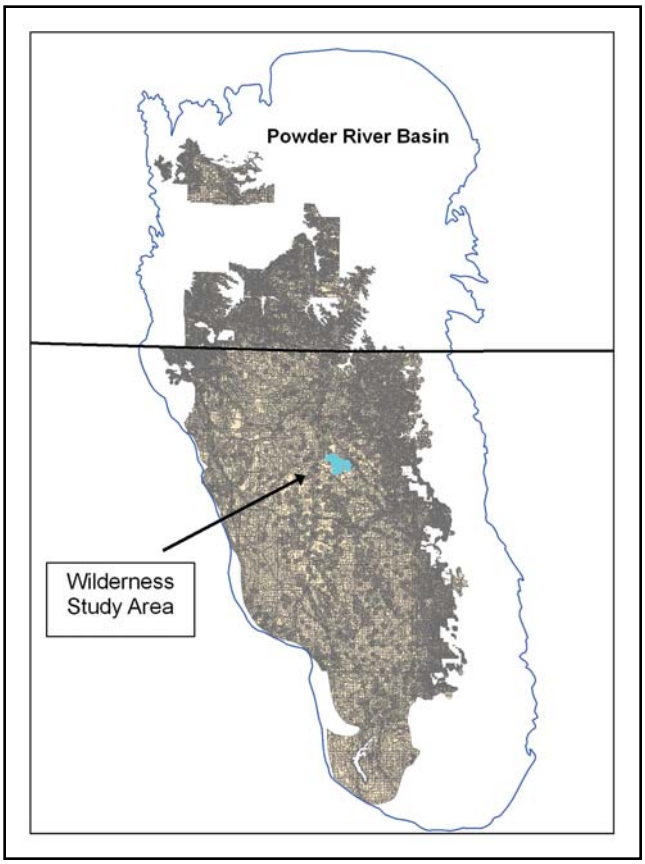
As noted in Section 2, polygons are assigned a Land Access Categorization (LAC) based on the combination of that area's unique coal restrictions. Where multiple restrictions coincide, the polygon is assigned the most restrictive access category. As discussed in Section 2, coal restrictions were assigned to access categories relative to surface and subsurface mining–for example, a polygon having a strip ratio greater than or equal to 10:1 was considered more appropriate for underground mining and was categorized using the restriction's subsurface category.

Based upon Section 522(e)(2)(B) of the Surface Mining Control and Reclamation Act of 1977 and guidance from Custer National Forest, the Forest is classified as NLS for surface mining and NLA for subsurface mining.

A3.4 Restriction Exceptions

Exceptions (including waivers and modifications) to restrictions are sometimes granted for coal developments. Exceptions are discussed in 43 CFR 3461 for each of the twenty unsuitability criteria. For example, an exception to a restriction on mining near a golden eagle nest location may be granted if the lessee proves that proper mitigation measures can be taken to relocate the nest. Because adequate records of exceptions to lease restrictions are not available to address this issue specifically, BLM and FS field personnel were asked to determine, based on their experience, which lease restrictions were granted exceptions for

Figure A3-13. New Polygons Representing Land with Leasing Restriction for "Wilderness Study Area"



mining and how often. The field personnel were asked to surmise the long-term (measured in decades that energy development would take place) relative to the hypothetical situation where virtually all mining permit requests in the affected habitat asked for exceptions. The personnel then provided an estimate of the portion of the requests for which exceptions would be granted. The exception factors thus determined are shown by jurisdiction in Table A3-3.

In most cases, the field personnel provided a quantifiable answer for their estimate. However, certain Unsuitability Criteria exceptions are not quantifiable, but qualitative. Rather than granting exceptions on a general basis, specific areas or values were excepted, while others were not.

For Rights-of-Way (ROW) Easements (Unsuitability Criterion 2) in the state of Wyoming (on both BLM and FS lands), exceptions are granted on all occasions except for railroads and Interstate Highways.

Surface mining exceptions are granted in High Priority Habitat (Unsuitability Criterion 15) in Buffalo and Casper, WY BLM districts 70 percent of the time for the big game winter range and parturition range, and 50 percent of the time for sage grouse leks.

Surface mining exceptions are granted on Floodplains (Unsuitability Criterion 16) in Miles City, MT; Buffalo, WY; and Casper, WY BLM districts for all tributaries, but not for major rivers. In Thunder Basin National Grassland, surface mining exceptions are granted for the floodplains of all rivers except the North Fork of the Cheyenne River.

Lease restrictions often overlap. Where restrictions with exception factors overlap, the cumulative effect is calculated by multiplying the overlapping factors (from Table A3-3). This calculation implicitly assumes that exceptions for multiple restrictions would likely not be obtained for a given area. For example, cumulative effects of excepted restrictions for the study area are determined as shown in Table A3-4. The application of these exception factors is described below in Section A3.6.

Table A3-3. Restriction Exception Factors by FS and BLM Office

Jurisdiction	Exception Factors											
	LUP Screen 2 – Unsuitability Criteria									LUP Screen 3 – Multiple Use Areas		LUP Screen 4 – Negative Surface Owner Consent
	2	3	6	11	12	13	14	15	16			
	Rights-of-Way or Easements	Buffer Zones	Lands Used for Scientific Study	Bald and Golden Eagle Nests	Bald and Golden Eagle Roost and concentration Sites	Falcon Cliff Nesting Sites	Migratory Birds of High Federal Interest	High Priority Habitat for Fish, Wildlife, and Plants	Floodplains	Town of Gillette Buffer	Town of Wright Buffer	
Buffalo, WY, BLM Field Office	*	80%	70%	90%	10%	90%	100%	*	*	20%	60%	90%
Casper, WY, BLM Field Office	*	80%	70%	90%	10%	90%	100%	*	*			90%
Miles City, MT, BLM Field Office	75%	25%				67%		67%	*			
Thunder Basin National Grassland	*	80%		100%	100%		100%	100%	*			100%

** See text for an explanation of the application for this Exception Factor*

Table A3-4. Exception Factors Example for Overlapping Restrictions

Restriction	Exception Factor (EF)
Sage Grouse Lek	50%
Areas within 100 feet of a cemetery	80%
Sage Grouse Lek and within 100 feet of a cemetery	40%

A3.5 Treatment of Offset Areas

For the Inventory, an "offset area" of 1,500 feet was placed around the edge of areas with No Leasing Statutory access category, Railroads, and Interstate Highways to account for the fact that mining is not permitted up to the boundary of the lease agreement in these areas. The actual area available for mining is offset from the lease boundary to allow for nearby lands to be mined in the standard, "benched" pattern. Lands within this offset were categorized as No Surface Operations Anticipated/Offset Areas.[20]

A3.6 Consideration of Conflict Administration Zones

Coalbed natural gas is in the early stages of development in the Powder River Basin of southeastern Montana. Production of CBNG began in 1999 from private and state wells and in 2003 from Federal wells. Approximately 750 wells are producing CBNG from Federal, state, and private leases. Most of the production is coming from wells in the CX Field which is operated by Fidelity Exploration & Production Company with the rest of the production coming from wells operated by Pinnacle Resources and Powder River Gas companies.

20 Under offset areas for railroad tracts, highways, etc., coal is typically leased to ensure that the coal is mined at a later date when and where it is feasible to remove or relocate the obstacle.

In order to analyze conventional oil and gas development as well as full field CBNG development, the BLM and the State of Montana (Montana Board of Oil & Gas Conservation and Department of Environmental Quality) prepared a joint environmental impact statement (2003) and resource management plan amendment. BLM issued its record of decision in April 2003. The ROD and supporting EIS are currently under litigation.

The BLM issued an Instruction Memorandum in 2006 to address CAZ management in the PRB.[21] Instruction Memorandum No. 2006-153 outlines BLM's goals regarding conflict management, as well as action the BLM may take if it deems necessary.

The U.S. District Court has directed BLM to prepare a supplemental environmental impact statement (SEIS) to the 2003 EIS that analyzes the phased development of CBNG. The BLM is currently under an injunction issued by the United States Court of Appeals for the Ninth Circuit (May 2005) enjoining BLM from approving any additional CBNG production in the Montana portion of the Powder River Basin. This injunction will remain in place at least until the Ninth Circuit rules on pending appeals in two consolidated cases that have been briefed and argued before the court.[22]

Wyoming BLM offices have identified CAZs within their jurisdiction and provided GIS data for purposes of the Inventory.

A3.7 Analytical Modeling of Federal Lands and Resources

The analytical goal of the Inventory is to calculate the area of Federal lands (including non-Federal lands overlying Federally owned coal [split estate]) in each access category in the hierarchy and the volume of coal resources underlying the Federal lands in each access category, while at the same time accounting for restriction exceptions.

One of the primary objectives for the development of the categorization is to achieve geographic independence for a given parcel of land subject to overlapping restrictions (hence, the use of the categorization hierarchy where that parcel of land would be subject to only one category). The following discussion illustrates the application of the land access categorization for an area of multiple restrictions from the Buffalo, WY, BLM FO, where sage grouse leks, areas within 100 feet of a cemetery, and VRM Class II areas define an access category.

Figure A3-14 shows a selected point where the restrictions overlap and the resultant category is No Surface Operations Anticipated/Offset Area. A query at that point brings up a dialog box which lists the restrictions in effect. Table A3-5 contains the corresponding restriction data extracted from a master restrictions list.

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21 The complete text of the Instruction Memorandum can be found in Appendix 6.

22 The two cases are listed below:
United States District Court of the District of Montana, Billings Div
Northern Plains Resources Council: CV 03-69-BLG-RWA
Northern Cheyenne Tribe: CV-03-78-BLG-RWA
United States Court of Appeals for the Ninth Circuit
Northern Plains Resource Council: 05-35413
Northern Cheyenne Tribe: 05-35408

Figure A3-14. Display of Overlapping Restrictions

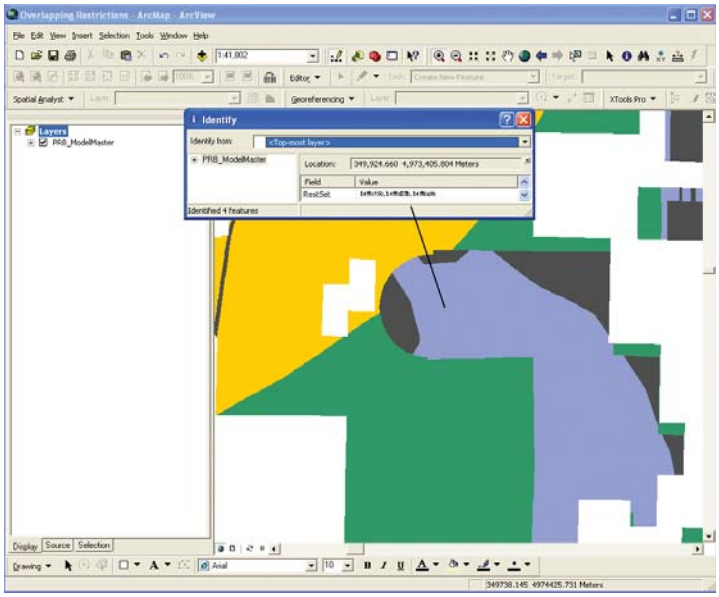


Figure A3-15. Display of Federal Land Access Category

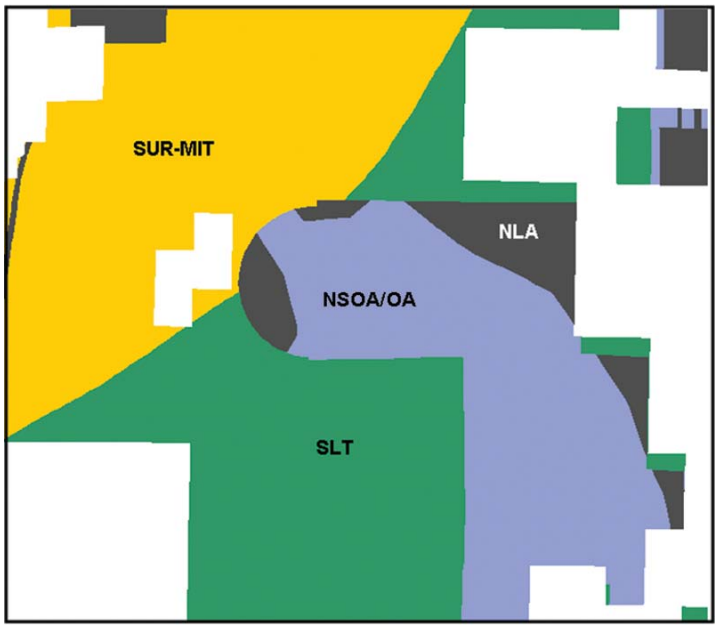


Table A3-5. Sample Master Restrictions List for a Selected Area

RestID	Description	SurfCat	SubCat	Exception Factor
bufflo15c	Sage Grouse Leks	2	5	50%
bufflo03b	Areas within 100 feet of a cemetery	2	5	80%
bufflovrm	VRM Class II Area	6	6	–

Figure A3-15 shows the land categorization as determined by the restrictions listed in the relevant land use plan. Note that the core nesting habitat of the sage grouse (shown in blue), is designated a “No Surface Operations/ Offset” area.

In addition, to account for restriction exceptions, the GIS model determined the effects due to the presence or absence of the restrictions by selectively removing excepted restrictions. This is illustrated by Figures A3-16 and A3-17, which show an example where the sage grouse habitat restriction has been removed. Note that in the case of an excepted restriction, the analysis defaults to the underlying restriction or standard lease terms, as appropriate.

In the case of the highlighted areas in the map, if sage grouse habitat restrictions are excepted 50 percent of the time (as shown in Table A3-3), then, for an area represented by the sage grouse restriction polygon (where sage grouse habitat restrictions do not overlap other restrictions), the remaining 50 percent is categorized according to the underlying restriction category, as shown in Figure A3-17 (SLT in this case). This change results in 9.3 MST of coal being reclassified as SLT from NSOA/OA.

In the EPAct coal model, the access category of the Federal lands and resources was determined in the aggregate, based upon discrete examination of individual GIS polygons using the following equation:

$$FLorRs = \sum((1-EF) * FLorRs + (EF * FLorRs_{(w/\ Excepted)}))$$

Where FlorRs = Federal Lands or Resources
EF = Exception Factor (listed in Table A3-3)
$FLorRs_{(w/\ Excepted}$ = FLorRs determined using the removal of restrictions for which exceptions are granted

Figure A3-16. Display of Federal Land Access Category without Sage Grouse Habitat Restriction Excepted

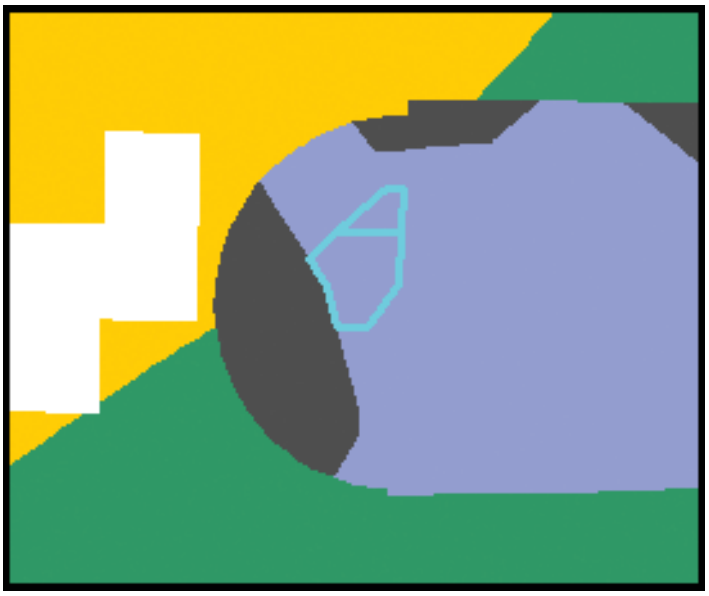
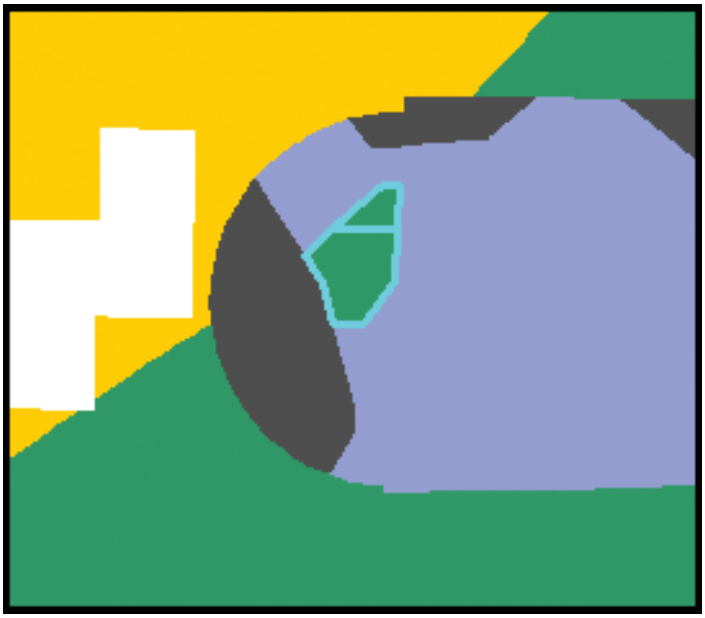


Figure A3-17. Display of Federal Land Access Category with Sage Grouse Habitat Restriction Excepted



This equation accounts for the occurrence of restriction exceptions. For excepted restrictions, the model defaults to the underlying restriction category in the hierarchy.

This process results in the generation of numerous individual GIS polygons for each study area. These data are then summed and reported by access category and Federal management agency. For coal resources, categorization is provided by specific resource type.

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APPENDIX 4

BLM CAZ INSTRUCTION MEMORANDUM NO. 2006-153

UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

WASHINGTON, D.C. 20240

May 11, 2006

In Reply Refer To:
3100 (310) P

EMS TRANSMISSION 05/18/2006
Instruction Memorandum No. 2006-153
Expires: 09/30/2007

To: State Directors, Wyoming and Montana

From: Director

Subject: Policy and Guidance on Conflicts between Coalbed Natural Gas (CBNG) and Surface Coal Mine Development in the Powder River Basin

Program Area: Coalbed natural gas development and surface coal mining Powder River Basin

Purpose: Provide direction concerning development conflicts between surface coal mining and CBNG operations on federal leases in the Powder River Basin and to clarify the actions the Bureau of Land Management (BLM) can and will take, if necessary.

Policy/Action: The BLM will seek to achieve the following goals in resolving development conflicts between CBNG and surface coal mining on federal coal and federal oil and gas leases. This policy supersedes all other directives on this subject.

- Optimize the recovery of both resources in an endeavor to secure the maximum return to the public in revenue and energy production.
- Prevent avoidable waste of the public's resources utilizing authority under existing statutes, regulations and lease terms.
- Honor the rights of each lessee, subject to the terms of the lease and sound principles of resource conservation.
- Protect public health and safety, and mitigate environmental impacts.

It is the policy of the BLM to encourage oil and gas and coal companies to resolve conflicts between themselves and when requested, the BLM will assist in facilitating agreements between the companies. The BLM will also exercise authority provided in the leases, applicable statutes, and regulations to manage federal mineral development in the public's best interest.

Conflict Resolution or Cooperative Development Agreements: The policy set forth in this memorandum requires, if requested by the lessees, the Authorized Officer (AO) to review and/or approve conflict resolution or cooperative development agreements between oil and gas and coal lessees. The BLM will advise, review and/or approve such an agreement only after reviewing all terms and conditions of the agreement to ensure that the provisions are consistent with this policy, applicable regulations, and statutes. The BLM's approval provides assurances to the parties that the agreement is consistent with lease obligations, regulations, statutes, requirements of conservation of the resources, and the provisions of this policy. The BLM's approval of the agreement reduces the risk of delays, disapproval of permits, or the issuance of operating orders inconsistent with actions required under the agreement.

Conflict Administration Zone: The BLM will establish a Conflict Administration Zone (CAZ) around each active coal mine or Lease-By-Application (LBA) area that has a potential for conflict with CBNG development; in order to provide timely notice to the coal and CBNG lessees or operators. This will provide more certainty to both oil and gas and coal lessees or operators as to the need for the prevention and resolution of such conflict.

A. The BLM will establish an expected 10-year mine-out zone around each surface mine where CBNG development is already underway or is anticipated. The zone will be used to designate a CAZ.

B. The BLM may include within a CAZ all or part of an approved LBA. The purpose is to anticipate and mitigate, if not prevent, future conflicts on coal tracts that may be leased.

C. Each CAZ must be reviewed annually to adjust its boundary.

Once the CAZ is identified, the CBNG lessees or operators will be notified immediately that their oil and gas lease is within the CAZ. Specifically, the oil and gas lessee or operator will be notified of near-future mining activities, BLM's authority to require the proper and timely development of leased resources, the prevention of waste and proper abandonment of wells, and the potential availability of incentives such as a royalty rate reduction to encourage development. Upon establishment of a CAZ around a coal mine, lease modification, or LBA tract, the BLM will review the status of all oil and gas leases within the CAZ for CBNG development and take the following actions:

A. For each oil and gas lease that is producing CBNG, the Authorized Officer (AO) will send a letter of notification to the lessee and operator that the lease is within the CAZ.

B. For leases that are not producing CBNG or for leases that are not being diligently developed for CBNG, the AO will, in the letter of notification, request to either immediately drill and produce all previously approved Applications For Permit to Drill (APDs), immediately submit APDs for approval, or show cause why the lessee or operator should not be required to produce the CBNG in such a manner that will maximize recovery of the federal natural gas prior to the removal of the coal. The letter of notification should also require the lessee or operator to provide in writing a response to the AO within a designated timeframe.

C. Lessees or operators who reply that it is uneconomical to drill one or more CBNG wells on the lease and, therefore, do not intend to develop the CBNG resources must supply satisfactory proof supporting their assertion to the AO. This proof must factor in a royalty rate reduction of 50 percent.

D. Lessees or operators who do not respond within the requisite timeframe or cannot demonstrate that drilling CBNG wells is uneconomical will be ordered to drill wells, consistent with good economic operating practices, pursuant to 43 CFR 3162.2-1(b) and provisions of the lease requiring prevention of waste. Lessees or operators who fail to comply with the order to drill wells are subject to the full range of sanctions for noncompliance with an order of the AO.

Prompt compliance will accelerate the recovery of the cost of drilling and operating a well and help to maximize the return to the lessee. All APDs submitted within a CAZ will be given a high priority for processing. This will allow extraction of as much of the CBNG resource as possible before a conflict with the advancing mine.

Incentive to Accelerate Natural Gas Production: To avoid the bypass of federal coal resources or to avoid waste of or to conserve the CBNG resources, the BLM may offer a royalty rate reduction to oil and gas lessees. This incentive is to encourage CBNG operators to drill wells and extract as much CBNG as possible in the time available to allow uninterrupted coal mining operations. This conflict policy does not apply to oil and gas wells which produce from zones deeper than those coal seams being mined.

To qualify for a royalty rate reduction the oil and gas lessee must agree to expedite CBNG production in a manner that will maximize the recovery of the resource before required abandonment, and to cease operations and abandon wells and facilities at BLM's request prior to the arrival of mining operations in the area of the wells. The BLM will notify the oil and gas operator at least 180 days prior to the date when the well should be abandoned. Any royalty rate reduction offered pursuant to this policy will be in the interest of optimizing both the coal and CBNG recovery. Those oil and gas lessees who agree to these conditions will be afforded the following:

A. Any CBNG well located on a federal oil and gas lease and that is within a CAZ, including existing wells, will be eligible for a 50 percent royalty rate reduction on CBNG production for the remaining life of the well. The BLM has determined that in absence of such royalty reductions, recoverable CBNG within the CAZ is likely not to be produced and further that such reductions are necessary to maximize the recovery of valuable coal deposits.

B. To receive such a reduction the applicant must:

   1. Submit a plan acceptable to BLM for maximum efficient production of CBNG during the period preceding the anticipated commencement of coal mining operations; and

   2. Agree that, upon the order of the AO, it will cease operations to enable the commencement of coal mining operations, and take such measures to plug well

bores, reclaim production pads, and remove production equipment as may be directed by the AO.

Interim Abandonment/Reclamation: Abandonment and reclamation of wells, production pads and related ancillary facilities must be approved by the AO in coordination with the coal lessee. In most cases, permanent reclamation of the well sites, access roads, pipeline rights of way, etc. may not be required, but only stabilized sufficiently to prevent erosion or other negative environmental impacts.

Existing Royalty Relief: Nothing herein is intended to limit the availability of royalty reductions to either the oil and gas or coal lessees under other circumstances that would qualify for such relief under existing regulations and guidance.

1. Coal Royalty Rate Reduction: Requests for royalty relief from coal lessees, as a result of costs associated with resolution of CBNG and surface coal mine development conflicts, will be handled on a case-by-case basis consistent with current guidance addressing the unsuccessful operations or expanded recovery/extension of mine life: financial test categories in BLM Manual 3485.

2. Oil and Gas Royalty Rate Reduction: Regulations and guidance for royalty relief for oil and gas under existing regulations can be found in 43 CFR 3103.4 and 43 CFR 3103.4-1.

Background: As development of CBNG accelerates inherent conflicts with nearby surface coal mining will continue to exist. In a majority of cases in the Basin, the oil and gas leases were issued first with a reservation of the right to the government “to dispose of any resource in such lands which will not unreasonably interfere with operations under this lease.” In such cases, the coal leases were issued subject to the condition that coal mining not unreasonably interfere with operations under a preexisting oil and gas lease. The BLM issued an Instruction Memorandum (IM) 2000-081, February 22, 2000, to help BLM offices to manage this issue, however, concerns with potential and actual conflicts continue. It is important that all lessees and operators are made aware that BLM has statutory and regulatory authority over all phases of federal oil and gas production and over Maximum Economic Recovery on federal coal production, and that the BLM will exercise and enforce these authorities, up to and including lease cancellation, should lease terms and regulations not be met. The BLM’s actions will maintain the overriding goal of conserving the resource and maximizing the return to the public in both revenue and energy production, and protecting public health and safety while mitigating environmental impacts. This policy may be considered for other coal basins in the future. Conflicts with underground coal mines may also be considered in the future.

Timeframe: This Instruction Memorandum is effective immediately.

Budget Impact: Some redirection of BLM field office personnel may be required which might impact existing workload priorities.

Manual/Handbook Sections Affected: None.

Coordination: This was coordinated with the Wyoming and Montana BLM State Offices: the BLM Washington Offices of Fluid Minerals, Solid Minerals, and the Department of the Interior Office of the Solicitor.

Contact: Assistant Director, Minerals Realty and Resource Protection at (202) 208-4201.

Signed by:	Authenticated by:
Lawrence E. Benna	Robert M. Williams
Acting, Director	Division of IRM Governance,WO-560

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APPENDIX 5

FEDERAL COAL DEVELOPMENT RESTRICTIONS

For this inventory, the Buffalo and Casper, WY BLM offices and the Thunder Basin National Grassland all used the same set of restrictions, found in the 2001 update of the Approved Resource Management Plan Update (Appendix D: Coal Screening Process) for the BLM Buffalo Field Office (cite website – http://www.blm.gov/rmp/wy). To avoid duplication, these restrictions are just marked once in the document, and have the same restriction number for all three jurisdictions.

Note that only the pages of the land use plans that contain restrictions used in the Inventory are reproduced. The restrictions are annotated with an EPAct code, e.g., [EPAct Code: milcit03a] for a restriction in Miles City, MT BLM. The EPAct coding system is used to identify coal leasing restrictions for modeling purposes.

A copy of BLM's special lease stipulations for Wyoming and Montana, followed by Form 3400-12, BLM's standard coal lease form, follow the coal development restrictions.

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APPENDIX 6

REFERENCED DOCUMENTS

COAL RESOURCE DOCUMENTS

1999 National Coal Resource Assessment Non-Proprietary Data: Location, Stratigraphy, and Coal Quality of Selected Tertiary Coals in the Northern Rocky Mountains and Great Plains Region, OFR 99-376 http://energy.cr.usgs.gov/coal/coal_assessments/index.html (source for all USGS assessment data)

1999 National Coal Resource Assessment of Selected Tertiary Coal Beds and Zones in the Northern Rocky Mountains and Great Plains Region, Prof. Paper 1625-A

2000 National Coal Resource Assessment Geologic Assessment of Coal in the Colorado Plateau: Arizona, Colorado, New Mexico, and Utah, Prof. Paper 1625-B

2001 Resource Assessment of Selected Coal Beds and Zones in the Northern and Central Appalachian Basin Coal Regions, Prof. Paper 1625-C

2002 Resource Assessment of the Springfield, Herrin, Danville, and Baker Coals in the Illinois Basin, Prof. Paper 1625-D

LAND USE PLANNING DOCUMENTS

Approved RMP for Public Lands Administered by the BLM Buffalo Field Office (2001)

Decision Record for Coal Suitability Redesignations Amendment to the Powder River RMP (1992)

Final South Powder River Basin Coal EIS (2003)

- Little Thunder ROD (2004)
- North Antelope/Rochelle (NARO) North ROD (2004)
- North Antelope/Rochelle (NARO) South ROD (2004)
- West Antelope ROD (2004)
- West Roundup ROD (2004)

Land and RMP for the Thunder Basin National Grassland (2001)

North Jacobs Ranch Coal Lease Application Final Environmental Impact Statement (2001)

RMP and EIS for the Casper Field Office Planning Area – Draft (2006)

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