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Coal Reserves Data Base Report

Final Report on the Demonstrated Reserve Base (DRB) of Coal in Wyoming

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**Prepared by
Richard W. Jones and Gary B. Glass
The Geological Survey of Wyoming**

December 5, 1991

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Richard W. Jones and Gary B. Glass
The Geological Survey of Wyoming**

**in cooperation with the
U.S. Department of Energy,
Energy Information Administration
Coal Division**

Cooperative Agreement DE-FG01-90EI21952

December 5, 1991

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1.0 EXECUTIVE SUMMARY

The Geological Survey of Wyoming's new estimate of the remaining demonstrated reserve base (or estimated economic resources) of strippable coal in Wyoming, through December 31, 1990 (or, as of January 1, 1991), is 26.998 billion short tons. This new estimate also incorporates an analysis of all available sulfur contents and heating values appropriate for characterizing the State's remaining strippable coal reserves. These analytical data were used in conjunction with the revised demonstrated reserve base to allocate coal reserves to categories of sulfur content and Btu value. This new allocation places 5.2 billion short tons, or 19.2 percent, of the demonstrated strippable reserve base in Wyoming into the Energy Information Administration's lowest sulfur category, (≤ 0.40 pounds sulfur/million Btu). It also places 2.6 billion short tons, or 9.8 percent, of the demonstrated reserve base of strippable coal in Wyoming into the Energy Information Administration's highest sulfur category (> 2.50 pounds sulfur/million Btu).

The Geological Survey of Wyoming evaluated accessibility for mining in the areas of the demonstrated reserve base of strippable coal, and derived an estimated "minable reserve base" of 26.351 billion short tons. This tonnage, adjusted by various local recovery factors, yields estimated strippable reserves, or "recoverable coal," of 23.314 billion short tons.

The demonstrated reserve base for underground mining was not analyzed as part of this study, but previously derived estimates of the Energy Information Administration were updated to reflect depletion adjustments based on recent mining. The adjusted data, as of January 1, 1991, for underground coal resources include 42.545 billion short tons in the demonstrated reserve base, 38.290 billion short tons in the minable reserve base, and 22.974 billion short tons of recoverable coal.

2.0 INTRODUCTION

2.1 Background. The Coal Reserves Data Base (CRDB) Program is a cooperative data base development program sponsored by the Energy Information Administration (EIA). The objective of the CRDB Program is to involve knowledgeable coal resource authorities from the major coal-bearing regions in EIA's effort to update the Nation's coal reserves data. This report describes one of two prototype studies to update State-level reserve estimates.

The Geological Survey of Wyoming (GSW) entered into Cooperative Agreement DE-FG01-90EI21952 with the U.S. Department of Energy, Energy Information Administration, to update reserve estimates for Wyoming. The 12-month project began on September 5, 1990, and ended on September 4, 1991. This project used funds furnished by the EIA and the GSW.

The CRDB uses an updated set of criteria designed to be nationally consistent but flexible. This program is needed because the traditional source of EIA coal reserve estimates, the demonstrated reserve base (DRB) of coal, is adapted from older published studies from various contributors. Many of the older published studies followed somewhat different criteria than those preferred for the DRB. Further, those studies did not usually contain point source data and coal characterization data that are needed for current coal reserve evaluations.

2.2 Purpose. The CRDB data are intended for use in coal supply analyses and to support analyses of policy and legislative issues. They will be available to both Government and non-Government analysts. The data also will be part of the information used to supply United States energy data for international data bases and for inquiries from private industry and the public.

The EIA recognizes that maps of coal beds and deposits, drilling records, historical mine maps, site specific analytical data, and structural geology are critical to reliable characterizations of coal reserves. These types of data have been used to various extents in the current study, as described in the following sections. In accordance with the terms of this prototype study, the supporting information and detailed documentation will remain with the GSW, where it will serve as the basis for future updates and revisions by the technical staff who developed the data.

The information in this report was compiled under guidelines that emphasize utilization of readily available coal resource and coal analytical data that can be assimilated during a short-term (12-month) project. This GSW project addresses only the revision of the the CRDB for strippable coal deposits in Wyoming. The resulting State-level data base for strippable coal deposits conforms to the criteria of a CRDB Phase I level of effort. Data on underground-minable coal deposits are based on the EIA underground DRB, and on EIA coal quality allocations and accessibility and recovery rate adjustments. They are included in this report in order to present in one place the complete summary of data, updated to the base year 1991, that EIA currently has available in Wyoming for analyses of coal supply.

A Phase II level of effort may be indicated in Wyoming to recalculate the DRB for specific strippable coal deposits and to recalculate, using updated information, the quantities and quality of coal deposits for underground mining. This would be optional and predicated on EIA priorities and funding availability. Phase II projects would permit development of updated coal resource and reserve estimates and coal characterizations that draw on available but previously unused data that would require relatively extensive analysis. This level of effort will especially benefit areas currently lacking in reliable or complete coal reserve data, which includes many of the major strippable and all of the underground coal deposits in Wyoming. No Phase II projects are authorized at this time.

3.0 ASSUMPTIONS AND METHODOLOGY

3.1 Use of existing data. With some minor exceptions, no recalculation or redelineation of strippable coal resources was attempted during this Phase I study. Coal resources or reserves added to previous estimates were based on reinterpretation or correction of errors in existing data. Revised coal recovery factors for some coal deposits resulted in new estimates of depleted resources. The revised DRB tonnages were allocated to appropriate categories of sulfur content and heating value on the basis of all the coal quality data available to the GSW. The EIA term "estimated economic resources" was specified in this project to indicate resource quantities that may result from special procedures and/or data in order to calculate an estimate that is considered equivalent to measured and indicated in reliability. Since all resource mapping data used are, in fact, believed to be measured and indicated under conventional U.S. Geological Survey criteria, the estimated economic resources in this study are wholly

equivalent to a demonstrated reserve base, or DRB, and the two terms are used interchangeably.

Estimates of original, in-place DRB quantities for each strippable coal deposit in Wyoming were compiled, where possible, from the original published sources (Table 1). Revisions, corrections, and additions to the original sources of data are also noted on Table 1. Section 5.0 SOURCES (below) lists all references used to compile Table 1 and the rest of this report, plus other reports on individual strippable deposits. Section 4.0 also discusses specific problems and/or corrections in the data used to compile this report. Production and mining losses in Table 1 for those strippable deposits (or coal beds within a deposit) that have had significant amounts of coal mining were calculated using recovery factors appropriate to the specific deposit rather than using a statewide average. The remaining DRB for each coal deposit (or coal bed) was calculated by subtracting production and mining losses from the original DRB.

All the strippable deposits in Wyoming, which occur in five of Wyoming's ten coal fields, were evaluated by GSW, using its own data, judgments, and calculations (see Figure 1 and Section 6.0 APPENDICES). In the Powder River Coal Field, nine specific strippable coal deposits were examined, including the Dave Johnston deposit (Appendix A), the Wyodak-Caballo Creek deposit (Appendix B), and seven other deposits (Appendix C). Two strippable coal deposits in the Hams Fork Coal Field (Appendix D), seven strippable deposits in the Green River Coal Field (Appendix E), four strippable deposits in the Hanna Coal Field, (Appendix F), and one strippable deposit in the Bighorn Coal Field (Appendix F) were examined. Each report on a strippable deposit(s) contains a detailed discussion of the data sources used, assumptions and methodology, and a description of any revisions to previous coal reserve estimates.

Estimates of coal resources and reserves for underground mining were not calculated by GSW. The estimates of underground DRB and the associated minable reserve base and recoverable coal (reserves), are based on EIA data and derivations (Energy Information Administration, 1989), updated to January 1, 1991, with depletion adjustment for limited deep mining from 1987 through 1990.

3.2 Reliability Criteria. Only estimates of coal tonnages considered to be in the "demonstrated" reliability category (includes both measured and indicated coal reserve base) were used in this study. However, chemical analyses from data points beyond the

Table 1. Estimated original and remaining demonstrated reserve base (DRB) of strippable coal in Wyoming, through December 31, 1990 (in millions of short tons). Numbers in parentheses are negative.

Strippable Deposit/ Coal Beds	Original Strippable DRB	Production & Mining Losses	Remaining Strippable DRB	References
<i>Powder River Coal Field</i>				
Dave Johnston/Glenrock				
Badger	9.5	(6.6)	2.9	Smith and others, 1972
School	126.2	(85.4)	40.8	Smith and others, 1972
subtotal all beds	135.7	(92.0)	43.7	
Wyodak/Caballo Creek				
Wyodak	19,000.0	(1,473.7)	17,526.3	Smith and others, 1972
	3.8	—	3.8	Jones and Glass, this report
	(1,012.6)	—	(1,012.6)	Jones and Glass, this report
	1,369.3	—	1,369.3	Grazis, 1977
subtotal Wyodak	19,360.5	(1,473.7)	17,886.8	
Felix	1,060.0	—	1,060.0	Grazis, 1977
Lower Ulm	43.8	—	43.8	Grazis, 1977
Scott	13.5	—	13.5	Grazis, 1977
C'	11.1	—	11.1	Grazis, 1977
C'	115.2	—	115.2	Grazis, 1977
C	26.3	—	26.3	Grazis, 1977
subtotal entire deposit	20,630.4	(1,473.7)	19,156.7	
Canyon				
Canyon	184.9	—	184.9	Smith and others, 1972
Dry Cheyenne				
F	179.5	—	179.5	Smith and others, 1972
Lake DeSmet/Healy				
Lake DeSmet/Healy	790.0	—	790.0	Mapel, 1959, and Smith and others, 1972
Other Wasatch Fm. coals	210.0	—	210.0	Mapel, 1959, and Smith and others, 1972
subtotal all beds	1,000.0	—	1,000.0	Smith and others, 1972
Acme—Kleenbum				
Monarch & Dietz #3	125.0	(45.7)	79.3	Glass, 1985
Spotted Horse				
Truman	74.5	—	74.5	)
Pamell	30.6	—	30.6	) Kent and others, 1977 and
Scott	17.9	—	17.9	) Haddock and others, 1976
Daly	11.2	—	11.2	)
Felix	821.3	—	821.3	Glass, 1985
Other Ft. Union Fm. coals	58.3	—	58.3	Smith and others, 1972
Other Wasatch Fm. coals	4.8	—	4.8	Kent and others, 1977
Smith	178.0	—	178.0	Smith and others, 1972
subtotal all beds	1,196.6	—	1,196.6	
Sussex				
Fort Union Fm. coals	13.6	—	13.6	Smith and others, 1972
Wyarno—Verona				
PK	200.0	—	200.0	Culbertson and Mapel, 1976
Ulm 1	543.0	—	543.0	Culbertson and Mapel, 1976
Ulm 2	990.0	—	990.0	Culbertson and Mapel, 1976
Other Wasatch Fm. coals	67.0	—	67.0	Culbertson and Mapel, 1976
subtotal all beds	1,800.0	—	1,800.0	
Coal field total	25,265.7	(1,611.4)	23,654.3	

Hams Fork Coal Field

Adaville/Kemmerer Adaville Fm. coals	1,000.0	(130.3)	869.7	Smith and others, 1972
South Haystack Adaville Fm. coals	64.9	-	64.9	Cumberland Coal Co., 1977
Coal field total	1,064.9	(130.3)	934.6	

Green River Coal Field

Red Desert				
Hadsell 2	39.8	-	39.8	Smith and others, 1972
Battle 2&3	38.1	-	38.1	Smith and others, 1972
Sourdough, Monument, & Tierney	458.9	-	458.9	Smith and others, 1972
Creston 2&3	125.6	-	125.6	Smith and others, 1972
Latham 3&4	70.7	-	70.7	Smith and others, 1972
subtotal all beds	733.1	-	733.1	

Creston-Cherokee				
Cherokee B&C	200.9	-	200.9	Smith and others, 1972
Other Fort Union Fm. coals	159.1	-	159.1	Jones and Glass, this report
subtotal all beds	360.0	-	360.0	Rocky Mountain Energy Co., 1976

Northern Little Snake River				
Fort Union & Lance Fm.	223.6	-	223.6	Glass, 1981
Mesaverde Fm. coals	46.0	-	46.0	Glass, 1981
subtotal all beds	269.6	-	269.6	

Jim Bridger				
Deadman coals	250.0	(98.8)	151.2	Smith and others, 1972
Leucite Hills				
Almond Fm. coals	168.0	(5.8)	162.2	Rocky Mountain Energy Co., 1976
Black Butte				
Fort Union Fm. coals	79.2	(42.1)	37.1	Black Butte Coal Co., 1976
Lance Fm. coals	48.8	(12.8)	36.0	Black Butte Coal Co., 1976
Almond Fm. coals	17.6	(2.2)	15.4	Black Butte Coal Co., 1976
subtotal all beds	145.6	(57.1)	88.5	

Salt Wells				
Almond Fm. coals	60.0	-	60.0	Rocky Mountain Energy Co., 1976

Coal field total	1,986.3	(161.7)	1,824.6	
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Hanna Coal Field

Corral Creek District				
Medicine Bow Fm. coals	1.1	-	1.1	Glass and Roberts, 1979
Almond Fm. coals	16.0	-	16.0	Glass and Roberts, 1979
subtotal all beds	17.1	-	17.1	

Carbon Mining District				
Hanna Fm. coals	118.9	-	118.9	Glass and Roberts, 1979

Hanna Mining District				
Hanna Fm. coals	273.9	(45.4)	228.5	Glass and Roberts, 1979

Seminole Mining District

Hanna Fm. coals	5.3	-	5.3	Glass and Roberts, 1979
Ferris Fm. coals	233.2	(36.9)	196.3	Glass and Roberts, 1979
subtotal all beds	238.5	(39.9)	201.6	

Coal field total	648.4	(82.3)	566.1
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Bighorn Coal Field

Grass Creek				
Fort Union Fm. coals	18.6	(0.6)	18.0	Glass and others, 1975
Coal field total	18.6	(0.6)	18.0	

Grand total, all coal fields	28,983.8	(1,986.3)	26,997.5
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Additional reserves determined by planimetering original isopach map of Wyodak coal bed by Smith and others, 1972.

Reserves in Caballo Creek area determined by planimetering original isopach map of Wyodak coal bed by Smith and others, 1972.

Reserves added in Caballo Creek area to replace those subtracted above.

Based on a percentage of the entire reserve within 1,000 feet of the surface in the demonstrated category for that coal bed.

Local coal beds below the Smith coal bed.

Local coal beds above and below the Felix coal bed.

Figure 1. Index map of Wyoming coal fields and location of strippable coal deposits.

boundaries of demonstrated reserves were also used to place the reserves into categories of coal quality. In areas of intensive drilling, such as in mine permit areas and within detailed coal exploration projects, the number and spacing of data points was assumed to be sufficient for characterization of the demonstrated reserves without using data points beyond the explored areas. All data sources for this study that used measured, indicated, and demonstrated reserve base definitions are believed to be consistent with U.S. Geological Survey Circular 891 (Wood, and others, 1983).

3.3 Mapping and Physical Criteria. All mapping and physical criteria for tonnage estimates are given in the sources used to compile the DRB for each strippable coal deposit. Criteria for classifying reserves as "strippable" are those in the original references and the criteria vary from one coal field to another and in many instances vary between coal deposits within a coal field. No additional or new physical criteria or strippable coal definitions were introduced in this report.

3.4 Selection and Integration of Coal Quality Data. Information on coal quality came from site specific data from drill holes, outcrops, and mines; tippable and delivered coal analyses; mine permit and coal development projects; and both publically-available and proprietary data available in the GSW files. The proprietary data were aggregated or averaged to avoid disclosure of individual data. The type of sampling represented by these data ranges from small, incremental coal analyses from coal cores to delivered coal quality data representative of millions of tons of coal produced during several years. Only analyses on an "as-received" or "as-delivered" basis were used in this report. Analyses used to characterize the coal in a particular deposit included solitary sulfur analyses and/or heating values, short proximate analyses, standard proximate analyses, or ultimate and proximate analyses plus heating values. Questionable data or data that could not be located accurately in a geographic or stratigraphic sense were not used. Coal analyses derived from weathered, burned, or oxidized coal beds and from significant non-coaly materials present in sampled coal beds were not used to characterize a coal deposit. The reliability of the coal quality data as it pertains to a specific coal deposit is discussed in the individual reports on strippable deposits (Section 4.0 RESULTS).

Coal beds, groups of coal beds, or coal zones in each coal deposit were assigned to an appropriate category of sulfur content and heating value used by the EIA for resource and reserve characterization. Sulfur contents and heating values for an individual coal

bed, a group of related coal beds, or a coal zone were determined by one of several methods, described below, depending on the coal deposit. The different methods are considered compatible for resource characterization, even though different levels of reliability and accuracy may exist.

In some deposits, variation in sulfur contents and heating values of a coal bed(s) or coal zone was determined by constructing iso-sulfur and iso-Btu maps and calculating the percentage of the total resources contained in a particular coal quality category. This method is best suited for coal deposits with a large number of coal analyses and a wide range of sulfur contents and heating values.

In other coal deposits, coal quality variation within a coal bed(s) or coal zone was not large enough to assign more than one coal quality category to the resources. The data that was used included aggregated data from detailed industry development projects (based on hundreds or thousands of coal analyses from drill holes and/or historical coal production and delivery data), numerous coal analyses from regional exploration programs, or widely-spaced coal analyses from reconnaissance-type exploration programs. Average or weighted average sulfur contents and heating values were determined and each coal bed(s) or coal zone was assigned to an appropriate coal quality category. In all cases, the available coal quality data are considered representative of production attainable from resources and reserves.

3.5 Use of Judgment and/or Extrapolation. For all coal deposits evaluated in this report, professional judgment was used in both the resource assessment techniques and in determining the reliability and usefulness of the available data. Resource estimation methods and projections of data used in this study are discussed in the reports on each strippable deposit (see Section 4.0 RESULTS).

4.0 RESULTS

4.1 Statewide Results. A summary of the revised DRB of strippable coal in Wyoming, by coal field and category of coal quality, through December 31, 1990, is given in Table 2. This table was compiled from the reports for individual coal deposits (Table 1, above, and Appendices A through F below). All the GSW estimates of demonstrated strippable reserve base can be equated with "estimated economic resources".

Table 2. Summary of the GSW's estimate of remaining demonstrated reserve base (DRB) of strippable coal deposits in Wyoming coal fields, through December 31, 1990 (in million short tons).

	Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
		≤ 0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
Powder River Coal Field								
	<15.00	--	--	--	1,127.40	210.00	1,606.50	2,943.90
	15.00–19.99	5,128.40	9,440.00	4,161.30	1,644.10	16.80	319.80	20,710.40
	20.00–22.99	--	--	--	--	--	--	--
Subtotal		5,128.40	9,440.00	4,161.30	2,771.50	226.80	1,926.30	23,654.30
Hams Fork Coal Field								
	<15.00	--	--	--	--	--	--	--
	15.00–19.99	63.00	331.54	320.00	1.85	--	--	716.39
	20.00–22.99	--	--	218.20	--	--	--	218.20
Subtotal		63.00	331.54	538.20	1.85	--	--	934.59
Green River Coal Field								
	<15.00	--	--	--	--	--	39.80	39.80
	15.00–19.99	--	438.30	187.20	--	398.10	655.20	1,678.80
	20.00–22.99	--	60.00	46.00	--	--	--	106.00
Subtotal		--	498.30	233.20	--	398.10	695.00	1,824.60
Hanna Coal Field								
	<15.00	--	--	--	--	--	--	--
	15.00–19.99	--	95.37	11.37	6.38	28.74	13.92	155.78
	20.00–22.99	55.08	170.57	67.15	84.24	33.20	--	410.24
Subtotal		55.08	265.94	78.52	90.62	61.94	13.92	566.02
Bighorn Coal Field								
	<15.00	--	--	--	--	--	--	--
	15.00–19.99	--	--	--	--	--	--	--
	20.00–22.99	--	17.99	--	--	--	--	17.99
Subtotal		--	17.99	--	--	--	--	17.99
All Coal Fields								
Powder River		5,128.40	9,440.00	4,161.30	2,771.50	226.80	1,926.30	23,654.30
Hams Fork		63.00	331.54	538.20	1.85	--	--	934.59
Green River		--	498.30	233.20	--	398.10	695.00	1,824.60
Hanna		55.08	265.94	78.52	90.62	61.94	--	566.02
Bighorn		--	17.99	--	--	--	--	17.99
Total		5,246.48	10,553.77	5,011.22	2,863.97	686.84	2,621.30	26,997.50
All Coal Fields by Btu content								
	<15.00	--	--	--	1,127.40	210.00	1,646.30	2,983.70
	15.00–19.99	5,191.40	10,305.21	4,679.87	1,652.33	443.64	988.92	23,261.37
	20.00–22.99	55.08	248.56	331.35	84.24	33.20	--	752.43
Total		5,246.48	10,553.77	5,011.22	2,863.97	686.84	2,635.22	26,997.50

About 15.8 billion tons, or 58 percent, of Wyoming's strippable DRB occurs in EIA's two lowest sulfur categories. The GSW's estimate also places 2.6 billion tons, or 9.8 percent, of the strippable DRB coal into the highest sulfur category. While only about 3.0 billion short tons of Wyoming's strippable DRB occur in the lowest heating value category (<15.00 million Btu/short ton), 86 percent or 23.3 billion tons occur in the 15.00-19.99 million Btu/short ton category. According to GSW's estimates, no strippable coal occurs in the highest heating value category, (23.00-25.99 million Btu/short ton).

The Powder River Coal Field contains about 23.7 billion short tons, or 87.6 percent, of Wyoming's total remaining strippable DRB. The Green River Coal Field contains about 1.8 billion short tons, or 6.8 percent, of the State's remaining strippable DRB; the Hams Fork Coal Field contains 935 million short tons, or 3.5 percent, of the strippable DRB; and the Hanna Coal Field contains 566 million short tons, or 2.1 percent, of the State's remaining strippable DRB.

The DRB, or estimated economic resources, of strippable coal in Wyoming is summarized in Table 3A by rank of coal and ranges of Btu and sulfur content. In Table 3B the state's minable reserve base of strippable coal comprises the portions of the DRB estimated to be free of land-use and regulatory restrictions, and therefore considered accessible for mining. The derivation of the minable reserve base estimates is discussed below.

In Table 3C the recoverable coal (or reserves) of strippable coal is summarized. These data represent the amount of coal in each rank and Btu or sulfur range that is expected to be recoverable from in-place deposits of the minable reserve base. The recoverable coal estimates were compiled by applying estimated recovery factors for individual coal deposits, as described below.

Tables 4A, 4B, and 4C contain estimates for underground coal resources and reserves in Wyoming. The distribution of these reserves by coal rank, Btu range, and sulfur range is primarily that used by the Energy Information Administration (1989); minor adjustments for recent underground coal production have been incorporated into these estimates by the GSW. The GSW did not develop the underground reserve base data and has neither reviewed nor verified its accuracy or validity. In addition, the GSW has neither evaluated the inaccessible percentages for underground minable coals nor assessed the recovery factors for underground coal as used by the EIA for Wyoming coal

Table 3A. Summary of GSW's estimated economic resources of strippable coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
Subbituminous coal							
<15.00	--	--	--	1,127.40	210.00	1,646.30	2,983.70
15.00–19.99	5,191.40	10,303.02	4,679.87	1,645.95	416.94	975.00	23,212.18
20.00–22.99	46.61	44.17	218.20	--	--	--	308.98
Subtotal	5,238.01	10,347.19	4,898.07	2,773.35	626.94	2,621.30	26,504.86
Bituminous coal							
15.00–19.99	--	2.19	--	6.38	26.70	13.92	49.19
20.00–22.99	8.47	204.39	113.15	84.24	33.20	--	443.45
Subtotal	8.47	206.58	113.15	90.62	59.90	13.92	492.64
All coal							
<15.00	--	--	--	1,127.40	210.00	1,646.30	2,983.70
15.00–19.99	5,191.40	10,305.21	4,679.87	1,652.33	443.64	988.92	23,261.37
20.00–22.99	55.08	248.56	331.35	84.24	33.20	--	752.43
Total	5,246.48	10,553.77	5,011.22	2,863.97	686.84	2,635.22	26,997.50

Table 3B. Summary of GSW's estimate of minable reserve base of strippable coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
Subbituminous coal							
<15.00	--	--	--	1,018.40	189.00	1,639.00	2,846.40
15.00–19.99	5,081.60	10,077.01	4,592.30	1,603.95	387.72	970.90	22,713.48
20.00–22.99	46.14	43.73	217.55	--	--	--	307.42
Subtotal	5,127.74	10,120.74	4,809.85	2,622.35	576.72	2,609.90	25,867.30
Bituminous coal							
15.00–19.99	--	2.17	--	6.32	26.63	13.92	49.04
20.00–22.99	8.39	199.34	110.18	83.40	32.87	--	434.78
Subtotal	8.39	202.11	110.18	89.72	59.50	13.92	483.82
All coal							
<15.00	--	--	--	1,018.40	189.00	1,639.00	2,846.40
15.00–19.99	5,081.60	10,079.18	4,592.30	1,610.27	414.35	984.82	22,762.52
20.00–22.99	54.53	243.67	327.73	83.40	32.87	--	742.20
Total	5,136.13	10,322.85	4,920.03	2,712.07	636.22	2,623.82	26,351.12

Table 3C. Summary of GSW's estimate of recoverable strippable coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
Subbituminous coal							
<15.00	--	--	--	909.80	170.10	1,393.40	2,473.30
15.00–19.99	4,555.60	8,986.18	4,095.94	1,402.28	330.32	831.10	20,201.42
20.00–22.99	36.91	34.98	174.04	--	--	--	245.93
Subtotal	4,592.51	9,021.16	4,269.98	2,312.08	500.42	2,224.50	22,920.65

<i>All coal</i>							
<15.00	--	--	--	1,127.40	210.00	1,646.30	2,983.70
15.00-19.99	5,191.40	10,305.21	4,679.87	1,652.33	443.64	988.92	23,261.37
20.00-22.99	55.08	248.56	331.35	84.24	33.20	--	752.43
Total	5,246.48	10,553.77	5,011.22	2,863.97	686.84	2,635.22	26,997.50

Table 3B. Summary of GSW's estimate of minable reserve base of strippable coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
Subbituminous coal							
<15.00	--	--	--	1,018.40	189.00	1,639.00	2,846.40
15.00–19.99	5,081.60	10,077.01	4,592.30	1,603.95	387.72	970.90	22,713.48
20.00–22.99	46.14	43.73	217.55	--	--	--	307.42
Subtotal	5,127.74	10,120.74	4,809.85	2,622.35	576.72	2,609.90	25,867.30
Bituminous coal							
15.00–19.99	--	2.17	--	6.32	26.63	13.92	49.04
20.00–22.99	8.39	199.94	110.18	83.40	32.87	--	434.78
Subtotal	8.39	202.11	110.18	89.72	59.50	13.92	483.82
All coal							
<15.00	--	--	--	1,018.40	189.00	1,639.00	2,846.40
15.00–19.99	5,081.60	10,079.18	4,592.30	1,610.27	414.35	984.82	22,762.52
20.00–22.99	54.53	243.67	327.73	83.40	32.87	--	742.20
Total	5,136.13	10,322.85	4,920.03	2,712.07	636.22	2,623.82	26,351.12

Table 3C. Summary of GSW's estimate of recoverable strippable coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
Subbituminous coal							
<15.00	--	--	--	909.80	170.10	1,393.40	2,473.30
15.00–19.99	4,555.60	8,986.18	4,095.94	1,402.28	330.32	831.10	20,201.42
20.00–22.99	36.91	34.98	174.04	--	--	--	245.93
Subtotal	4,592.51	9,021.16	4,269.98	2,312.08	500.42	2,224.50	22,920.65
Bituminous coal							
15.00–19.99	--	1.73	--	5.05	21.30	11.14	39.22
20.00–22.99	6.71	164.15	90.28	66.72	26.30	--	354.16
Subtotal	6.71	165.88	90.28	71.77	47.60	11.14	393.38
All coal							
<15.00	--	--	--	909.80	170.10	1,393.40	2,473.30
15.00–19.99	4,555.60	8,987.91	4,095.94	1,407.33	351.62	842.24	20,240.64
20.00–22.99	43.62	199.13	264.32	66.72	26.30	--	600.09
Total	4,599.22	9,187.04	4,360.26	2,383.85	548.02	2,235.64	23,314.03

Table 4A. Summary of EIA's estimated economic resources of underground coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤ 0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
<i>Subbituminous coal</i>							
15.00–19.99	3,781.40	15,223.00	9,691.90	8,780.70	1,186.10	--	38,663.10
Subtotal	3,781.40	15,223.00	9,691.90	8,780.70	1,186.10	0.00	38,663.10
<i>Bituminous coal</i>							
20.00–22.99	493.70	504.70	687.40	367.10	--	61.10	2,114.00
23.00–25.99	82.70	506.80	835.00	343.10	--	--	1,767.60
Subtotal	576.40	1,011.50	1,522.40	710.20	0.00	61.10	3,881.60
<i>All coal</i>							
15.00–19.99	3,781.40	15,223.00	9,691.90	8,780.70	1,186.10	--	38,663.10
20.00–22.99	493.70	504.70	687.40	367.10	--	61.10	2,114.00
23.00–25.99	82.70	506.80	835.00	343.10	--	--	1,767.60
Total	4,357.80	16,234.50	11,214.30	9,490.90	1,186.10	61.10	42,544.70

Table 4B. Summary of EIA's estimate of minable reserve base of underground coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤ 0.40	0.41—0.60	0.61—0.83	0.84—1.67	1.68—2.50	> 2.50	
<i>Subbituminous coal</i>							
15.00—19.99	3,403.26	13,700.70	8,722.71	7,902.63	1,067.49	--	34,796.79
Subtotal	3,403.26	13,700.70	8,722.71	7,902.63	1,067.49	0.00	34,796.79
<i>Bituminous coal</i>							
20.00—22.99	444.33	454.23	618.66	330.39	--	54.99	1,902.60
23.00—25.99	74.43	456.12	751.50	308.79	--	--	1,590.84
Subtotal	518.76	910.35	1,370.16	639.18	0.00	54.99	3,493.44
<i>All coal</i>							
15.00—19.99	3,403.26	13,700.70	8,722.71	7,902.63	1,067.49	--	34,796.79
20.00—22.99	444.33	454.23	618.66	330.39	--	54.99	1,902.60
23.00—25.99	74.43	456.12	751.50	308.79	--	--	1,590.84
Total	3,922.02	14,611.05	10,092.87	8,541.81	1,067.49	54.99	38,290.23

Table 4C. Summary of EIA's estimate of recoverable underground coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
<i>Subbituminous coal</i>							
15.00–19.99	2,041.96	8,220.42	5,233.63	4,741.58	640.49	--	20,878.08
Subtotal	2,041.96	8,220.42	5,233.63	4,741.58	640.49	0.00	20,878.08
<i>Bituminous coal</i>							

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
Subbituminous coal							
15.00–19.99	3,403.26	13,700.70	8,722.71	7,902.63	1,067.49	--	34,796.79
Subtotal	3,403.26	13,700.70	8,722.71	7,902.63	1,067.49	0.00	34,796.79
Bituminous coal							
20.00–22.99	444.33	454.23	618.66	330.39	--	54.99	1,902.60
23.00–25.99	74.43	456.12	751.50	308.79	--	--	1,590.84
Subtotal	518.76	910.35	1,370.16	639.18	0.00	54.99	3,493.44
All coal							
15.00–19.99	3,403.26	13,700.70	8,722.71	7,902.63	1,067.49	--	34,796.79
20.00–22.99	444.33	454.23	618.66	330.39	--	54.99	1,902.60
23.00–25.99	74.43	456.12	751.50	308.79	--	--	1,590.84
Total	3,922.02	14,611.05	10,092.87	8,541.81	1,067.49	54.99	38,290.23

Table 4C. Summary of EIA's estimate of recoverable underground coal in Wyoming, as of January 1, 1991 (in million short tons).

Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
	≤0.40	0.41–0.60	0.61–0.83	0.84–1.67	1.68–2.50	>2.50	
Subbituminous coal							
15.00–19.99	2,041.96	8,220.42	5,233.63	4,741.58	640.49	--	20,878.08
Subtotal	2,041.96	8,220.42	5,233.63	4,741.58	640.49	0.00	20,878.08
Bituminous coal							
20.00–22.99	266.60	272.54	371.20	198.23	--	32.99	1,141.56
23.00–25.99	44.65	273.67	450.90	185.27	--	--	954.49
Subtotal	311.25	546.21	822.10	383.50	0.00	32.99	2,096.05
All coal							
15.00–19.99	2,041.96	8,220.42	5,233.63	4,741.58	640.49	--	20,878.08
20.00–22.99	266.60	272.54	371.20	198.23	--	32.99	1,141.56
23.00–25.99	44.65	273.67	450.90	185.27	--	--	954.49
Total	2,353.21	8,766.63	6,055.73	5,125.08	640.49	32.99	22,974.13

deposits. Those areas of information were beyond the scope of study of this project, but are included to permit a statewide summary of the data currently available.

Table 5 contains a detailed assessment of estimated economic resources, minable reserve base, and recoverable coal reserves for strippable coal. To calculate minable reserve base, the inaccessible percentages for land usage and for environmental restrictions were first determined separately, using map measurements, field observations, and published land use plans for individual coal deposits. Once this was done, the remaining reserves were aggregated and averaged in Table 5 according to coal rank, Btu range, and sulfur range. Similarly, recovery factors (for calculated recoverable coal) were first determined for individual coal deposits, based on published and unpublished data and GSW's best estimates, and then aggregated and averaged in Table 5.

The inaccessible percentages and recovery factors for strippable coal reported in Table 5 are averages derived from aggregating the various resources and reserves for all sulfur ranges within a standard Btu range. The average inaccessible percentage or recovery factor as reported in Table 5 cannot be used to derive individual minable reserve base or recoverable coal for a particular Btu and sulfur range.

Table 5 also contains estimates for underground coal reserves in Wyoming. Inaccessible underground coal due to land usage and environmental restrictions was calculated using factors developed by EIA; recovery factors for underground coal are also those used by EIA. The GSW can neither agree nor disagree with the accuracy or validity of these factors.

The last two pages of Table 5 summarize all Wyoming coal resources and reserves by ranges of Btu content and by ranges of sulfur content. These two pages contain statewide totals for all categories of coal reserves as well as final totals for estimated economic resources, minable reserve base, and recoverable coal reserves.

4.2 Regional Results by Strippable Coal Deposit. The individual reports on coal fields and deposits in Appendices A through F form the basis for the GSW revisions to the remaining strippable DRB for Wyoming.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

State: Wyoming Region: Statewide (summary)

Remaining as of: January 1, 1991

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COAL QUANTITY AND QUALITY

Coal Rank: Subbituminous (<15.00 million Btu/short ton)

	Std. Btu Range	Std. Sulfur Range	Estimated Economic Resources		Minable* Reserve Base (millions of short tons)	Recoverable Coal		Inaccessible Percentage	
			Resources			Coal		Land use*	Environmental*
(Remaining) Total	<15.00	0.84-1.67	1,127.40		1,018.40	909.80			
Underground			0.00		0.00	0.00			
Surface			1,127.40		1,018.40	909.80		0.88	3.69
(Remaining) Total	<15.00	1.68-2.50	210.00		189.00	170.10			
Underground			0.00		0.00	0.00			
Surface			210.00		189.00	170.10			
(Remaining) Total	<15.00	>2.50	1,646.30		1,639.00	1,393.40			
Underground			0.00		0.00	0.00			
Surface			1,646.30		1,639.00	1,393.40			
(Remaining) Total									
Underground									
Surface									
(Remaining) Total									
Underground									
Surface									
(Remaining) Total									
Underground									
Surface									
(Remaining) Total	<15.00	All Ranges	2,983.70		2,846.40	2,473.30			
Underground			0.00		0.00	0.00			
Surface			2,983.70		2,846.40	2,473.30			

Recovery Factor

Underground	
Surface	0.8689

*Notes: Minable. Following the definition in USGS Circular 891, "minable" describes resources capable of being mined under current mining technology, and environmental and legal restrictions, rules, and regulations. EIA is using "minable", therefore, to describe resources adjusted for inaccessibility due to land use and environmental restrictions.

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

State: Wyoming Region: Statewide (summary)

Remaining as of: January 1, 1991

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Coal Rank: Subbituminous (15.00-19.99 million Btu/short ton)

COAL QUANTITY AND QUALITY

	Std. Btu Range	Std. Sulfur Range	Estimated Economic Resources (millions of short tons)	Minable* Reserve Base	Recoverable Coal	Inaccessible Percentage	
						Land use*	Environmental*
(Remaining) Total	15.00-19.99	≤0.40	8,972.80	8,484.86	6,597.56		
Underground			3,781.40	3,403.26	2,014.96	5.00	5.00
Surface			5,191.40	5,081.60	4,555.60	1.64	0.50
(Remaining) Total	15.00-19.99	0.41-0.60	25,526.02	23,777.71	17,206.60		
Underground			15,223.00	13,700.70	8,220.42		
Surface			10,303.02	10,077.01	8,986.18		
(Remaining) Total	15.00-19.99	0.61-0.83	14,371.77	13,315.01	9,329.57		
Underground			9,691.90	8,722.71	5,233.63		
Surface			4,679.87	4,592.30	4,095.94		
(Remaining) Total	15.00-19.99	0.84-1.67	10,426.65	9,506.58	6,143.86		
Underground			8,780.70	7,902.63	4,741.58		
Surface			1,645.95	1,603.95	1,402.28		
(Remaining) Total	15.00-19.99	1.68-2.50	1,603.04	1,455.21	970.81		
Underground			1,186.10	1,067.49	640.49		
Surface			416.94	337.72	330.32		
(Remaining) Total	15.00-19.99	>2.50	975.00	970.90	831.10		
Underground			0.00	0.00	0.00		
Surface			975.00	970.90	831.10		
(Remaining) Total							
Underground							
Surface							
(Remaining) Total							
Underground							
Surface							
(Remaining) Total	15.00-19.99	All Ranges	61,875.28	57,510.27	41,079.50		
Underground			38,663.10	34,796.79	20,878.08		
Surface			23,212.18	22,713.48	20,201.42		

Recovery Factor	
Underground	0.6000
Surface	0.8895

*Notes: Minable. Following the definition in USGS Circular 891, "minable" describes resources capable of being mined under current mining technology, and environmental and legal restrictions, rules, and regulations. EIA is using "minable", therefore, to describe resources adjusted for inaccessibility due to land use and environmental restrictions.

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

State: Wyoming Region: Statewide (summary)

Remaining as of: January 1, 1991

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COAL QUANTITY AND QUALITY

Coal Rank: Subbituminous (20.00-22.99 million Btu/short ton)

	Std. Btu Range	Std. Sulfur Range	Estimated Economic Resources		Minable* Reserve Base (millions of short tons)	Recoverable Coal	Inaccessible Percentage	
							Land use*	Environmental*
(Remaining) Total	20.00-22.99	≤0.40	46.61	46.14	36.91			
Underground			0.00	0.00	0.00			
Surface			46.61	46.14	36.91			
(Remaining) Total	20.00-22.99	0.41-0.60	44.17	43.73	34.98			
Underground			0.00	0.00	0.00			
Surface			44.17	43.73	34.98			
(Remaining) Total	20.00-22.99	0.61-0.83	218.20	217.55	174.04			
Underground			0.00	0.00	0.00			
Surface			218.20	217.55	174.04			
(Remaining) Total								
Underground								
Surface								
(Remaining) Total								
Underground								
Surface								
(Remaining) Total								
Underground								
Surface								
(Remaining) Total								
Underground								
Surface								
(Remaining) Total	20.00-22.99	All Ranges	308.98	307.42	245.93			
Underground			0.00	0.00	0.00			
Surface			308.98	307.42	245.93			

Recovery Factor

Underground	0.6000
Surface	0.8000

*Notes: Minable. Following the definition in USGS Circular 891, "minable" describes resources capable of being mined under current mining technology, and environmental and legal restrictions, rules, and regulations. EIA is using "minable", therefore, to describe resources adjusted for inaccessibility due to land use and environmental restrictions.

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

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Coal Rank: Subbituminous summary

	Inaccessible Percentage	
	Land use*	Environmental*
Underground	5.00	5.00
Surface	1.55	0.86

	Recovery Factor
Underground	0.6000
Surface	0.8861

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

State: Wyoming Region: Statewide (summary)

Remaining as of: January 1, 1991

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COAL QUANTITY AND QUALITY

Coal Rank: Bituminous (15.00-19.99 million Btu/short ton)

	Std. Btu Range	Std. Sulfur Range	Estimated Economic Resources	Minable* Reserve Base (millions of short tons)	Recoverable Coal	Inaccessible Percentage	
						Land use*	Environmental*
(Remaining) Total	15.00-19.99	0.41-0.60	2.19	2.17	1.73		
Underground			0.00	0.00	0.00		
Surface			2.19	2.17	1.73		
(Remaining) Total	15.00-19.99	0.84-1.67	6.38	6.32	5.05		
Underground			0.00	0.00	0.00		
Surface			6.38	6.32	5.05		
(Remaining) Total	15.00-19.99	1.68-2.50	26.70	26.63	21.30		
Underground			0.00	0.00	0.00		
Surface			26.70	26.63	21.30		
(Remaining) Total	15.00-19.99	>2.50	13.92	13.92	11.14		
Underground			0.00	0.00	0.00		
Surface			13.92	13.92	11.14		
(Remaining) Total							
Underground							
Surface							
(Remaining) Total							
Underground							
Surface							
(Remaining) Total							
Underground							
Surface							
(Remaining) Total	15.00-19.99	All Ranges	49.19	49.04	39.22		
Underground			0.00	0.00	0.00		
Surface			49.19	49.04	39.22		

Recovery Factor

0.8000

*Notes: Minable. Following the definition in USGS Circular 891, "minable" describes resources capable of being mined under current mining technology, and environmental and legal restrictions, rules, and regulations. EIA is using "minable", therefore, to describe resources adjusted for inaccessibility due to land use and environmental restrictions.

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

State: Wyoming Region: Statewide (summary)

Remaining as of: January 1, 1991

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COAL QUANTITY AND QUALITY

Coal Rank: Bituminous (20.00-22.99 million Btu/short ton)

	Std. Btu Range	Std. Sulfur Range	Estimated Economic Resources	Minable* Reserve Base (millions of short tons)	Recoverable Coal	Inaccessible Percentage	
						Land use*	Environmental*
(Remaining) Total	20.00-22.99	≤0.40	502.17	452.72	273.31	5.00	5.00
Underground			493.70	444.33	266.60		
Surface			8.47	8.39	6.71	1.96	0.00
(Remaining) Total	20.00-22.99	0.41-0.60	709.09	654.17	436.69		
Underground			504.70	454.23	272.54		
Surface			204.39	199.94	164.15		
(Remaining) Total	20.00-22.99	0.61-0.83	800.55	728.84	461.48		
Underground			637.40	618.66	371.20		
Surface			113.15	110.18	90.28		
(Remaining) Total	20.00-22.99	0.34-1.67	451.34	413.79	264.95		
Underground			367.10	330.39	198.23		
Surface			84.24	83.40	66.72		
(Remaining) Total	20.00-22.99	1.68-2.50	33.20	32.87	26.30		
Underground			0.00	0.00	0.00		
Surface			33.20	32.87	26.30		
(Remaining) Total	20.00-22.99	>2.50	61.10	54.99	32.99		
Underground			61.10	54.99	32.99		
Surface			0.00	0.00	0.00		
(Remaining) Total							
Underground							
Surface							
(Remaining) Total							
Underground							
Surface							
(Remaining) Total	20.00-22.99	All Ranges	2,557.45	2,337.38	1,495.72		
Underground			2,114.00	1,902.60	1,141.56		
Surface			443.45	434.78	354.16		

Recovery Factor

Underground	0.6000
Surface	0.8146

*Notes: Minable. Following the definition in USGS Circular 891, "minable" describes resources capable of being mined under current mining technology, and environmental and legal restrictions, rules, and regulations. EIA is using "minable", therefore, to describe resources adjusted for inaccessibility due to land use and environmental restrictions.

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

State: Wyoming Region: Statewide (summary)

Remaining as of: January 1, 1991

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COAL QUANTITY AND QUALITY

Coal Rank: Bituminous (23.00-25.99 million Btu/short ton)

	Std. Btu Range	Std. Sulfur Range	Estimated Economic Resources (millions of short tons)	Minable* Reserve Base	Recoverable Coal	Inaccessible Percentage	
						Land use*	Environmental*
(Remaining) Total	23.00-25.99	≤0.40	82.70	74.43	44.65	5.00	5.00
Underground			82.70	74.43	44.65		
Surface			0.00	0.00	0.00		
(Remaining) Total	23.00-25.99	0.41-0.60	506.80	456.12	273.67		
Underground			506.80	456.12	273.67		
Surface			0.00	0.00	0.00		
(Remaining) Total	23.00-25.99	0.61-0.83	835.00	751.50	450.90		
Underground			835.00	751.50	450.90		
Surface			0.00	0.00	0.00		
(Remaining) Total	23.00-25.99	0.84-1.67	343.10	308.79	185.27		
Underground			343.10	308.79	185.27		
Surface							
(Remaining) Total							
Underground							
Surface							
(Remaining) Total							
Underground							
Surface							
(Remaining) Total							
Underground							
Surface							
(Remaining) Total	23.00-25.99	All Ranges	1,767.60	1,590.84	954.49		
Underground			1,767.60	1,590.84	954.49		
Surface			0.00	0.00	0.00		

Recovery Factor

0.6000

*Notes: Minable. Following the definition in USGS Circular 891, "minable" describes resources capable of being mined under current mining technology, and environmental and legal restrictions, rules, and regulations. EIA is using "minable", therefore, to describe resources adjusted for inaccessibility due to land use and environmental restrictions.

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

COAL QUANTITY AND QUALITY

Estimated Economic Resources			Minable* Reserve Base (millions of short tons)	Recoverable Coal	Inaccessible Percentage
Std. Btu Range	Std. Sulfur Range	Land use* Environmental*			
(Remaining) Total					
Underground					5.00
Surface					1.79
(Remaining) Total					0.00
Recovery Factor					
Underground					0.6000
Surface					0.8131

*Notes: Minable. Following the definition in USGS Circular 891, "minable" describes resources capable of being mined under current mining technology, and environmental and legal restrictions, rules, and regulations. EIA is using "minable", therefore, to describe resources adjusted for inaccessibility due to land use and environmental restrictions.

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1 -18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

State: Wyoming Region: Statewide (summary)

Remaining as of: January 1, 1991

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COAL QUANTITY AND QUALITY

Coal Rank: Bituminous & Subbituminous summary (by Btu range)

Estimated Economic Resources				Minable* Reserve Base	Recoverable Coal
(millions of short tons)					
Std. Btu Range	Std. Sulfur Range				
(Remaining) Total	<15.00	All Ranges	2,983.70	2,846.40	2,473.30
Underground			0.00	0.00	0.00
Surface			2,983.70	2,846.40	2,473.30
(Remaining) Total	15.00-19.99	All Ranges	61,866.17	57,502.81	41,070.72
Underground			38,663.10	34,796.79	20,240.64
Surface			23,261.37	22,762.52	20,192.64
(Remaining) Total	20.00-22.99	All Ranges	2,866.43	2,644.80	1,741.65
Underground			2,114.00	1,902.60	1,141.56
Surface			752.43	742.20	600.09
(Remaining) Total	23.00-25.99	All Ranges	1,767.60	1,590.84	954.49
Underground			1,767.60	1,590.84	954.49
Surface			0.00	0.00	0.00
(Remaining) Total					
Underground					
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	Inaccessible Percentage	
	Land use*	Environmental*
Underground	5.00	5.00
Surface	1.54	0.85
	Recovery Factor	
	Underground	Surface
	0.6000	0.8847

*Notes: Minable. Following the definition in USGS Circular 891, "minable" describes resources capable of being mined under current mining technology, and environmental and legal restrictions, rules, and regulations. EIA is using "minable", therefore, to describe resources adjusted for inaccessibility due to land use and environmental restrictions.

Land Use. Municipal Boundaries. Highway and other rights of way, Buffers around oil and gas wells and at property boundaries; Parks, Cemeteries, Reservoirs, etc. Includes those lands excluded from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

Table 5. EIA COAL RESERVES DATA BASE - DATA MATRIX

State: Wyoming Region: Statewide (summary)

Remaining as of: January 1, 1991

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COAL QUANTITY AND QUALITY

Coal Rank: Bituminous & Subbituminous (by sulfur range)

	Std. Btu Range	Std. Sulfur Range	Estimated Economic Resources		Minable* Reserve Base (millions of short tons)	Recoverable Coal		Inaccessible Percentage		Recovery Factor
						Land use*	Environmental*			
(Remaining) Total	All Ranges	≤0.40	9,604.28		9,058.15	6,952.43		Underground	5.00	5.00
Underground			4,357.80		3,922.02	2,353.21		Surface	1.54	0.85
Surface			5,246.48		5,136.13	4,599.22				
(Remaining) Total		0.41-0.60	26,788.27		24,933.90	17,953.67				
Underground			16,234.50		14,611.05	8,766.63				
Surface			10,553.77		10,322.85	9,187.04				
(Remaining) Total		0.61-0.83	16,225.52		15,012.90	10,415.99				
Underground			11,214.30		10,092.87	6,055.73				
Surface			5,011.22		4,920.03	4,360.26				
(Remaining) Total		0.84-1.67	12,354.87		11,253.88	7,508.93				
Underground			9,490.90		8,541.81	5,125.08				
Surface			2,863.97		2,712.07	2,383.85				
(Remaining) Total		1.68-2.50	1,872.94		1,703.71	1,188.51				
Underground			1,186.10		1,067.49	640.49				
Surface			686.84		636.22	548.02				
(Remaining) Total		>2.50	2,696.32		2,678.81	2,268.63				
Underground			61.10		54.99	32.99				
Surface			2,635.22		2,623.82	2,235.64				
(Remaining) Total										
Underground										
Surface										
(Remaining) Total										
Underground										
Surface										
(Remaining) Total	All Ranges	All Ranges	69,542.20		64,641.35	46,288.16				
Underground			42,544.70		38,290.23	22,974.13				
Surface			26,997.50		26,351.12	23,314.03				

*Notes: Mirable. Following the definition in US 891, "mirable" describes resources cap being mined under current mining techn and environmental and legal restrictions and regulations. EIA is using "mirable" to describe resources adjusted for inacc due to land use and environmental rest

Land Use. Municipal Boundaries. High other rights of way, Buffers around oil wells and at property boundaries; Parks Reservoirs, etc. Includes those lands from coal development through BLM's Unsuitability Criteria #1-18 and #20.

Environmental. State and Federal minir reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Sleep slopes, etc.

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Environmental. State and Federal mining, reclamation, and discharge restrictions; Alluvial valley floors (BLM's Unsuitability Criterion #19); Steep slopes, etc.

5.0 SOURCES

Many of the sources of data used to estimate the original demonstrated reserve base (DRB) tonnages for strippable coal deposits in Wyoming are no longer accurate, reliable, or adequate. Recent geologic and coal resource mapping, as well as numerous coal analyses and drill holes must all be incorporated into any new reserve base estimates. Detailed coal deposit maps that did not exist at the time many of the original DRB reports were written can now be constructed and used to redefine and recalculate the DRB. This Phase I project could only incorporate the recent coal quality data into the reserve base. A Phase II project would allow this new coal quality data to be matched with new tonnage estimates to redefine both the strippable and underground DRB.

This report used coal analyses from at least 5,230 channel, tipple, and core samples and over 1,500 delivered samples. Those data are derived from a variety of different sources which are shown on the tables of analytical data presented in the reports on individual coal deposits. Other references used to compile this report are listed below.

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6.0 APPENDICES

The individual reports on various coal deposits or coal fields in Appendices A through F detail the assumptions, methodology, and data used to derive and or/revise resources, remaining DRB, and recoverable reserves of strippable coal in Wyoming.

**APPENDIX A. DEMONSTRATED RESERVE BASE OF STRIPPABLE
COAL IN THE DAVE JOHNSTON DEPOSIT, POWDER
RIVER COAL FIELD, WYOMING.**

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Table 4.	Analyses of Badger seam	A-6
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1. Summary. The Dave Johnston coal deposit contains a total of 43.7 million tons of remaining demonstrated reserve base (DRB) of coal through December 31, 1990 (or as of January 1, 1991). All the coal resources contain 15.00 - 19.99 million Btu/short ton. The Badger coal seam contains 2.9 million tons of coal with 0.41 - 0.60 lbs sulfur/million Btu and the School coal seam contains 40.8 million tons of coal with 0.61 - 0.83 lbs sulfur/million Btu (Table 1).

Table 1. Summary table of remaining demonstrated resource base of coal in the Dave Johnston strippable deposit, through December 31, 1990 (in millions of tons).

Seam	Btu content (million Btu/short ton)	Sulfur Content (lbs sulfur/million Btu)		Total all Categories
		0.41-0.60	0.61-0.83	
Badger	15 - 19.99	2.9	—	2.9
School	15 - 19.99	—	40.8	40.8
Total	15 - 19.99	2.9	40.8	43.7

2. Methodology and Assumptions. The original strippable coal resources for this deposit were taken from Smith and others (1972). The School and the overlying Badger coal beds occur in the Eocene Wasatch Formation in the southern part of the Powder River Coal Field. Correlation of these coal beds with other named coal beds to the north has not been established. The Badger coal bed averages about 17 feet in thickness and is considered strippable under less than 80 feet of overburden. The School coal bed averages 33.6 feet in thickness and is considered strippable under less than 140 feet of overburden. The interburden between the Badger and the School coal beds ranges from 110 to 180 feet. An additional 45 million tons of reserves in the School coal bed occurs where overburden on top of the School exceeds 140 feet. In this case, overburden above the Badger coal bed is included as part of the overburden above the School and both coal beds can be recovered by multiple-seam mining.

After determining the sulfur contents and heating values for each coal bed (see part 3, Analyses, below), the reserves for each coal bed were assigned an appropriate heating value and sulfur content category. The remaining strippable resources (DRB) for both beds were determined by subtracting coal production and mining losses from the original strippable coal reserves (Table 2).

Table 2. Original and remaining DRB of strippable coal in the Dave Johnston coal deposit, through December 31, 1990 (in millions of tons). Numbers in parentheses are negative.

	Badger	School	Total
Original strippable DRB (from Smith, 1972)	9.5	126.2	135.7
Production and mining losses			
Coal production through 1990	(5.3)	(68.3)	(73.6)
Mining losses (80%)	(1.3)	(17.1)	(18.4)
Total coal depleted	(6.6)	(85.4)	(92.0)
Remaining strippable DRB (through December 31, 1990)	2.9	40.8	43.7

Production losses were calculated by assuming that the coal actually produced (reported as cumulative production) represents 80 percent of the coal removed from this deposit; the remaining 20 percent of the coal removed represents coal lost or not recovered during mining. Cumulative production and mining losses for each coal bed in the deposit were calculated assuming that the amount of coal from the Badger seam accounts for an average of 7.5 percent of the total coal produced each year.

3. Analyses. Coal analyses used in this report were taken from various sources as detailed on Tables 3, 4, and 5 and plotted on Figure 1. Analyses related only to specific beds were used to categorize the remaining reserve. Seven analyses of the School seam (Table 5) included a weighted average of 12 monthly coal deliveries in 1989. All of the seven analyses had a heating value in the 15 - 19.99 million Btu/short ton range. Sulfur contents varied from 0.37 to 1.01 lbs sulfur/million Btu; the average, the weighted average, and the average without using the delivered samples were all in the 0.61 - 0.83 lbs sulfur/million Btu range. Because the highest sulfur content sample only represents one-sixth of the total School seam thickness, the value reported is probably anomalous, is not typical of the entire coal seam, and probably doesn't represent a significant area of higher sulfur content. Fourteen analyses of the Badger seam (Table 4) had an average sulfur content of 0.55 lbs sulfur/million Btu and a heat content of 15.93 million Btu/short ton. One analysis from the Badger showed a higher sulfur content than the average but because that analysis came from only one-third of the coal bed, the values reported for this sample are probably anomalous or not indicative of the entire seam.

Table 3. Analysis of School and Badger seams combined

Sulfur and Heating Values for MRB SULBTU20 (School/Badger Seams)

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value	MMBTU / Short Ton	Lbs S / MMBTU
0.001		School/Badger				Delivered			Marketing Reports, 1981	99 MB of Div., 12Mo/Yr, 9Yr, 1088, 27.3MM Ton	0.45	7641	15.28	0.59
0.002		School/Badger				Delivered			Marketing Reports, 1981	Weighted Ave. of 12 months of deliveries	0.48	7729	15.46	0.62
0.003		School/Badger				Delivered			Marketing Reports, 1982	Weighted Ave. of 12 months of deliveries	0.46	7604	15.21	0.60
0.004		School/Badger				Delivered			Marketing Reports, 1983	Weighted Ave. of 12 months of deliveries	0.44	7695	15.39	0.57
0.005		School/Badger				Delivered			Marketing Reports, 1984	Weighted Ave. of 12 months of deliveries	0.44	7701	15.40	0.57
0.006		School/Badger				Delivered			Marketing Reports, 1985	Weighted Ave. of 12 months of deliveries	0.45	7620	15.24	0.59
0.007		School/Badger				Delivered			Marketing Reports, 1986	Weighted Ave. of 12 months of deliveries	0.44	7539	15.08	0.58
0.008		School/Badger				Delivered			Marketing Reports, 1987	Weighted Ave. of 12 months of deliveries	0.44	7574	15.15	0.58
0.009		School/Badger				Delivered			Marketing Reports, 1988	Weighted Ave. of 12 months of deliveries	0.48	7699	15.40	0.62
0.010		School				Delivered			Marketing Reports, 1989	Weighted Ave. of 12 months of deliveries	0.45	7593	15.19	0.59

Table 4. Analyses of Badger seam

Sulfur and heating values for DRB SULBU20 (Badger Seam)

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Heating Value		MMBTU / Short Ton	Lbs S / MMBTU
											Sulfur	Value		
367515.001	MSWSESN	Badger ?		0.0	0.00	Tipple			USBR R.I.5085, TLR	Badger Mine, 3/8"x0, anal:1953	0.37	8250	16.50	0.45
367515.002	MSWSESN	Badger ?		0.0	0.00	Tipple			EIA70070(L) 1/10/90, TLR	Badger Mine, 3/8"x0, anal:1947	0.40	7990	15.99	0.50
367515.003	MSWSESN	Badger ?		0.0	0.00	Tipple			USBR R.I.5085, TLR	Badger Mine, 1 5/8"x3/8, anal:1953	0.40	8070	16.14	0.50
367515.004	MSWSESN	Badger ?		0.0	0.00	Tipple			EIA70070(L) 1/10/90, TLR	Badger Mine, 2"x3/8, anal:1947	0.35	8010	16.02	0.44
367515.005	MSWSESN	Badger ?		0.0	0.00	Tipple			EIA70070(L) 1/10/90, TLR	Badger Mine, 2 1/2"x2, anal:1947	0.40	8030	16.06	0.50
367515.006	MSWSESN	Badger ?		0.0	0.00	Tipple			USBR R.I.5085, TLR	Badger Mine, 4"x1 5/8, anal:1953	0.40	7870	15.74	0.51
367515.007	MSWSESN	Badger ?		0.0	0.00	Tipple			EIA70070(L) 1/10/90, TLR	Badger Mine, 2 1/2" lump, anal:1947	0.35	8010	16.02	0.44
367515.008	MSWSESN	Badger ?		0.0	0.00	Tipple			EIA70070(L) 1/10/90, TLR	Badger Mine, Run of mine, anal:1947	0.40	8000	16.00	0.50
367515.009	MSWSESN	Badger ?		0.0	0.00	Tipple			EIA70070(L) 1/10/90, TLR	Badger Mine, Run of mine, anal:1953	0.50	7910	15.82	0.63
367515.010	MSWSESN	Badger ?		0.0	0.00	Tipple			EIA70070(L) 1/10/90, TLR	Badger Mine, Run of mine, anal:1945	0.40	8080	16.16	0.50
367515.011	MSWSESN	Badger ?		0.0	0.00	Tipple			USBR R.I.5085, TLR	Badger Mine, 4" lump, anal:1953	0.40	7870	15.74	0.51
367521.002		Badger		4.5	0.00	Mine			EIA70070(L) 1/10/90	Face-channel, Dave Johnston Mine, 1973	0.80	7530	15.06	1.06
367534.001	MSWSE	Badger		16.2	16.80	Mine	D171833, K-45927		GS of Wyo., R.I.11 p18-19	Face-channel sample, 1975	0.50	8790	16.58	0.60
367534.003		Badger				Core			MS, R.I.11, p.156-157	Typical analysis provided by P&L	0.41	7606	15.21	0.54

Average 15.93 0.55

Sulfur and Heating Values for D2B SULFUR20 (School Zone)

Simple Average,
Delivered Samples
Omitted 16.57 0.71

As a check on the coal quality of the entire deposit, 108 analyses from coal delivered between 1981 and 1989 were included as blended coal from both the Badger and the School seams (Table 3). The weighted average for these analyses was 15.28 million Btu/short ton and 0.59 pounds sulfur/million Btu. Although the blended coal samples are from two separate coal beds, the beds are very similar in composition and are very close to each other stratigraphically. Even though the blended coal samples were only used as a check on the separate bed analyses and were not used to assign the final quality categories to this deposit, it is felt that the blended coal analyses in this case are representative of both the Badger and the School coal seams and the entire strippable deposit.

REFERENCE CITED

Smith, J.B., Ayler, M.F., Knox, C.C., and Pollard, B.C., 1972, Strippable coal reserves of Wyoming: U.S. Bureau of Mines Information Circular 8538, 51 p.

**APPENDIX B. DEMONSTRATED RESERVE BASE OF STRIPPABLE
COAL IN THE WYODAK-CABALLO CREEK DEPOSIT,
EASTERN POWDER RIVER COAL FIELD, WYOMING.**

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1. Summary. The remaining demonstrated reserve base (DRB) of strippable coal in the Wyodak and other coal beds in the Wyodak-Caballo Creek deposit is about 19.2 billion tons (see Table 1). The DRB includes the Wyodak coal bed under less than 200 feet of cover within the eastern part of the Powder River Coal Field plus additional strippable coal beds within the Caballo Creek area (see Figures 1-3). The Wyodak coal bed alone accounts for about 17.9 billion tons or 94 percent of the total.

The entire DRB for the Wyodak is in the heating value category of 15 - 19.99 million Btu/short ton (Table 1). Of the 17.9 billion short tons of coal in the Wyodak DRB, about 4.9 billion tons (or 28 percent) of the coal contains less than 0.40 lbs sulfur/million Btu, about 9.2 billion tons (or 51 percent) contains 0.41 - 0.60 lbs sulfur/million Btu, and about 3.8 billion tons (or 21 percent) contains 0.61 - 0.83 lbs sulfur/million Btu.

The DRB for other coal beds (stratigraphically above the Wyodak) in the Caballo Creek area is about 1.3 billion tons. Like the Wyodak, most of the coal in this area is also in the heating value category of 15 - 19.99 million Btu/short ton (Table 1). Most of the 1.3 billion tons contains 0.61 - 1.67 lbs sulfur/million Btu; about 11 percent of the 1.3 billion tons of coal contains more than 1.68 lbs sulfur/million Btu.

Table 1. Summary of remaining demonstrated reserve base (DRB) of the Wyodak and other coal seams in the Wyodak-Caballo Creek deposit through December 31, 1990 (in million short tons).

Seam	Btu Content (million Btu/ short ton)	Sulfur Content (lbs sulfur/million Btu)						Total All Sulfur Categories
		≤0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	>2.50	
Wyodak	15-19.99	4,892.1	9,178.3	3,816.4	—	—	—	17,886.8
Felix	15-19.99	—	—	304.1	755.9	—	—	1,060.0
Lower Ulm	15-19.99	—	—	—	27.0	16.8	—	43.8
Scott	<15	—	—	—	13.5	—	—	13.5
C" bed	<15	—	—	—	—	—	6.5	6.5
	15-19.99	—	—	—	—	—	4.6	4.6
C' bed	15-19.99	—	—	—	—	—	115.2	115.2
C bed	15-19.99	—	—	—	26.3	—	—	26.3
Total	<15	—	—	—	13.5	—	6.5	20.0
All beds	15-19.99	4,892.1	9,178.3	4,120.5	809.2	16.8	119.8	19,136.7
Total All Btu Categories		4,892.1	9,178.3	4,120.5	822.7	16.8	126.3	19,156.7

Figure 1. Sulfur contents and isopach map of the Wyodak-Caballo Creek deposit (modified from Smith and others, 1972).

BELLE FOURCHE RIVER

BELLE

R69W

R70W

Wilcox Mine

Coal Creek Mine

Saddle Horse Mine

Cordero Mine

Caballo Rico Mine

Belle Ayr Mine

Caballo Mine

Tisdale Creek

R71W

R72W

R73W

R74W

Wild Horse Creek

Creek

The Gap S.W.

59

Felix Outcrop

Seaport Reservoir

Caballo Creek

16.62/.72

16.09/.91

15.74/1.17

15.96/1.05

15.89/1.46

16.24/1.35

15.57/1.49

17.09/.92

14.48/1.96

MATH per Short Ton
Lbs 5 per MMBTU

Area of Felix DRB

Pleasantdale

Figure 2. Weighted average sulfur and heating contents, by Township, for the Caballo Creek area, Felix coal bed.

Figure 3. Weighted average sulfur and heating contents, by Township, for the Caballo Creek area, C'', C', C, Lower UIm, and Scott coal beds.

2. Methodology and Assumptions. Original strippable DRB by sulfur content for the Wyodak was derived by planimetering the original coal resource map (Figure 1) from Smith and others (1972), on which were superimposed iso-sulfur lines that subdivide the different sulfur content categories. Original resources for the Wyodak coal bed present in the Caballo Creek area were subtracted from the original strippable DRB and replaced with new coal resources estimated by Grazis (1977) for that area. Calculations for remaining strippable DRB for the Wyodak coal bed are shown in Table 2. Mining and production losses for the Wyodak coal bed (Table 3) were subtracted from the adjusted DRB to calculate the remaining strippable DRB.

Table 2. In-place and remaining DRB for the Wyodak coal bed in the Wyodak-Caballo Creek deposit, eastern part of the Powder River Coal Field (in million short tons). Numbers in parentheses are negative.

	Btu Content (million Btu/ short ton)	Sulfur Content (lbs sulfur/million Btu)						Total All Sulfur Categories
		≤0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	>2.50	
A. Original strippable DRB from Smith, et.al. (1972)	15-19.99	5,856.9	9,263.7	3,873.2	—	—	—	19,003.8
Caballo Creek Adjustment								
B. Subtract Smith, et.al. (1972)	15-19.99	(970.5)	(42.1)	—	—	—	—	(1,012.6)
C. Add Grazis (1977)	15-19.99	<u>890.0</u>	<u>479.3</u>	—	—	—	—	<u>1,369.3</u>
D. Total adjustment (B+C)	15-19.99	(80.5)	437.2	—	—	—	—	356.7
E. Adjusted original DRB (A+D)	15-19.99	5,786.4	9,700.9	3,873.2	—	—	—	19,360.5
F. Coal production through 1990	15-19.99	(804.9)	(470.3)	(51.1)	—	—	—	(1,326.3)
G. Mining losses (90% recovery)	15-19.99	<u>(89.4)</u>	<u>(42.3)</u>	<u>(5.7)</u>	—	—	—	<u>(147.4)</u>
H. Total coal depleted (F+G)	15-19.99	(894.3)	(522.6)	(56.8)	—	—	—	(1,473.7)
I. Remaining strippable DRB through 12/31/90 (E+H)		4,892.1	9,178.3	3,816.4	—	—	—	17,886.8

Table 3. Coal production and mining for the Wyodak coal bed by sulfur contents¹ (in million short tons).

Mine Name	Average Sulfur Content ¹ (lbs sulfur/ million Btu)	Sulfur Content (lbs sulfur/million Btu)			Total all sulfur Categories
		≤ 0.40	0.41-0.60	0.61-0.83	
Belle Ayr	0.39	215.6			215.6
Eagle Butte	0.38	132.7			132.7
Cabello	0.52		95.2		95.2
Rawhide	0.40	112.3			112.3
Cordero	0.45		124.3		124.3
Dry Fork	0.45		0.8		0.8
Ft. Union	0.48		2.6		2.6
Clovis Point	0.52		18.1		18.1
Jacobs Ranch	0.55		142.3		142.3
Caballo Rojo	0.42		43.7		43.7
N. Antelope	0.22	41.1			41.1
Rochelle	0.26	41.8			41.8
N. Rochelle	0.29	0.0			0.0
Black Thunder	0.39	233.4			233.4
Coal Creek	0.39	11.8			11.8
Buckskin	0.57		43.3		43.3
Wyodak	0.75			51.1	51.1
Antelope (NERCO)	0.32	16.2			16.2
Antelope (Brannon)	0.32	0.0			0.0
Total production		804.9	470.3	51.1	1,326.3
Total mining loss ²		89.4	42.3	5.7	147.4
Total production and mining loss		894.3	522.6	56.8	1,473.7

¹Based on selected delivery analyses 1986-1990.²Based on 90% recovery factor.

Because mine-specific recovery factors were not available, it was assumed that surface mines in this portion of the Powder River Coal Field recover about 90 percent of the total coal in-place; the remaining 10 percent of the coal in-place is not recovered because of mining losses and other inefficiencies. For the Wyodak coal bed, it was possible to categorize the coal production and mining losses by sulfur content, using coal delivery data (Table 3).

Estimates of strippable DRB for other coal beds in the Caballo Creek deposit (Figures 2 and 3) were taken from Grazis, 1977. Sulfur contents and heating values were assigned to each coal bed by determining weighted averages for each Township underlain by strippable coal beds. See Tables 4B (Felix coal bed), 4C (C" coal bed), 4D (C' coal bed), 4E (C coal bed), 4F (Lower Ulm), and 4G (Scott coal bed). Because none of these coal beds have been mined, no adjustments to the original strippable DRB were necessary. A total remaining strippable DRB for the entire area, including the coal beds in the Caballo Creek area plus the Wyodak, was also calculated (Table 1).

3. Analyses. Coal analyses used in this report were taken from various sources as detailed in Tables 4 and 5. Selected coal delivery data from producing coal mines were used for characterizing mine permit areas (Figure 4). Analyses related only to the specific coal beds included in the DRB were used to assign coal quality categories to the DRB. Analyses from more than 700 core, channel, and tipple samples were examined for this strippable deposit. The lateral variation in sulfur content (in lbs sulfur/million Btu) and heating content (in million Btu/short ton) for the Wyodak coal bed was determined by constructing iso-Btu and iso-sulfur maps from the coal quality data.

All analyses were evaluated on an individual basis. Analyses from unknown coal beds or poorly located data points were not used. Where only partial thicknesses of a coal bed were sampled and analyzed and no other information was available nearby, the data were not considered representative of the entire coal bed and were not used in this study. Where only partial thicknesses of a coal bed were sampled and analyzed and there was other information on coal thickness and quality (of complete coal beds) available nearby, the analyses were weighted by linear footage sampled.

4. Wyodak. The Wyodak coal bed occurs at or near the top of the Paleocene Fort Union Formation and is found in a large area both north and south of Gillette (Figure 5). The Wyodak can occur as a single thick coal bed or as a coal zone with as many as five individual coal beds. Because it splits into two major coal seams both south and west of the Gillette area, the Wyodak is also called the Anderson-Canyon or the Wyodak-Anderson (Glass and Jones, 1991). The total thickness of the Wyodak coal bed (or coal beds in the zone) ranges from 25 to 175 feet.

Table 4A. Sulfur and Heating Values for the Wyodak coal bed (DRB SILBT005)

Page 1 of 7

Weighted
Averages

Reference Number	Other Location	Published or Company	Depth Interval	Sample No.	Sample Type	Sample Thickness	Drill Hole	Base Source	Remarks	Percent Sulfur (BTU/lb)	Heating Value (BTU/lb)	MBTU per Short Ton	Lbs S per MBTU	Weighted Averages
407100.001	Permit Area Anderson-Canyon		60.00 Core					Antelope Mine Plan/EIS	Median of 20+ MA	0.30	8509	17.02	0.35	
407100.002	Permit Area Anderson		30.00 Core					Antelope Mine Plan/EIS	Median of 20+ MA	0.32	8493	16.99	0.38	17.14
407100.003	Permit Area Canyon		30.00 Core					Antelope Mine Plan/EIS	Median of 20+ MA	0.24	8782	17.56	0.27	
407129.001	U. Wyodak		220.0 234.0	14.0	Core			TEP	M.A. 2A	0.38	8315	16.63	0.46	0.34
417000.001	Permit Area Anderson (Roland)		65.00 Core					Rochelle Mine Plan/EIS	Av of 95 cores	0.20	8520	17.04	0.23	
417000.002	Permit Area Roland		65.00 Core ?					M. Antelope Mine Plan/EIS	Av 20+ A	0.31	9104	18.21	0.34	
417020.001	U. Wyodak		130.0 167.0	31.0	Core			US-7544 MMS/USGS DER 76-450, TLR	MA 4B, Log shows coal 172-154	0.20	8850	17.78	0.22	17.27
417027.001	SWSNE (LL) Lower Wyodak		9.0		Channel D178073			USBN Printout		0.20	8945	17.89	0.22	
417027.002	SWSNE (LL) Lower Wyodak		9.0		Channel D178074			USBN Printout		0.20	9073	18.15	0.22	0.26
417027.003	SWSNE (LL) Lower Wyodak		10.0		Channel D178075			USBN Printout		0.20	8719	17.44	0.23	
417027.004	SWSNE (LL) Lower Wyodak		9.0		Channel D178076			USBN Printout		0.20	8857	17.71	0.23	
417133.001	Anderson?		0.0		Tipple			E1870070(UL), TLR	F. Antelope Mine, 1947	0.40	9060	18.12	0.44	Production
417133.002	Anderson		0.0		Mine Avg			TLR	Av @ Antelope Mine '74	0.20	8850	17.30	0.23	data
417133.003	Wyodak ?		0.0		Tipple			USBN R.I. 5085, p43	Morsch-Antelope Mine, 1953	0.40	8810	17.62	0.45	17.87
417133.004	Wyodak ?		0.0		Tipple			USBN R.I. 5332, p49	Morsch-Antelope Mine, 3rd jump, 1956	0.40	9260	18.52	0.43	
417133.005	Wyodak ?		0.0		Tipple			USBN R.I. 5332, p49	Morsch-Antelope Mine, 3rd jump, 1956	0.60	8900	17.80	0.67	0.45
417133.006	Wyodak ?		0.0		Tipple			USBN R.I. 5489, p38	Morsch-Antelope Mine, R.O.M., 1958	0.40	8920	17.84	0.45	
417216.001	Anderson		399.6 424.0	24.4	24.40 Core			S-303A Mapco, TLR	MA 2A, 401.6-407 omitted	0.34	8485	16.97	0.40	17.44
417216.002	Canyon		571.8 605.0	33.2	33.20 Core			S-303B Mapco, TLR	MA 4A	0.27	9065	18.13	0.30	0.34
427000.001	Permit Area Wyodak (B)		5.0		5.00 Core			M. Rochelle Mine Plan/EIS		0.59	8312	16.62	0.71	17.19
427000.002	Permit Area Wyodak (E)		60.7		60.70 Core			M. Rochelle Mine Plan/EIS		0.19	8900	17.80	0.21	
427000.003	Permit Area Wyodak (E1)		10.00 Core		10.00 Core			M. Rochelle Mine Plan/EIS		0.56	8868	13.74	0.82	0.33
437000.001	Permit Area Wyodak		60.00 Typical Core		60.00 Typical Core			Jacobs Ranch Mine Plan/EIS	MA values, 1A	0.47	8527	17.05	0.55	
437000.002	Permit Area L. Wyodak		8.10 Core		8.10 Core			Jacobs Ranch Mine Plan/EIS	MA of 2A A	1.04	8677	17.35	1.27	
437000.003	Permit Area L. Wyodak 1		43.00 Core		43.00 Core			Jacobs Ranch Mine Plan/EIS	MA of 2B A	0.39	8518	17.04	0.46	17.18
437000.004	Permit Area L. Wyodak 2		5.90 Core		5.90 Core			Jacobs Ranch Mine Plan/EIS	MA of B A	0.27	8312	16.62	0.32	
437000.005	Permit Area L. Wyodak		8.10 Typical		8.10 Typical			Jacobs Ranch Mine Plan/EIS	C, 1A	1.06	8669	17.34	1.27	0.42
437000.006	Permit Area L. Wyodak 1		43.00 Typical		43.00 Typical			Jacobs Ranch Mine Plan/EIS	C, 1A	0.34	8519	17.04	0.40	
437000.007	Permit Area L. Wyodak 2		5.90 Typical		5.90 Typical			Jacobs Ranch Mine Plan/EIS	C, 1A	0.29	8310	16.62	0.35	
437000.008	Permit Area Roland		65.50 Typical		65.50 Typical			Black Thunder Mine Plan/EIS	C, 90A	0.33	8605	17.21	0.38	
447005.001	Wyodak		98.5 134.5	36.0	36.00 Core			CD-79008 USGS/MMS DER 82-29, TLR	MA 2A, 1.2' 10	0.69	8385	16.77	0.82	
447006.001	Wyodak		184.1 220.9	36.8	36.80 Core			CD-79006 USGS/MMS DER 82-29, TLR	MA 2A, 1' 11	0.55	8436	16.87	0.65	16.81
447021.001	Wyodak		265.4 323.3	57.9	57.90 Core			CD-79007 USGS/MMS DER 82-29, TLR	MA 5A, 14.2' 10s	0.58	8490	16.98	0.68	
447034.001	SWSNE (LL) Wyodak ?		9.0		Channel D178081			USBN Printout		0.40	8620	17.24	0.46	0.56
447034.002	SWSNE (LL) Wyodak ?		10.0		Channel D178082			USBN Printout		0.30	8108	16.72	0.37	
447034.003	SWSNE (LL) Wyodak ?		7.0		Channel D178083			USBN Printout		0.30	8408	16.82	0.36	18.46
447123.001	Wyodak		309.4 381.5	66.7	76.00 Core			CD-79022 USGS/MMS DER 82-29, TLR	MA 4A, 5' 10, 4.9' lost	0.43	9253	18.51	0.46	
447133.001	Wyodak		402.0 509.3	102.4	108.00 Core			CD-79027 USGS/MMS DER 82-29, TLR	MA, 3A, 445.6-450 omitted, 5.6' lost	0.41	9208	18.42	0.45	0.46

Table 4A. Sulfur and Heating Values for the Wyodak coal bed (D88 S481005)

Page 2 of 7

Weighted
Averages

Reference Number	Other Locational Data	Published or Bed Designation	Depth Interval	Sample No.	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Basis	Heating Value			Sulfur			Weighted Average
											MBTU	per	Short Ton	MBTU	per	Short Ton	MBTU
457016.001	Permit Area Roland A		11.40 Core						WYOD Fuels Mine Plan/EIS	C, S4(2)A	1.23	8134	16.27	1.51			
457016.002	Permit Area Roland B		23.30 Core						WYOD Fuels Mine Plan/EIS	C, S4(2)A	0.38	8336	16.67	0.46			
457016.003	Permit Area Roland C		10.70 Core						WYOD Fuels Mine Plan/EIS	C, S4(2)A	0.47	8450	16.90	0.56			
457016.004	Permit Area Roland D		10.70 Core						WYOD Fuels Mine Plan/EIS	C, S4(2)A	0.42	8072	16.14	0.52			
457016.005	Permit Area Roland (All)		56.70 Calculated						WYOD Fuels Mine Plan/EIS	MA from above 4A	0.52	8275	16.55	0.63			16.54
457020.001	U. Wyodak		193.0 208.0	12.1	15.00 Core				CD-78038 USGS OFR 80-851, T&R	MA 2A	1.00	8267	16.53	1.21			
457020.002	M. Wyodak		227.3 253.7	26.4	26.40 Core				CD-78038 USGS OFR 80-851, T&R	MA 2A	0.35	8467	16.93	0.41			0.70
457020.003	L. Wyodak, U. Bench		288.0 297.0	9.0	9.00 Core				CD-78038 USGS OFR 80-851, T&R	MA 2A	0.40	8469	16.94	0.47			
457020.004	L. Wyodak, L. Bench		320.1 332.1	12.0	12.00 Core				CD-78038 USGS OFR 80-851, T&R	MA 3A	0.30	8461	16.92	0.35			
457027.001	M. & L. Wyodak		156.0 182.0	26.0	31.00 Core				US-757 USGS OFR 74-450, T&R	MA 3A	0.34	8366	16.73	0.41			
457027.002	M. Wyodak		97.0 108.0	11.0	11.00 Core				CD-78041 USGS OFR 80-851, T&R	MA 2A	1.30	8953	16.11	1.61			
457027.003	L. Wyodak		128.0 149.3	21.3	21.30 Core				CD-78041 USGS OFR 80-851, T&R	MA 2A	0.40	8314	16.63	0.48			
457113.001	NESEN (LL) Wyodak ?		10.0		Channel D178078				USBN Printout		0.20	8655	17.31	0.23			17.13
457113.002	NESEN (LL) Wyodak ?		10.0		Channel D178079				USBN Printout		0.20	8486	16.97	0.24			
457113.003	NESEN (LL) Wyodak ?		10.0		Channel D178080				USBN Printout		0.20	8562	17.12	0.23			0.24
467000.001	Permit Area Roland No.1		23.00 Typical						Coal Creek Mine Plan/EIS	1977	0.32	8110	16.22	0.39			
467000.002	Permit Area Roland No.3		18.00 Typical						Coal Creek Mine Plan/EIS	1977	0.38	7400	14.80	0.51			15.74
467003.001	MEWNN (LL) Wyodak-Anderson		4.8		Channel D177022				USBN Printout		0.50	9830	19.66	0.51			
467003.002	MEWNN (LL) Wyodak-Anderson		5.0		Channel D177023				USBN Printout		0.50	9830	19.66	0.51			0.46
467003.003	MEWNN (LL) Wyodak-Anderson		5.5		Channel D177024				USBN Printout		0.50	9830	19.66	0.51			
467007.001	Wyodak		261.3 245.0	42.4	55.00 Core				CD-79018 USGS OFR 80-1041, T&R	MA 3A, 5.10	0.50	8557	17.11	0.58			
467101.001	Wyodak		60.1 114.6	51.5	65.90 Core				CD-79016 USGS/MNS OFR 82-29, T&R	MA 3A, 5.10	0.41	8111	16.22	0.51			16.97
467110.001	L. Wyodak		287.0 325.0	28.0	38.00 Core				US-755 USGS OFR 74-450, T&R	MA 3A	0.21	8568	17.14	0.23			
467124.001	Wyodak		90.0 136.3	46.3	46.30 Core				CD-79020 USGS/MNS OFR 82-29, T&R	MA 3A, 3.4.10s	0.37	8718	17.44	0.42			0.42
477032.001	SESESE Wyodak		85.0 120.0	28.0	35.00 Core				US-7310 NRG/USGS OFR 74-47/Map-77 MA 4A, 7.10		0.41	8057	16.11	0.51			16.42
477100.001	Permit Area Wyodak ?		65.00 Core						Caballo Rojo Mine Plan/EIS	C, 40A	0.31	9590	17.18	0.36			
477100.002	Permit Area Wyodak ?		52.00 Core						Cordero Mine Plan/EIS	MA 20* A	0.30	8185	16.37	0.37			0.36
487100.001	Permit Area Smith		0.0		70.00 Typical Core				Caballo Mine Plan/EIS	Map of SSA	0.35	7977	15.95	0.44			
487100.002	Permit Area Smith		142.7 214.8	71.2	72.10 Selected Core				Caballo Mine Plan/EIS	MA 8A	0.34	8566	17.13	0.42			
487100.003	Permit Area Wyodak		70.00 Core						Belle Ayr Mine Plan/EIS	Av 40(2)A	0.35	8400	16.80	0.42			
487122.001	SESEN (LL) Wyodak ?		5.0		Channel D165921				USBN Printout	Caballo Mine?	0.60	8630	17.26	0.70			16.37
487122.002	SESN (LL) Wyodak ?		10.0		Core D165930				USBN Printout	Caballo Mine?	1.40	7514	15.03	1.86			
487122.003	SESN (LL) Wyodak ?		10.0		Core D165931				USBN Printout	Caballo Mine?	0.60	7412	14.82	0.81			0.44
487122.004	SESN (LL) Wyodak ?		5.0		Core D165932				USBN Printout	Caballo Mine?	0.60	7709	15.42	0.78			
487134.001	SENNW L. Wyodak		35.0		74.40 Channel D171827, K46216				WGS R.I. 11, p. 18 k19	Belle Ayr Mine, 1974	0.40	9330	18.78	0.64			
487134.002	SENNW L. Wyodak		41.7		91.80 Channel D171826, K46216				WGS R.I. 11, p. 18 k19	Belle Ayr Mine, 1974	0.40	9310	18.62	0.43			
487134.003	SENNW Wyodak		74.4		74.40 Channel D171825, K46218				WGS R.I. 11, p. 18 k19	Belle Ayr Mine, 1974	0.50	9480	18.96	0.53			16.20
487222.001	SESNW (LL) Wyodak		46.0		Core D167688				USBN Printout		1.00	8110	16.22	1.23			
487222.002	SESNW (LL) Wyodak		51.0		Core D167689				USBN Printout		0.70	8090	16.18	0.87			1.04

Table 4a. Sulfur and Heating Values for the Wyodak coal bed (DRB SULFUR)

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Weighted
Averages

Reference Number	Other Locational Data	Published or Bed Designation	Depth Interval ² From To	Sample Thickness ² From To	Sample Type	Sample Number	Drill Hole	Data Source ⁵	Remarks ³	Percent Sulfur (BTU/lb)	Heating Value (BTU/lb)	Short Ton	Lbs S per MMBTU	Lbs S per MMBTU	Weighted Average
507123-001		M or L Wyodak	121.0	129.0	8.0	20.00 Core	US-7363	USGS DFR 74-97, T&R		0.65	7807	15.61	0.84		
507128-001	ANWENE	Anderson	41.7	91.80	Channel	D171831, K44430	US-7363	WGS R.L. 11, p. 18 t19	Wyodak M. Pit, 1974	0.60	9600	19.20	0.63		
507128-002	KEWESE	Anderson	58.5	109.05	Channel	D171830, K44566	US-7363	WGS R.L. 11, p. 18 t19	Wyodak S. Pit, 1974	0.80	8280	16.56	0.97		16.70
507128-003	SWNESE	Canyon	42.0	109.05	Channel	D171829, K44565	US-7363	WGS R.L. 11, p. 18 t19	Wyodak S. Pit, 1974	0.30	8180	16.36	0.37		
507128-004	SWNESE	Wyodak	93.1	93.10	Channel	F115 a-c	US-7363	USGS R.L. 2832	Peerless Mine, Kirby Mutual Coal, 1977	0.50	7760	15.52	0.64		0.82
507128-005		Saith & Roland	0.0	80.00	Face-channel		US-7363	E1A70070(L) 1/10/90	Wyodak Mine, 1948	1.00	8390	16.78	1.19		
507128-006		Saith & Roland	0.0	80.00	Face-channel		US-7363	E1A70070(L) 1/10/90	Wyodak Mine, 1973	1.00	8450	16.90	1.18		
507128-007		Saith & Roland	0.0	80.00	Face-channel		US-7363	E1A70070(L) 1/10/90	Wyodak Mine, 1973	0.50	8560	17.12	0.58		
507230-001	(LL)	Wyodak			Channel	PSUC-100	PSUC-100	PSDB, p. 31		0.36	8311	16.62	0.43		16.90
507230-002	(LL)	Wyodak			Channel	PSUC-101	PSUC-101	PSDB, p. 36		0.34	8583	17.17	0.40		0.42
517100-001	Permit Area	Anderson & Canyon			86.00 Core			Dry Fork Mine Plan/EIS	Av 20+ A	0.43	8111	16.22	0.53		16.00
517100-002	Permit Area	Anderson & Canyon			86.00 Core			Dry Fork Mine Plan/EIS	Av 20+ A	0.33	7906	15.81	0.42		
517100-003	Permit Area	Wyodak			70.00 Core			Fl. Union Mine Plan/EIS	Av 20+ A	0.33	7906	15.81	0.42		0.46
517200-001	Permit Area	Wyodak top bench			30.00 Core			Eagle Butte Mine Plan/EIS	Av 20+ A	0.65	7985	15.97	0.81		
517200-002	Permit Area	Wyodak middle bench			40.00 Core			Eagle Butte Mine Plan/EIS	Av 20+ A	0.36	8075	16.15	0.45		
517200-003	Permit Area	Wyodak bottom bench			40.00 Core			Eagle Butte Mine Plan/EIS	Av 20+ A	0.25	8149	16.30	0.31		
517200-004	Permit Area	Wyodak, full seam			110.00 Core			Eagle Butte Mine Plan/EIS	Av 20+ A	0.41	8070	16.14	0.51		
517200-005	Permit Area	Wyodak-Anderson Canyon			107.00 Core			R. Rawhide Mine Plan/EIS	Av 35A	0.38	8063	16.13	0.47		
517217-001		Anderson	100.0	144.0	14.0	44.00 Core	US-734	USGS DFR 74-97, T&R		0.92	8167	16.33	1.13		
517217-002		Anderson	122.0	165.0	5.0	43.00 Core	US-739	USGS DFR 74-97, T&R		1.07	8737	17.47	1.22		
517217-003		Anderson	122.0	165.0	5.0	Core	US-739C	USGS DFR 74-97, T&R	MA 5A, 4'10"	0.49	8140	16.28	0.60		
517227-001	SINENW (LL)	Wyodak			14.0	Core	D164604	US-739C	Eagle Butte Mine	0.90	8170	16.34	1.10		
517227-002	SINENW (LL)	Wyodak			7.0	Core	D164605	US-739C	Eagle Butte Mine	1.10	8112	16.22	1.36		
517227-003	SINENW (LL)	Wyodak			7.0	Core	D164606	US-739C	Eagle Butte Mine	1.10	8453	16.91	1.30		
517227-004	SINENW (LL)	Wyodak			15.0	Core	D164607	US-739C	Eagle Butte Mine	1.10	8316	16.63	1.32		
517227-005	SINENW (LL)	Wyodak			15.0	Core	D164608	US-739C	Eagle Butte Mine	0.20	7770	15.54	0.26		
517227-006	SINENW (LL)	Wyodak			10.0	Core	D164609	US-739C	Eagle Butte Mine	0.50	8068	16.14	0.62		16.14
517227-007	SINENW (LL)	Wyodak			5.0	Core	D164610	US-739C	Eagle Butte Mine	1.10	8737	17.47	1.26		
517227-008	SINENW (LL)	Wyodak			9.0	Core	D164611	US-739C	Eagle Butte Mine	1.00	8187	16.37	1.22		0.50
517227-009	SINENW (LL)	Wyodak			9.0	Core	D164612	US-739C	Eagle Butte Mine	0.50	8159	16.32	0.61		
517227-010	SINENW (LL)	Wyodak			10.0	Core	D165901	US-739C	Eagle Butte Mine	0.50	8387	16.77	0.60		
517227-011	SINENW (LL)	Wyodak			10.0	Core	D165902	US-739C	Eagle Butte Mine	0.20	8513	17.03	0.23		
517227-012	SINENW (LL)	Wyodak			8.0	Core	D165903	US-739C	Eagle Butte Mine	0.20	7537	15.07	0.27		
517227-013	SINENW (LL)	Wyodak			2.0	Core	D165904	US-739C	Eagle Butte Mine	0.20	8252	16.50	0.24		
517227-014	SINENW (LL)	Wyodak			10.0	Core	D165905	US-739C	Eagle Butte Mine	0.10	8338	16.72	0.12		
517227-015	SINENW (LL)	Wyodak			10.0	Core	D165906	US-739C	Eagle Butte Mine	0.40	8522	17.04	0.47		
517227-016	SINENW (LL)	Wyodak			10.0	Core	D165907	US-739C	Eagle Butte Mine	0.20	8233	16.47	0.24		
517227-017	SINENW (LL)	Wyodak			10.0	Core	D165908	US-739C	Eagle Butte Mine	0.30	8409	17.22	0.35		
517227-018	SINENW (LL)	Wyodak			10.0	Core	D165912	US-739C	Eagle Butte Mine	0.50	7713	15.43	0.65		
517227-019	SINENW (LL)	Wyodak			10.0	Core	D165913	US-739C	Eagle Butte Mine	0.30	8146	16.29	0.37		
517227-020	SINENW (LL)	Wyodak			10.0	Core	D165914	US-739C	Eagle Butte Mine	0.30	8185	16.37	0.37		
517227-021	SINENW (LL)	Wyodak			10.0	Core	D165915	US-739C	Eagle Butte Mine	0.60	7272	14.54	0.83		
517227-022	SINENW (LL)	Wyodak			3.0	Core	D165986	US-739C	Eagle Butte Mine	0.70	7738	15.48	0.90		
517227-023	SINENW (LL)	Wyodak			10.0	Core	D165987	US-739C	Eagle Butte Mine	0.50	8284	16.57	0.60		
517227-024	SINENW (LL)	Wyodak			10.0	Core	D165988	US-739C	Eagle Butte Mine	0.30	8133	16.27	0.37		
517227-025	SINENW (LL)	Wyodak			10.0	Core	D165989	US-739C	Eagle Butte Mine	0.40	7935	15.87	0.50		
517227-026	SINENW (LL)	Wyodak			10.5	Core	D165990	US-739C	Eagle Butte Mine	0.80	7758	15.52	1.03		

Table 4A. Sulfur and Heating Values for the Wyodak coal bed (DRB SULBTU05)

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Weighted
Averages

Reference Number	Other Locational Data ⁴	Published or Company Bed Designation	Depth Interval ² From To	Sample Thickness ² From To	Sample Type	Sample Number	Drill Hole	Data Source ⁵	Remarks ³	Heating Value per Short Ton				Sulfur ¹ Lbs S per MMBTU	
										Percent	MMBTU	per	Short Ton	MMBTU	Lbs S per MMBTU
517227.027	SWENH (LL) Wyodak		106.0	147.0	36.0	Core	D165910	USBM Printout	Eagle Butte Mine	1.00	7713	15.43	1.30	cont.	
517227.028	SWENH (LL) Wyodak		2.0			Core	D165911	USBM Printout	Eagle Butte Mine	0.90	7709	15.42	1.17		
517227.029	SWENH (LL) Wyodak		10.0			Core	D165918	USBM Printout	Eagle Butte Mine	0.60	7823	15.25	0.79		
517227.030	SWENH (LL) Wyodak		4.0			Core	D165919	USBM Printout	Eagle Butte Mine	0.80	8016	16.03	1.00		
517227.031	SWENH (LL) Wyodak		10.0			Core	D165920	USBM Printout	Eagle Butte Mine	0.40	7433	14.87	0.81		
517301.001	MESWE Anderson		106.0	147.0	36.0	41.00 Core		US-7334 USGS OFR 74-97, 148	MA 4A	0.45	8057	16.11	0.56	16.30	
517301.002	MESWE Canyon		332.0	410.0	60.0	78.00 Core		US-7334 USGS OFR 74-97, 148	MA 6A	0.28	8329	16.66	0.34		
517311.001		Anderson	230.0	264.0	10.0	34.00 Core		US-7338 USGS OFR 74-97, 148		0.57	7433	14.87	0.77	0.45	
527206.001		Anderson	43.0	50.0	7.0	37.60 Core		US-737C USGS OFR 74-97, 148		1.13	8453	16.91	1.34	16.10	
527206.002		Anderson	64.0	74.0	10.0	35.00 Core		US-738 USGS OFR 74-97, 148		0.25	7770	15.54	0.32		0.74
527303.001		Anderson	139.0	174.0	7.0	42.00 Core		BMC7223 OFR, 73, 148		0.43	7987	15.97	0.54	15.76	
527335.001 SE		Anderson	224.0	266.0	38.0	42.00 Core		US-7336 USGS OFR 74-97, 148	MA 4A	0.41	7858	15.72	0.52		
527413.001 W1/2		Anderson	291.0	307.0	8.0	16.00 Core		US-7340 USGS OFR 74-97, 148		0.31	8371	16.74	0.37	0.52	

Table 48. Sulfur and Heating Values for the Felix coal bed (DRB SULATU05)

Reference Number	Other Location Data	Published or Company	Depth Interval	Sample No	Sample Size	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value per (Btu/Lb.) Short Ton	MMBTU per Short Ton	Lbs S per MMBTU	Averages
467403.001		Felix?		6.1	6.10	Mine		22927.0	USNM Bull. 123, p. 126, 128			1.42	7240	14.48	1.96	
477206.001	HESE	Felix 2	44.0	64.0	22.00	Core			US-7314	USNS OFR 74-97/Map C-77, 128 MA 3A		0.60	8076	16.15	0.74	
477207.001	HESE	Felix 1	98.0	110.1	12.10	Core			ILL 3-04	TER	Uncertain of sample thickness	0.46	8093	16.19	0.57	
477207.002	HESE	Felix 2	126.4	53.4	27.00	Core			ILL 3-04	TER	Uncertain of sample thickness	0.34	8352	16.72	0.41	16.09
477207.003	HESE	Felix ?			0.9	Channel		9178089	USNM Printout			1.30	8080	16.16	1.61	
477207.004	HESE	Felix ?			1.0	Channel		9178090	USNM Printout			0.40	8050	16.10	0.50	0.91
477214.002	HESE	Felix ?	59.0	64.0	7.00	Core			US-7312C	USNS OFR 74-97, 128	This is thickest of several thin beds	3.53	7683	15.37	4.67	
477217.001	HESE	Felix 1	48.0	56.0	8.00	Core			US-7316	USNS OFR 74-97/Map C-77, 128		0.70	7794	15.59	0.90	
477217.002	HESE	Felix 2	65.0	88.0	16.00	Core			US-7316	USNS OFR 74-97/Map C-77, 128 MA 2A, 7' 10		0.44	7717	15.43	0.57	
477302.001	HESE	Felix 1	104.0	108.0	4.00	Core			US-7315	USNS OFR 74-97/Map C-77, 128		0.75	7950	15.90	0.94	16.62
477302.002	HESE	Felix 2	185.0	208.0	23.00	Core			US-7315	USNS OFR 74-97/Map C-77, 128 MA 3A		0.51	8118	16.24	0.63	
477317.001	HESE	Felix 1	265.0	270.0	5.00	Core			US-7324	USNS OFR 74-97/Map C-77, 128		1.08	7477	14.94	1.45	0.72
477317.002	HESE	Felix 2	327.0	347.0	20.00	Core			US-7324	USNS OFR 74-97/Map C-77, 128 MA 2A		0.52	8812	17.62	0.59	15.96
487207.001		Felix	24.0	51.0	25.00	Core			US-7355	USNS OFR 74-97, 128	MA 2A	0.92	8099	16.20	1.14	
487209.001		Felix	69.0	96.0	26.00	Core			US-7353	USNS OFR 74-97, 128	MA 3A, 2' 11	0.76	7859	15.72	0.97	1.05
487301.001		Felix	86.0	113.0	27.00	Core			US-7321	USNS OFR 74-97, 128	MA 3A	1.14	7832	15.44	1.46	15.74
487314.001		Felix 1	133.0	149.0	11.00	Core			US-7320	USNS OFR 74-97, 128	MA 2A	0.65	7796	15.59	0.83	
487314.002		Felix 2	152.0	164.0	13.00	Core			US-7320	USNS OFR 74-97, 128	MA 2A	0.69	8027	16.05	0.86	1.17
487415.001		Felix	46.0	55.0	9.00	Core			US-7329	USNS OFR 74-97, 128		1.49	7605	15.21	1.95	15.89
487424.001	ENH	Felix	450.0	458.0	8.00	Core			US-7326	USNS OFR 74-97/Map C-77, 128		0.75	8324	16.65	0.90	
497206.001		Felix 1	40.0	55.0	15.00	Core			US-7332	USNS OFR 74-97, 128	MA 2A	1.47	7533	15.07	1.95	1.46
497206.002		Felix 2	58.0	67.0	8.00	Core			US-7332	USNS OFR 74-97, 128	MA 2A	1.31	8125	16.25	1.61	
497207.001		Felix 1	26.0	40.0	14.00	Core			US-7330	USNS OFR 74-97, 128	MA 2A	1.80	7908	15.82	2.28	15.57
497207.002		Felix 2	51.0	58.0	7.00	Core			US-7330	USNS OFR 74-97, 128		0.43	8199	16.40	0.52	
497217.001		Felix	26.0	36.0	9.00	Core			US-7327	USNS OFR 74-97, 128	Thin interbed may be included	0.62	8156	16.31	0.76	1.49
497226.001		Felix	43.0	70.0	75.00	Core			US-7359	USNS OFR 74-97, 128	MA 3A, 2' 11	0.95	7517	15.02	1.26	
497302.001		Felix 1	140.0	176.0	14.00	Core			US-7353	USNS OFR 74-97, 128	MA 2A	1.42	7883	15.77	1.80	16.24
497302.002		Felix 2	183.0	192.0	9.00	Core			US-7353	USNS OFR 74-97, 128		0.63	8348	16.70	0.75	
497335.001		Felix	134.0	162.0	26.00	Core			US-7322	USNS OFR 74-97, 128	MA 3A, 2' 10	1.07	8170	16.34	1.31	1.35
497403.001		Felix	230.0	254.0	19.00	Core			US-7355	USNS OFR 74-97, 128	MA 3A, 2' 11	0.78	8543	17.09	0.91	

Table 4C. Sulfur and Heating Values for the C' coal bed (DRB SULBTU05)

Reference Number ¹	Other Locational Data ⁴	Published or Company Bed Designation	Depth Interval ² From To	Sample Thickness ³ From To	Sample Type	Sample Number	Drill Hole	Data Source ⁵	Remarks ³	Heating Value			Weighted Averages	
										MBTU	per	Short Ton	MBTU	Lbs S per MBTU
47728.001	SMSNM	C', Smith? Local?	24.0	26.0	2.0	2.00	Core	US-7311 USSS OFR 74-97/Map C-77, 14R		4.20	7649	15.30	5.49	
477214.001	SMSNM	C'	61.0	63.0	2.0	2.00	Core	US-7312C USSS Map C-77		2.61	4139	8.28	6.31	

Table 4D. Sulfur and Heating Values for the C' coal bed (DRB SULBTU05)

Reference Number ¹	Other Locational Data ⁴	Published or Company Bed Designation	Depth Interval ² From To	Sample Thickness ³ From To	Sample Type	Sample Number	Drill Hole	Data Source ⁵	Remarks ³	Heating Value			Weighted Averages	
										MBTU	per	Short Ton	MBTU	Lbs S per MBTU
477214.001	SMSNM	C'	160.0	166.0	6.0	6.00	Core	US-7312C USSS Map C-77		3.59	7683	15.37	4.67	

Table 4E. Sulfur and Heating Values for the C' coal bed (DRB SULBTU05)

Reference Number ¹	Other Locational Data ⁴	Published or Company Bed Designation	Depth Interval ² From To	Sample Thickness ³ From To	Sample Type	Sample Number	Drill Hole	Data Source ⁵	Remarks ³	Heating Value			Weighted Averages	
										MBTU	per	Short Ton	MBTU	Lbs S per MBTU
477214.001	SMSNM	C	233.0	240.0	7.0	7.00	Core	US-7312C USSS Map C-77		1.07	8215	16.43	1.30	

Table 4F. Sulfur and Heating Values for the Lower U1a coal bed (DRB SULBTU05)

Reference Number ¹	Other Locational Data ⁴	Published or Company Bed Designation	Depth Interval ² From To	Sample Thickness ³ From To	Sample Type	Sample Number	Drill Hole	Data Source ⁵	Remarks ³	Heating Value			Weighted Averages	
										MBTU	per	Short Ton	MBTU	Lbs S per MBTU
477435.001	Lower U1a?		59.0	74.0	13.0	15.00	Core	US-7331 USSS OFR 74-97, 14R	MA 2A	1.68	7544	15.09	2.23	15.44
487423.001	Lower U1a		144.0	154.0	10.0	10.00	Core	US-7327 USSS OFR 74-97/Map C-77, 14R	MA 2A	1.14	7952	15.90	1.43	1.88

Table 4G. Sulfur and Heating Values for Scott coal bed (DRB SULBTU05)

Reference Number ¹	Other Locational Data ⁴	Published or Company Bed Designation	Depth Interval ² From To	Sample Thickness ³ From To	Sample Type	Sample Number	Drill Hole	Data Source ⁵	Remarks ³	Heating Value			Weighted Averages	
										MBTU	per	Short Ton	MBTU	Lbs S per MBTU
477410.001	NESE	Scott	179.0	180.0	1.0	1.00	Core	US-7323 USSS Map C-77		2.15	7741	14.48	2.97	14.59
477435.001	SMSNM	Scott	112.0	114.0	2.0	2.00	Core	US-7325 USSS Map C-77	MA 2A	2.23	7325	14.65	3.04	3.02
487423.001	SESW	Scott	219.0	221.0	2.0	2.00	Core	US-7327 USSS Map C-77	MA 2A	0.87	7425	14.85	1.17	

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Footnotes for Table 4.

1) This is a number assigned by Geological Survey of Wyoming, the first two digits indicate township number, the second two indicate Range number and the third two indicate Section number. Numbers to the right of the decimal point indicate number of analyses available for each section. 00 for section number indicates either multiple sections or unknown section.

2) All depths, sample thicknesses and seam thicknesses are in feet.

3) Includes additional information on analyses such as number of samples or analyses (A), weighted averages (WA), Simple average (Av), composite samples (C), 20+ indicates that the actual number of analyses is unknown, but is assumed to be a minimum of 20. Core data abbreviations: IO = interbed omitted from analyses (IOs = plural), II = interbed included in analysis, b' lost = specified core footage not recovered, MR = no record for specified interval, omitted = specified interval omitted from analysis.

4) Includes quarter sections; (LL) = Location derived from a latitude and longitude description which may be questionable in its accuracy.

5) T & R = Township and Range files from Geological Survey of Wyoming; Mapco = corehole data supplied to the Geological Survey Of Wyoming by Mapco; EIA70070(II) = computerized listing supplied by U.S. Energy Information Administration dated 1/10/90 ; USBM printout = U.S. Bureau of Mines computerized listing (undated)

Table 5. Delivered Sulfur and Heating Values, by mine, for Wyodak coal production (SULBTU04)

Reference Number	Other Locational Data	Published or Company Red Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/Lb) Short Ton	Lbs S per Ton	Weighted Averages Lbs S/MBTU
407100.001	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Antelope Mine, WA 83.8k Tons	0.20	8809	17.62	0.23
407100.002	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Antelope Mine, WA 114.8k Tons	0.20	8845	17.69	0.23
407100.003	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Antelope Mine, WA 99.7k Tons	0.25	8834	17.67	0.28
407100.004	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Antelope Mine, WA 239.0k Tons	0.24	8882	17.76	0.27
407100.005	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Antelope Mine, WA 224.4k Tons	0.26	8845	17.69	0.29
407100.006	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Antelope Mine, WA 270.6k Tons	0.31	8819	17.64	0.35
407100.007	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Antelope Mine, WA 315.0k Tons	0.29	8903	17.81	0.33
407100.008	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Antelope Mine, WA 431.17k Tons	0.32	8847	17.69	0.36
417000.001	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	North Antelope Mine, WA 389.3k Tons	0.20	8773	17.55	0.23
417000.002	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	North Antelope Mine, WA 388.2k Tons	0.20	8792	17.58	0.23
417000.003	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	North Antelope Mine, WA 492.71k Tons	0.21	8837	17.67	0.24
417000.004	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	North Antelope Mine, WA 320.41k Tons	0.23	8872	17.74	0.26
417000.005	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	North Antelope Mine, WA 213.75k Tons	0.17	8766	17.53	0.19
417000.006	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	North Antelope Mine, WA 389.3k Tons	0.19	8840	17.72	0.21
417000.007	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	North Antelope Mine, WA 537.66k Tons	0.19	8850	17.70	0.21
417000.008	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	North Antelope Mine, WA 434.98k Tons	0.18	8822	17.64	0.20
417000.009	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	North Antelope Mine, WA 629.66k Tons	0.19	8847	17.69	0.21
427000.001	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Rochelle Mine, WA 63.7k Tons	0.30	8791	17.58	0.34
427000.002	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Rochelle Mine, WA 115.6k Tons	0.29	8752	17.50	0.33
427000.003	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Rochelle Mine, WA 93.54k Tons	0.24	8799	17.60	0.27
427000.004	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Rochelle Mine, WA 103.99k Tons	0.23	8787	17.57	0.26
427000.005	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Rochelle Mine, WA 341.21k Tons	0.21	8840	17.68	0.24
427000.006	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Rochelle Mine, WA 424.5k Tons	0.23	8950	17.90	0.26
427000.007	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Rochelle Mine, WA 895.9k Tons	0.22	8746	17.49	0.25
427000.008	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Rochelle Mine, WA 848.67k Tons	0.21	8803	17.61	0.24
427000.009	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Rochelle Mine, WA 783.63k Tons	0.23	8801	17.60	0.26
437000.001	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Jacobs Ranch Mine, WA 1075.7k Tons	0.50	8624	17.25	0.58
437000.002	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Jacobs Ranch Mine, WA 971.3k Tons	0.50	8623	17.25	0.58
437000.003	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Jacobs Ranch Mine, WA 1025.49k Tons	0.46	8563	17.13	0.54
437000.004	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Jacobs Ranch Mine, WA 838.08k Tons	0.44	8555	17.11	0.51
437000.005	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Jacobs Ranch Mine, WA 988.38k Tons	0.40	8551	17.10	0.47
437000.006	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Jacobs Ranch Mine, WA 954.79k Tons	0.41	8544	17.09	0.48
437000.007	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Jacobs Ranch Mine, WA 1233.08k Tons	0.50	8637	17.27	0.58
437000.008	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Jacobs Ranch Mine, WA 1317.39k Tons	0.50	8646	17.29	0.58
437000.009	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Jacobs Ranch Mine, WA 1250.09k Tons	0.48	8749	17.50	0.55
437000.010	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Black Thunder Mine, WA 1949.10k Tons	0.30	8885	17.77	0.34
437000.011	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Black Thunder Mine, WA 1787.90k Tons	0.30	8884	17.77	0.34
437000.012	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Black Thunder Mine, WA 1759.29k Tons	0.34	8920	17.84	0.38
437000.013	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Black Thunder Mine, WA 1632.99k Tons	0.35	8868	17.74	0.39
437000.014	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Black Thunder Mine, WA 1189.72k Tons	0.37	8942	17.88	0.41
437000.015	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Black Thunder Mine, WA 1373.82k Tons	0.36	8961	17.92	0.40
437000.016	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Black Thunder Mine, WA 1737.11k Tons	0.36	8908	17.82	0.40
437000.017	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Black Thunder Mine, WA 1834.73k Tons	0.36	8891	17.78	0.40
437000.018	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Black Thunder Mine, WA 1952.18k Tons	0.36	8803	17.61	0.41

Table 5. Delivered Sulfur and Heating Values, by mine, for Wyodak coal production (SUL87U04)

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Reference Number	Other Locational Data	Published or Company Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source ¹	Reagents ²	Percent Sulfur	Heating Value (BTU/Lb)	Short Ton	Lbs S per Ton	Weighted Averages Lbs S/MBTU
467000.001	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Coal Creek Mine, WA 88.1k Tons	0.30	8368	16.74	0.36	
467000.002	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Coal Creek Mine, WA 54.5k Tons	0.30	9413	18.83	0.32	
467000.003	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Coal Creek Mine, WA 231.34k Tons	0.36	8756	17.51	0.41	0.39
467000.004	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Coal Creek Mine, WA 92.0k Tons	0.38	8863	17.73	0.43	
467000.005	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Coal Creek Mine, WA 78.37k Tons	0.34	8385	16.77	0.41	
467000.006	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Coal Creek Mine, WA 100.8k Tons	0.31	8453	16.91	0.37	
477100.001	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Caballo Rojo Mine, WA 382.20k Tons	0.40	8321	16.64	0.48	
477100.002	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Caballo Rojo Mine, WA 225.40k Tons	0.40	8341	16.68	0.48	
477100.003	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Caballo Rojo Mine, WA 261.25k Tons	0.37	8321	16.64	0.44	
477100.004	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Caballo Rojo Mine, WA 149.14k Tons	0.40	8368	16.74	0.48	
477100.005	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Caballo Rojo Mine, WA 382.20k Tons	0.33	8316	16.63	0.40	0.42
477100.006	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Caballo Rojo Mine, WA 493.20k Tons	0.34	8334	16.67	0.41	
477100.007	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Caballo Rojo Mine, WA 438.74k Tons	0.33	8491	16.98	0.39	
477100.008	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Caballo Rojo Mine, WA 519.20k Tons	0.31	8517	17.03	0.36	
477100.009	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Caballo Rojo Mine, WA 541.37k Tons	0.37	8527	17.05	0.43	
477100.010	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Cordero Mine, WA 1085.20k Tons	0.39	8278	16.56	0.47	
477100.011	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Cordero Mine, WA 936.60k Tons	0.40	8302	16.60	0.48	
477100.012	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Cordero Mine, WA 1006.13k Tons	0.38	8328	16.66	0.46	
477100.013	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Cordero Mine, WA 838.67k Tons	0.38	8317	16.63	0.46	
477100.014	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Cordero Mine, WA 920.74k Tons	0.39	8287	16.57	0.45	0.45
477100.015	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Cordero Mine, WA 880.68k Tons	0.36	8248	16.50	0.44	
477100.016	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Cordero Mine, WA 713.94k Tons	0.36	8362	16.72	0.43	
477100.017	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Cordero Mine, WA 865.48k Tons	0.33	8478	16.96	0.39	
477100.018	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Cordero Mine, WA 976.51k Tons	0.37	8435	16.87	0.44	
487100.001	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Belle Ayr Mine, WA 979.70k Tons	0.32	8323	16.65	0.38	
487100.002	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Belle Ayr Mine, WA 829.60k Tons	0.32	8341	16.68	0.38	
487100.003	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Belle Ayr Mine, WA 966.20k Tons	0.33	8285	16.57	0.40	
487100.004	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Belle Ayr Mine, WA 506.80k Tons	0.32	8334	16.71	0.38	
487100.005	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Belle Ayr Mine, WA 286.14k Tons	0.29	8490	16.98	0.34	0.39
487100.006	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Belle Ayr Mine, WA 404.85k Tons	0.31	8429	16.86	0.37	
487100.007	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Belle Ayr Mine, WA 288.60k Tons	0.33	8482	16.96	0.41	
487100.008	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Belle Ayr Mine, WA 404.90k Tons	0.33	8485	16.97	0.39	
487100.009	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Belle Ayr Mine, WA 797.90k Tons	0.32	8478	16.96	0.38	
487100.010	Permit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Caballo Mine, WA 348.50k Tons	1.40	8427	16.85	1.66	
487100.011	Permit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Caballo Mine, WA 181.20k Tons	0.41	8287	16.57	0.49	
487100.012	Permit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Caballo Mine, WA 715.60k Tons	0.39	8339	16.68	0.47	
487100.013	Permit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Caballo Mine, WA 486.80k Tons	0.39	8339	16.68	0.47	
487100.014	Permit Area	Wyodak			Delivered			Marketing Report, May, 1987	Caballo Mine, WA 1000.4k Tons	0.33	8331	16.66	0.42	0.52
487100.015	Permit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Caballo Mine, WA 1065.4k Tons	0.36	8348	16.70	0.43	
487100.016	Permit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Caballo Mine, WA 1024.5k Tons	0.37	8474	16.95	0.46	
487100.017	Permit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Caballo Mine, WA 1326.4k Tons	0.38	8479	16.96	0.45	
487100.018	Permit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Caballo Mine, WA 1325.5k Tons	0.40	8423	16.85	0.47	

Table 5. Delivered Sulfur and Heating Values, by mine, for Wyodak coal production (SULBTH04)

Reference Number	Other Locational Data	Published or Company Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb)	MMBTU per Short Ton	Lbs S per MMBTU	Weighted Averages LbsS/MMBTU
507100.001	Permit Area Wyodak				Delivered			Marketing Report, Jan., 1986	Clovis Point Mine, WA 99.0k Tons	0.40	8223	16.45	0.49	0.52
507100.002	Permit Area Wyodak				Delivered			Marketing Report, Feb., 1986	Clovis Point Mine, WA 109.0k Tons	0.40	7968	15.94	0.50	
507100.003	Permit Area Wyodak				Delivered			Marketing Report, Mar., 1986	Clovis Point Mine, WA 99.0k Tons	0.42	8011	16.02	0.52	
507100.004	Permit Area Wyodak				Delivered			Marketing Report, Apr., 1986	Clovis Point Mine, WA 133.0k Tons	0.43	8033	16.07	0.54	
507100.005	Permit Area Wyodak				Delivered			Marketing Report, May, 1987	Clovis Point Mine, WA 114.0k Tons	0.45	7984	15.97	0.56	
507100.006	Permit Area Wyodak				Delivered			Marketing Report, Jun., 1987	Clovis Point Mine, WA 114.0k Tons	0.41	8023	16.05	0.51	0.75
507100.007	Permit Area Wyodak				Delivered			Marketing Report, Jan., 1986	Wyodak Mine, WA 209.7k Tons	0.65	8051	16.10	0.81	
507100.008	Permit Area Wyodak				Delivered			Marketing Report, Feb., 1986	Wyodak Mine, WA 207.5k Tons	0.74	8095	16.19	0.91	
507100.009	Permit Area Wyodak				Delivered			Marketing Report, Mar., 1986	Wyodak Mine, WA 194.4k Tons	0.56	8103	16.21	0.69	
507100.010	Permit Area Wyodak				Delivered			Marketing Report, Apr., 1986	Wyodak Mine, WA 195.0k Tons	0.59	8124	16.25	0.73	
507100.011	Permit Area Wyodak				Delivered			Marketing Report, May, 1987	Wyodak Mine, WA 190.3k Tons	0.53	8127	16.25	0.65	0.83
507100.012	Permit Area Wyodak				Delivered			Marketing Report, Jun., 1987	Wyodak Mine, WA 200.4k Tons	0.44	8103	16.21	0.54	
507100.013	Permit Area Wyodak				Delivered			Marketing Report, Jul., 1988	Wyodak Mine, WA 170.0k Tons	0.66	7993	15.99	0.83	
507100.014	Permit Area Wyodak				Delivered			Marketing Report, Aug., 1988	Wyodak Mine, WA 178.0k Tons	0.66	7930	15.86	0.83	
507100.015	Permit Area Wyodak				Delivered			Marketing Report, Sep., 1990	Wyodak Mine, WA 136.0k Tons	0.65	8080	16.16	0.80	
517100.001	Permit Area Wyodak				Delivered			Marketing Report, Jan., 1986	FL. Union Mine, WA 10.5k Tons	0.40	8056	16.11	0.50	0.48
517100.002	Permit Area Wyodak				Delivered			Marketing Report, Feb., 1986	FL. Union Mine, WA 16.0k Tons	0.40	8056	16.11	0.50	
517100.003	Permit Area Wyodak				Delivered			Marketing Report, Mar., 1986	FL. Union Mine, WA 12.0k Tons	0.54	8503	17.01	0.64	
517100.004	Permit Area Wyodak				Delivered			Marketing Report, Apr., 1986	FL. Union Mine, WA 8.0k Tons	0.48	8410	16.82	0.57	
517100.005	Permit Area Wyodak				Delivered			Marketing Report, May, 1987	FL. Union Mine, WA 17.9k Tons	0.44	8304	16.61	0.53	
517100.006	Permit Area Wyodak				Delivered			Marketing Report, Jun., 1987	FL. Union Mine, WA 6.05k Tons	0.38	8351	16.70	0.46	0.38
517100.007	Permit Area Wyodak				Delivered			Marketing Report, Jul., 1988	FL. Union Mine, WA 65.95k Tons	0.35	8174	16.35	0.43	
517100.008	Permit Area Wyodak				Delivered			Marketing Report, Aug., 1988	FL. Union Mine, WA 10.5k Tons	0.35	8061	16.12	0.43	
517200.001	Permit Area Wyodak				Delivered			Marketing Report, Jan., 1986	Eagle Butte Mine, WA 696.30k Tons	0.30	8309	16.62	0.36	0.36
517200.002	Permit Area Wyodak				Delivered			Marketing Report, Feb., 1986	Eagle Butte Mine, WA 617.90k Tons	0.30	8316	16.63	0.36	
517200.003	Permit Area Wyodak				Delivered			Marketing Report, Mar., 1986	Eagle Butte Mine, WA 915.80k Tons	0.33	8293	16.59	0.40	
517200.004	Permit Area Wyodak				Delivered			Marketing Report, Apr., 1986	Eagle Butte Mine, WA 300.50k Tons	0.32	8344	16.69	0.39	
517200.005	Permit Area Wyodak				Delivered			Marketing Report, May, 1987	Eagle Butte Mine, WA 58.90k Tons	0.33	8304	16.61	0.40	
517200.006	Permit Area Wyodak				Delivered			Marketing Report, Jun., 1987	Eagle Butte Mine, WA 58.10k Tons	0.32	8286	16.57	0.39	0.44
517200.007	Permit Area Wyodak				Delivered			Marketing Report, Jul., 1988	Eagle Butte Mine, WA 14.90k Tons	0.40	8510	17.02	0.47	
517200.008	Permit Area Wyodak				Delivered			Marketing Report, Aug., 1988	Eagle Butte Mine, WA 53.50k Tons	0.37	8423	16.85	0.44	
517200.009	Permit Area Wyodak				Delivered			Marketing Report, Sep., 1990	Eagle Butte Mine, WA 142.00k Tons	0.29	8249	16.50	0.33	
517200.010	Permit Area Wyodak				Delivered			Marketing Report, Jan., 1986	Ramhide Mine, WA 767.60k Tons	0.30	8183	16.37	0.37	0.40
517200.011	Permit Area Wyodak				Delivered			Marketing Report, Feb., 1986	Ramhide Mine, WA 936.20k Tons	0.30	8230	16.46	0.36	
517200.012	Permit Area Wyodak				Delivered			Marketing Report, Mar., 1986	Ramhide Mine, WA 1039.96k Tons	0.31	8338	16.68	0.37	
517200.013	Permit Area Wyodak				Delivered			Marketing Report, Apr., 1986	Ramhide Mine, WA 1069.2k Tons	0.25	8181	16.36	0.31	
517200.014	Permit Area Wyodak				Delivered			Marketing Report, May, 1987	Ramhide Mine, WA 865.17k Tons	0.34	8292	16.58	0.41	
517200.015	Permit Area Wyodak				Delivered			Marketing Report, Jun., 1987	Ramhide Mine, WA 809.67k Tons	0.35	8346	16.69	0.42	0.47
517200.016	Permit Area Wyodak				Delivered			Marketing Report, Jul., 1988	Ramhide Mine, WA 877.62k Tons	0.39	8366	16.73	0.47	
517200.017	Permit Area Wyodak				Delivered			Marketing Report, Aug., 1988	Ramhide Mine, WA 1096.7k Tons	0.37	8385	16.77	0.44	
517200.018	Permit Area Wyodak				Delivered			Marketing Report, Sep., 1990	Ramhide Mine, WA 1017.66k Tons	0.36	8342	16.68	0.43	

Table 5. Delivered Sulfur and Heating Values, by mine, for Wyodak coal production (SILBTU04)

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb)	Lbs S per Short Ton	Weighted Averages LbsS/MBTU
527200.001	Pirmit Area	Wyodak			Delivered			Marketing Report, Jan., 1986	Buckskin Mine, WA 289.00k Tons	0.53	8243	16.49	0.64
527200.002	Pirmit Area	Wyodak			Delivered			Marketing Report, Feb., 1986	Buckskin Mine, WA 212.30k Tons	0.56	8211	16.42	0.68
527200.003	Pirmit Area	Wyodak			Delivered			Marketing Report, Mar., 1986	Buckskin Mine, WA 746.56k Tons	0.57	8374	16.75	0.68
527200.004	Pirmit Area	Wyodak			Delivered			Marketing Report, Apr., 1986	Buckskin Mine, WA 223.82k Tons	0.58	8404	16.81	0.69
527200.005	Pirmit Area	Wyodak			Delivered			Marketing Report, May, 1987	Buckskin Mine, WA 387.50k Tons	0.52	8383	16.77	0.62
527200.006	Pirmit Area	Wyodak			Delivered			Marketing Report, Jun., 1987	Buckskin Mine, WA 412.50k Tons	0.51	8374	16.75	0.61
527200.007	Pirmit Area	Wyodak			Delivered			Marketing Report, Jul., 1988	Buckskin Mine, WA 535.38k Tons	0.40	8563	17.13	0.47
527200.008	Pirmit Area	Wyodak			Delivered			Marketing Report, Aug., 1988	Buckskin Mine, WA 667.73k Tons	0.43	8457	16.91	0.51
527200.009	Pirmit Area	Wyodak			Delivered			Marketing Report, Sep., 1990	Buckskin Mine, WA 744.32k Tons	0.43	8446	16.89	0.51

Footnotes for Table 5.

1. Data derived from U.S. Department of Energy, FERC Form 423 marketing data compiled by Resource Data International, Inc.
2. WA = weighted average based on tonnage shipped or delivered,
10k Tons = 10 thousand short tons.

Figure 4. Sulfur contents of delivered coal, by mine, for the Wyodak coal bed, Wyodak-Caballo Creek deposit.

Figure 5. Correlation of coal beds in the Wasatch and Fort Union Formations, Powder River Coal Field, Wyoming (from Glass and Jones, 1991).

All but six analyses of the Wyodak coal bed (Table 4) were within the heating value category of 15-19.99 million Btu/short ton. However, each of those six analyses represent only part of the total coal bed thickness and is not typical of the entire coal bed. The six analyses probably do not represent significant areas of lower heating values within the Wyodak coal deposit.

The 19 billion tons of original strippable DRB of coal in the Wyodak bed consist of about 5.8 billion tons of coal with less than 0.40 lbs sulfur/million Btu, about 9.3 billion tons of coal with 0.41-0.60 lbs sulfur/million Btu, and about 3.9 billion tons of coal with 0.61-0.83 lbs sulfur/million Btu. An additional 0.4 billion tons of new DRB for the Caballo Creek area (Grazis, 1977) was added to the original DRB and about 1.5 billion tons of coal depleted through mining and production losses was subtracted from the original DRB. With those adjustments, the remaining DRB for the Wyodak is now about 17.9 billion tons. Of this total, about 4.9 billion tons of coal is less than 0.40 lbs sulfur/million Btu, 9.2 billion tons of coal is from 0.41-0.60 lbs sulfur/million Btu, and 2.8 billion tons of coal is from 0.61-0.83 lbs sulfur/million Btu. All this is shown on Table 2.

5. Felix, Lower Ulm, Scott, C", C' and C coal beds. The C", C', and C coal beds occur above the Wyodak coal bed, and are overlain, in turn, by the Felix, Scott, and Lower Ulm coal beds (Figure 5). These Wasatch Formation beds all contain original strippable DRB of coal because none of them have been mined. As in the Wyodak deposit, strippable coal is that under 200 feet or less of cover. The DRB for these coal beds is restricted to the Caballo Creek area (Figures 2 and 3).

The Felix coal bed in the Caballo Creek area contains about 1.1 billion tons of DRB coal with a heating value of 15-19.99 million Btu/short ton (Table 1). About 0.8 billion tons of the DRB coal contains 0.84-1.67 lbs sulfur/million Btu. The rest contains 0.61-0.83 lbs/sulfur/million Btu.

Coal beds other than the Felix coal bed in the Caballo Creek area contain a combined total DRB of about 0.2 billion tons of coal. Most of these coals are higher in sulfur contents (0.84 to over 2.50 lbs sulfur/million Btu). The Scott and part of the C" coal beds contain some coal reserves having heating contents of less than 15 million Btu/short ton; the remainder of the DRB for these beds occurs in the 15-19.99 million Btu/short ton category. Table 1 shows a breakdown of the DRB for all these coal beds.

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- Grazis, S.L., 1977, Geologic map and coal resources of the Scaper Reservoir Quadrangle, Campbell County, Wyoming: U.S. Geological Survey Coal Investigations Map C-77, scale 1:24,000, 3 sheets.
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**APPENDIX C. DEMONSTRATED RESERVE BASE OF STRIPPABLE
COAL IN THE CANYON, DRY CHEYENNE, LAKE DE
SMET/HEALY, ACME-KLEENBURN, SPOTTED HORSE,
SUSSEX, AND WYARNO-VERONA DEPOSITS, POWDER
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1. Summary. The remaining demonstrated reserve base (DRB) of strippable coal in the above seven deposits totals 4.4 billion short tons (Table 1). Coals in these deposits occur in the Paleocene Fort Union Formation and the Eocene Wasatch Formation. Of the total DRB in these seven deposits, the Wyarno-Verona deposit contains about 1.8 billion tons (40%), the Spotted Horse deposit contains just over 1 billion tons (27 percent), and the Lake De Smet/Healy deposit contains 1 billion tons (22 percent).

Of the 4.4 billion tons of coal in the DRB, about 1.5 billion tons (33 percent) have a heating value of 15.00 - 19.99 million Btu/short ton. Coal beds in this heating value category include the F bed in the Dry Cheyenne deposit, the Monarch and Dietz #3 beds in the Acme-Kleenburn deposit, the Felix and Smith beds in the Spotted Horse deposit, Fort Union Formation beds in the Sussex deposit, and the PK bed in the Wyarno-Verona deposit. The remaining 3.0 billion tons (64 percent) contain less than 15.00 million Btu/short ton.

The 4.4 billion tons of strippable coal in the DRB occur in five different sulfur categories. About 45 percent (2.0 billion tons) of the coal occurs in the 0.84-1.67 lbs sulfur/million Btu category. This includes 0.2 billion tons in the Canyon coal deposit, 0.8 billion tons in the Lake De Smet/Healy deposit, and 1.0 billion tons in the Spotted Horse deposit. Only 0.4 billion tons (ten percent) of the coal is found in the three sulfur categories of less than 0.84 lbs sulfur/million Btu. The 0.4 billion tons of coal in these three lower sulfur categories are all from coal beds in the Fort Union Formation.

About 1.8 billion tons (about 40 percent) of the DRB in these seven deposits contain more than 2.50 lbs sulfur/million Btu. About 0.2 billion tons (about 5 percent) of the DRB in these seven deposits contain 1.68 - 2.50 lbs sulfur/million Btu. Coals in these two highest sulfur categories all occur in the Wasatch Formation.

2. Methodology and Assumptions. Original strippable DRB tonnages were taken from published sources including Smith and others (1972), Culbertson and Mapel (1976), and Glass (1981). Only the Acme-Kleenburn deposit required a tonnage adjustment due to mining and production losses. Although some production did occur in several other deposits, the tonnage was not significant and did not affect the DRB. The adjustment for the Acme-Kleenburn deposit, as shown in Table 2, used an 83 percent recovery factor, a calculated figure based on Glass (1981) for Big Horn Coal Company.

Table 1. Summary of Remaining Demonstrated Reserve Base (DRB) of the Canyon, Dry Cheyenne, Lake De Smet-Healy, Acme-Kleenburn, Spotted Horse, Sussex, and Wyarno-Verona coal deposits, Powder River Coal Field, Wyoming, through December 31, 1990 (in million short tons).

Seam	BTU Content (million Btu per short ton)	Sulfur Content (lbs sulfur/million Btu)						Total All Sulfur Categories
		≤0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	>2.50	
CANYON DEPOSIT								
Canyon	<15	--	--	--	184.9	--	--	184.9
Subtotal All Beds	<15	--	--	--	184.9	--	--	184.9
DRY CHEYENNE DEPOSIT								
F bed	15-19.99	--	179.5	--	--	--	--	179.5
Subtotal All Beds	15-19.99	--	179.5	--	--	--	--	179.5
LAKE DE SMET-HEALY DEPOSIT								
Lake DeSmet-Healy	<15	--	--	--	790.0	--	--	790.0
Other Wasatch coals	<15	--	--	--	--	210.0	--	210.0
Subtotal All Beds	<15	--	--	--	790.0	210.0	--	1,000.0
ACME-KLEENBURN DEPOSIT								
Monarch & Dietz #3	15-19.99	--	79.3	--	--	--	--	79.3
Subtotal All Beds	15-19.99	--	79.3	--	--	--	--	79.3
SPOTTED HORSE DEPOSIT								
Truman	<15	--	--	--	74.5	--	--	74.5
Parnell	<15	--	--	--	30.6	--	--	30.6
Scott	<15	--	--	--	17.9	--	--	17.9
Daly	<15	--	--	--	11.2	--	--	11.2
Felix	15-19.99	--	--	--	821.3	--	--	821.3
Other Wasatch coals	<15	--	--	--	4.8	--	--	4.8
Smith	15-19.99	178.0	--	--	--	--	--	178.0
Other Ft. Union coals	15-19.99	58.3	--	--	--	--	--	58.3
Subtotal All Beds	<15	--	--	--	139.0	--	--	139.0
	15-19.99	236.3	--	--	821.3	--	--	1,057.6
SUSSEX DEPOSIT								
Fort Union Fm. coals	15-19.99	--	--	--	13.6	--	--	13.6
Subtotal All Beds	15-19.99	--	--	--	13.6	--	--	13.6
WYARNO-VERONA DEPOSIT								
PK	15-19.99	--	--	--	--	--	200.0	200.0
Ulm 2 (lower)	<15	--	--	--	--	--	990.0	990.0
Ulm 1 (upper)	<15	--	--	--	--	--	543.0	543.0
Other Wasatch coals	<15	--	--	--	--	--	67.0	67.0
Subtotal All Beds	<15	--	--	--	--	--	1,600.0	1,600.0
	15-19.99	--	--	--	--	--	200.0	200.0
TOTAL ALL DEPOSITS								
Total All Coal Beds	<15	--	--	--	1,113.9	210.0	1,600.0	2,923.9
	15-19.99	236.3	258.6	--	834.9	--	200.0	1,530.0
Total All Btu Categories		236.3	258.8	--	1,948.8	210.0	1,800.0	4,453.9

Table 2. In-place and remaining DRB for the Acme-Kleenburn Deposit in the western part of the Powder River Coal Field (In million short tons). Numbers in parentheses are negative.

	Btu Content (million Btu/ short ton)	Sulfur Content (lbs sulfur/million Btu)						Total All Sulfur Categories
		≤0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	>2.50	
A. Original strippable DRB modified from Smith et al, 1972. Revised to Jan. 1, 1969 by Glass, 1981	15-19.99	—	125.0	—	—	—	—	125.0
B. Coal production 1969 through 1990	15-19.99	—	(37.9)	—	—	—	—	(37.9)
C. Mining losses (83% recovery)	15-19.99	—	(7.8)	—	—	—	—	(7.8)
D. Total coal depleted (B+C)	15-19.99	—	(45.7)	—	—	—	—	(45.7)
E. Remaining strippable DRB through 12/31/90 (A+D)	—	—	79.3	—	—	—	—	79.3

This recovery factor means that 83 percent of the total coal in-place was recovered, and that the remaining 17 percent of the coal in-place was not recovered because of mining losses and other inefficiencies.

In all seven deposits, sulfur contents and heating values were assigned to each coal bed or group of coal beds by determining either averages or weighted averages for each area underlain by strippable DRB. Where little or no data was found within the DRB, analyses of similar coals from nearby areas were used in characterizing the deposits.

3. Analyses. Coal analyses used in this report were taken from various published and unpublished sources (Tables 3 through 8). Whenever possible, analyses from within a coal deposit were used to assign coal quality categories to the DRB. Analyses of nearby coal beds, however, were used to characterize the F bed in the Dry Cheyenne deposit and the Parnell and Daly beds in the Spotted Horse deposit. Analyses from more than 1,000 core, channel, tipple, and delivered coal samples were examined for these strippable deposits.

All analyses were evaluated on an individual basis. Analyses from uncorrelated coal beds or poorly located data points were not used. Where only partial thicknesses of a coal bed were sampled and analyzed and no other information was available nearby, the data were not considered representative of the entire coal bed and were not used in this study. Where only partial thicknesses of a coal bed were sampled and analyzed and

Table 3

Sulfur and Heating Values for the Canyon (Clear Creek) Deposit (DRS SULFUT24)

Saltur and Heating Values for the Canyon (Clear Creek) Deposit (DRE SULTRU24)														
Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb)	MMBTU per Short Ton	Weighted Averages	
													Lbs S per MMBTU	MMBTU/lbs S
Canyon bed														
557322.001	SNSE (LL)	Canyon	9.4		Core	D177746		USBM Printout		5.10	6910	13.82	7.38	
557322.002	SNSE (LL)	Canyon	10.0		Core	D177747		USBM Printout		0.60	7550	15.10	0.79	
557322.003	SNSE (LL)	Canyon	7.1		Core	D177748		USBM Printout		0.20	7780	15.56	0.26	14.74
557322.004	SNSE (LL)	Canyon	11.4		Channel	D177749		USBM Printout		0.20	7780	15.56	0.26	
557322.005	SNSE (LL)	Canyon	8.3		Core	D177750		USBM Printout		0.60	7570	15.14	0.79	1.62
557322.006	SNSE (LL)	Canyon	3.6		Core	D177751		USBM Printout		0.90	6770	13.54	1.33	
557322.007	SNSE (LL)	Canyon	1.2		Core	D177752		USBM Printout		0.40	7000	14.00	0.57	
557322.008	SNSE (LL)	Canyon	11.2		Channel	D177753		USBM Printout		0.40	7000	14.00	0.57	
557322.001	NNNE (LL)	Canyon	0.7		Core	D177735		USBM Printout		0.80	6990	13.98	1.14	
557322.002	NNNE (LL)	Canyon	4.0		Channel	D177736		USBM Printout		0.80	6990	13.98	1.14	14.52
557322.003	NNNE (LL)	Canyon	0.6		Core	D177737		USBM Printout		2.00	4690	9.38	4.26	
557322.004	NNNE (LL)	Canyon	12.5		Core	D177738		USBM Printout		0.40	7270	14.54	0.55	0.67
557321.005	NNNE (LL)	Canyon	12.7		Channel	D177739		USBM Printout		0.40	7270	14.54	0.55	
557321.006	NNNE (LL)	Canyon	4.8		Core	D177740		USBM Printout		REF	7790	15.58	0.33	
567325.001	NWSW (LL)	Canyon	1.0		Core	D176806		USBM Printout		4.00	7400	14.80	5.41	
567325.002	NWSW (LL)	Canyon	4.0		Core	D176807		USBM Printout		0.90	7170	14.34	1.26	
567325.003	NWSW (LL)	Canyon	1.0		Core	D176808		USBM Printout		1.50	7620	15.24	1.97	
567325.004	NWSW (LL)	Canyon	2.4		Core	D176809		USBM Printout		0.50	7530	15.06	0.66	
567325.005	NWSW (LL)	Canyon	3.6		Channel	D176810		USBM Printout		0.50	7530	15.06	0.66	
567325.006	NWSW (LL)	Canyon	4.0		Channel	D176811		USBM Printout		0.50	7530	15.06	0.66	14.99
567325.007	NWSW (LL)	Canyon	4.5		Channel	D176812		USBM Printout		0.50	7530	15.06	0.66	
567325.008	NWSW (LL)	Canyon	4.0		Core	D176813		USBM Printout		0.30	7430	14.86	0.40	0.75
567325.009	NWSW (LL)	Canyon	5.3		Core	D176814		USBM Printout		0.30	7530	15.06	0.40	
567325.010	NWSW (LL)	Canyon	3.0		Channel	D176815		USBM Printout		0.30	7530	15.06	0.40	
567325.011	NWSW (LL)	Canyon	3.1		Channel	D176816		USBM Printout		0.30	7530	15.06	0.40	
567325.012	NWSW (LL)	Canyon	3.6		Channel	D176817		USBM Printout		0.30	7530	15.06	0.40	
567325.013	NWSW (LL)	Canyon	4.0		Channel	D176818		USBM Printout		0.30	7530	15.06	0.40	
567325.014	NWSW (LL)	Canyon	3.0		Core	D176819		USBM Printout		0.90	7650	15.30	1.18	
567327.001	MNSE (LL)	Canyon	1.5		Core	D177721		USBM Printout		1.00	7580	15.16	1.32	
567327.002	MNSE (LL)	Canyon	3.5		Channel	D177722		USBM Printout		1.00	7580	15.16	1.32	
567327.003	MNSE (LL)	Canyon	1.8		Core	D177723		USBM Printout	(Omit Montcoal Split)	0.40	6880	13.76	0.58	14.52
567327.004	MNSE (LL)	Canyon	8.9		Core	D177724		USBM Printout		0.40	6880	13.76	0.58	
567327.005	MNSE (LL)	Canyon	3.7		Channel	D177725		USBM Printout		0.40	6880	13.76	0.58	
567327.006	MNSE (LL)	Canyon	1.1		Channel	D177726		USBM Printout		0.40	6880	13.76	0.58	0.86
567327.007	MNSE (LL)	Canyon	8.4		Core	D177727		USBM Printout		0.70	7440	14.88	0.94	
567327.008	MNSE (LL)	Canyon	7.9		Channel	D177728		USBM Printout		0.70	7440	14.88	0.94	
567327.009	MNSE (LL)	Canyon	3.3		Channel	D177729		USBM Printout		0.70	7440	14.88	0.94	
577621.001		Canyon (?) or Powder River (?)	9.5	32.80	Mine	00017		USBM 9722, USGS 8244	Kendrick Prospect, collected in 1907	0.20	8235	16.47	0.74	
577620.001	SNW	Canyon	9.5 (?)	38.0 (?)	Outcrop	RP40A1622		Mapco Inc.	Kendrick Cattle Co., 25% of sea	1.29	7921	15.84	1.63	

** Omitted because of possible lab error prior to 1913 ASTM standards

Table 4
Sulfur and Heating Values for the Dry Cheyenne Deposit (DRS SULBTU24)

Reference Number	Other Locational Data	Published or Company	Depth Interval	Sample Thickness	Sample Seal	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb) Sulfur Free	Average	
													MMBTU	Lbs S per ton
F bed														
367515.001		Badger (?)				MINE			USNM Printout	Badger Mine, 3/8"x 0	0.37	8250	16.50	0.45
367515.002		Badger (?)				MINE			USNM Printout	Badger Mine, 3/8"x 0	0.40	7990	15.98	0.50
367515.003		Badger (?)				MINE			USNM Printout	Badger Mine, 1 5/8"x 3/8"	0.40	8070	16.14	0.50
367515.004		Badger (?)				MINE			USNM Printout	Badger Mine, 2"x 3/8"	0.35	8010	16.02	0.44
367515.005		Badger (?)				MINE			USNM Printout	Badger Mine, 2 1/2"x 2"	0.40	8030	16.06	0.50
367515.006		Badger (?)				MINE			USNM Printout	Badger Mine, 4"x 1 5/8"	0.40	7870	15.74	0.51
367515.007		Badger (?)				MINE			USNM Printout	Badger Mine, 2 1/2" lump	0.35	8010	16.02	0.44
367515.008		Badger (?)				Run of Mine			USNM Printout	Badger Mine	0.40	8000	16.00	0.50
367515.009		Badger (?)				Run of Mine			USNM Printout	Badger Mine	0.50	7910	15.82	0.63
367515.010		Badger (?)				Run of Mine			USNM Printout	Badger Mine	0.40	8080	16.16	0.50
367515.011		Badger (?)				Run of Mine			USNM Printout	Badger Mine, 4" lump	0.40	7870	15.74	0.51
367536.001			4.2	4.00		Bottom	5317# Unit		USNM 822, USGS 8344	Collected in 1907, center of Sec.	0.43	5645	11.28	0.76
367536.001			2.5			Bottom	5422# Unit		USNM 8423, TP484	Collected in 1907, center of Sec.	0.38	5934	11.86	0.42
377505.001		Badger (?)	5.0	12.70		Mine	11048		USNM 885, TP484		0.45	8350	16.70	0.54

* Omitted because of lab error prior to 1913 ASTM standards

Table 5

Sulfur and Heating Values for the Late De Smet Deposit (DRB SULLTUZZ)

Page 1 of 2

Weighter
Average

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb) Short Ton	Lbs S per MMTU	MMBTU/lbS
518200.001	Healy					Face			EIA70070(L) 1/10/90	Hamilton Prospect Strip	1.00	8000	16.00	1.25
518235.001	Healy	L. DeSmet (Healy)	95.5	100.9	5.4	5.40	Core	D179941	USGS OFR78-901	Within City limits of Buffalo	0.40	5790	11.58	0.69
518235.002	Healy	L. DeSmet (Healy)	119.8	125.3	5.5	5.50	Core	D179942	USGS OFR78-901	Within City limits of Buffalo	1.00	5130	10.26	1.95
518235.003	Healy	L. DeSmet (Healy)	140.4	149.8	9.4	9.40	Core	D179948	USGS OFR78-901	Within City limits of Buffalo	1.00	4940	9.88	2.07
518235.004	Healy	L. DeSmet (Healy)	195.7	201.4	5.7	5.70	Core	D179951	USGS OFR78-901	Within City limits of Buffalo	0.70	5680	11.36	1.23
518235.005	Healy	L. DeSmet (Healy)	224.6	228.2	3.6	3.60	Core	D179954	USGS OFR78-901	Within City limits of Buffalo	0.40	5950	11.90	0.67
518235.006	Healy	L. DeSmet (Healy)	230.6	244.8	14.2	14.20	Core	D179956	USGS OFR78-901	Within City limits of Buffalo	0.90	6540	13.08	1.38
518235.007	Healy	L. DeSmet (Healy)	248.3	274.3	26.0	26.00	Core	D179958	USGS OFR78-901	Within City limits of Buffalo	0.80	5720	11.44	1.40
518235.008	Healy	L. DeSmet (Healy)	279.7	288.9	9.2	9.20	Core	D179962	USGS OFR78-901	Within City limits of Buffalo	0.70	6080	12.16	1.15
518235.009	Healy	L. DeSmet (Healy)	294.0	316.3	22.3	22.30	Core	D179964	USGS OFR78-901	Within City limits of Buffalo	0.80	6780	13.56	1.18
518235.010	Healy	L. DeSmet (Healy)	321.4	326.4	5.0	5.00	Core	D179967	USGS OFR78-901	Within City limits of Buffalo	2.80	6040	12.08	4.64
518235.011	Healy	L. DeSmet (Healy)	340.2	343.7	3.5	3.50	Core	D179968	USGS OFR78-901	Within City limits of Buffalo	1.80	6810	13.62	2.64
518235.012	Healy	L. DeSmet (Healy)	423.7	424.9	1.2	1.20	Core	D179969	USGS OFR78-901	Within City limits of Buffalo	3.00	4790	9.58	6.26
528016.001	Healy		108.0	126.5	18.5	18.50	Core	RP4CDA19585C	Mapco Inc	.3' Pyrite included	1.63	7229	14.46	2.25
528016.003	Healy		42.0	64.0	22.0	22.00	Core	RP4CDA19583C	Mapco Inc	3.85' II	1.27	7245	14.49	1.75
528016.004	Healy		162.0	183.5	21.5	21.50	Core	RP4CDA195154C	Mapco Inc	2.3' II	1.24	7465	14.93	1.66
528016.005	Healy		71.0	91.0	20.0	20.00	Core	RP4CDA19527C	Mapco Inc	2.25' Shale Omitted	1.15	7493	14.99	1.53
528016.007	Healy		132.0	150.0	18.0	18.00	Core	RP4CDA19579C	Mapco Inc	.7' Shale Omitted	1.17	7352	14.70	1.57
528032.002	Healy		184.0	200.0	16.0	16.00	Core	RP4CDA19587C	Mapco Inc		0.95	7262	14.52	1.36
528200.001	Upper Seam (U. Healy)					20.00	Core		Texaco Mine Plan/EIS	NA 20* A	0.69	6009	12.02	1.15
528200.002	Upper Seam (U. Healy)					100.00	Core		Texaco Mine Plan/EIS	NA 20* A	0.53	6273	12.53	0.84
528200.003	Upper Seam (U. Healy)					20.00	Core		Texaco Mine Plan/EIS	NA 20* A	0.45	5141	10.28	0.88
528200.004	Upper Seam (U. Healy)					100.00	Core		Texaco Mine Plan/EIS	NA 20* A	0.61	5353	10.71	1.14
528203.001	Healy		5.0	10.80			Mine		USRM 872, TP484, USGS 8381	NA 2A	0.55	7997	15.99	0.69
528206.001	Healy		118.8	159.8	37.2	41.00	Core	D56436-D56441	USGS C728, B1078	Selective Sample Increments Bias Analysis	0.60	7890	15.78	0.76
528208.001	Healy		66.0	119.0	40.8	53.00	Core	D55616-21, D55871-77/55-2A	USGS C728	Selective Sample Increments Bias Analysis	0.50	7845	15.69	0.64
528301.001	Healy		59.0	141.5	45.5	82.50	Core	D56797-804	USGS C728	Selective Sample Increments Bias Analysis	0.60	7970	15.94	0.75
528301.002	Healy		172.0	292.0	68.1	120.00	Core	D55867-70, D56375-8065-6	USGS C728	Selective Sample Increments Bias Analysis	0.60	7515	15.03	0.80
528301.003	Healy		95.0	224.9	101.6	129.90	Core	C97450	USGS B1078	Selective Sample Increments Bias Analysis	1.00	8270	16.54	1.21
538032.001	Healy		78.0	97.0	9.0	9.00	Core	RP4CDA76	Mapco Inc.	.1' II	0.83	7582	15.16	1.09
538032.002	Healy		74.0	95.0	17.0	17.00	Core	RP4CDA19582C	Mapco Inc.	.55' Coal omitted, .5' Shale omitted	0.92	7478	14.96	1.23
538032.005	Healy		65.5	84.0	18.3	18.30	Core	RP4CDA19578C	Mapco Inc.	.2' II	1.05	7444	14.89	1.41
538032.006	Healy		97.0	113.5	16.3	16.30	Core	RP4CDA19588C	Mapco Inc.	.2' Shale omitted	0.65	7317	14.63	0.87
538032.007	Healy		39.0	57.5	18.2	18.20	Core	RP4CDA19511C	Mapco Inc.	.3' II	0.56	7467	14.93	0.75
538201.001	Healy		6.0	17.00			Mine	D50515	USGS B1078, C728	Krezelot Mine	0.40	7990	15.80	0.51

Table 5

Sulfur and Heating Values for the Lake De Saet Deposit (ORB SULRT022)

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Weighted
Averages

Reference Number	Other Locational Data	Published or Company Red Designation	Depth Interval From To	Sample In Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (Btu/Lb)	MMBTU Short Ton	Lbs S per MMBTU	Lbs S/MMBTU
Cameron bed															
508120.001 SE		L. Cameron(?)	5.0			Tipple	US8M B516			Clear Creek NO.2 Mine	2.20	7580	15.16	2.90	
518120.002 SE		L. Cameron(?)	5.0			Tipple	US8M B516			Clear Creek NO.2 Mine	1.80	7500	15.00	2.40	14.97
518120.003 SE		L. Cameron(?)	5.0			Tipple	US8M B516			Clear Creek NO.2 Mine	1.60	7530	15.06	2.12	
518120.004 SE		L. Cameron	7.3	13.90		Channel	D25128			Clear Creek Coal Co.	1.40	7350	14.70	1.90	1.72
518120.005 SE		L. Cameron	5.0			Tipple	US8M Printout			Av of 46, Clear Creek NO.2 Mine	1.35	7523	15.05	1.79	
518226.001		L. Cameron	18.7	18.70		Mine	US8M B22, JP484, USGS B381			MA 2A, Mitchell Mine	0.49	7514	15.03	0.65	14.98
518226.002		L. Cameron	18.70	18.70		Face	E1A70070(L) 1/10/90			Mitchell Mine	0.90	7340	14.68	1.23	
518226.003		L. Cameron	18.70	18.70		Face	E1A70070(L) 1/10/90			Mitchell Mine	0.60	7620	15.24	0.79	0.89
518235.013		L. Cameron	6.0	18.40		MINE	US8M B22, JP484, USGS B381			Numbers Mine	0.74	7582	15.16	0.98	
538032.004		Cameron	211.0	224.0	13.0	Core	RP4C0A19580C	S-241A	Mapco Inc.	1.55' Coal omitted, 6' rock omitted	2.92	6763	13.53	4.32	
Schuman bed															
528016.002		Schuman	69.0	76.0	7.0	Core	RP4C0A19584C	S-246A	Mapco Inc.	3.1 II	0.91	6846	13.69	1.33	14.37
528016.006		Schuman	121.0	134.0	13.0	Core	RP4C0A19576C	S-249A	Mapco Inc.	5.65' Shale Omitted	2.14	7298	14.60	2.93	
538032.003		Schuman	143.0	151.0	5.7	Core	RP4C0A19581C	S-241A	Mapco Inc.	2.3' Rock omitted	2.90	7339	14.68	3.95	2.72
Walters bed															
528032.001		Walters	39.0	56.0	17.0	Core	RP4C0A19586C	S-247A	Mapco Inc.		1.22	7082	14.16	1.72	
R. Hose's beds															
498016.001		Fed 4 of R. Hose	43.0	52.0	9.0	Core	RP4C0A195160	S-258A	Mapco Inc.	1.8' Shale omitted, III	2.67	7346	14.69	3.63	
498016.002		Fed 2 of R. Hose	148.0	159.5	11.5	Core	RP4C0A195163	S-258A	Mapco Inc.	.3' coal omitted, 1.9' rock omitted	3.28	7187	14.37	4.56	14.86
498016.003		Fed 1 of R. Hose	231.0	251.0	20.0	Core	RP4C0A195162	S-258A	Mapco Inc.	5' rock omitted	2.06	7514	15.03	2.74	
508036.001		Fed 1 of R. Hose	175.0	191.0	16.0	Core	RP4C0A195158	S-262	Mapco Inc.	4.4' Rock Omitted	2.34	7511	15.02	3.12	3.32

Table 6
Sulfur and Heating Values for the Spotted Horse Deposit (DRB SULFID24)

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval	Sample No	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value Btu/Lb	Heating Value per Short Ton	Lbs S per MMTU	Weighted Averages MMTU/ST
517411.001	Felix		214.0	231.0	5.0	22.00	Core	US-7345	USGS OFR 74-97, T&R		0.34	8111	16.22	0.42	
517425.001	Felix		176.0	184.0	12.0	27.00	Core	US-7343	USGS OFR 74-97, T&R	2' II	0.48	8488	16.98	0.57	
517502.001	NEWSW (LL)	Felix		6.0			Channel D178107		USBM Printout		1.00	7950	15.90	1.26	
517502.002	NEWSW (LL)	Felix		6.0			Channel D178108		USBM Printout		1.00	7950	15.90	1.26	
517502.003	NEWSW (LL)	Felix		5.0			Channel D178109		USBM Printout		1.00	7950	15.90	1.26	
517708.000	Felix		0.4	9.10			KCEB8142		Warwick, 1985		1.00	6320	12.64	1.58	15.83
527522.001	Felix		23.5	29.25			KCEB8166-74		Warwick, 1985	MA 9A within 1 core	0.61	7943	15.89	0.77	1.08
527522.002	Felix			30.00		Mine	** Omit		USBM Drill, 22, T&R	Excludes Mine	0.60				
527602.001	Felix			11.00		Mine	** Omit		USBM Drill, 22, T&R	Excludes Mine	0.39	8465	16.92	0.46	
527708.001	Felix		9.1	9.10			KCEB8146-50		Warwick, 1985	MA 5A within 1 core	1.58	7515	15.03	2.10	
527727.001	Felix		1.8	17.45			KCEB8158		Warwick, 1985		1.20	7320	14.64	1.64	
537615.001	Felix		14.6	15.05			KCEB8159-65		Warwick, 1985	MA 7A within 1 core	0.99	7465	15.33	1.29	
Other Wasatch coals															
527414.001	Smith		291.0	307.0	8.0	16.00	Core	US-7340	USGS/MBMG OFR 74-97		0.31	8371	16.74	0.37	
557600.001	Smith						Pippie ** Omit		EA70079(4) / 110/790	Excludes Ranch Bl. trap Mine	0.46	7860	15.72	0.76	
537525.001	Truman			10.0(2)	10.00		FACE D178396		ME 917		0.70	6570	13.04	1.67	13.36
537619.001	NESENE	Scott		1.9			Channel B178104		USBM Printout		2.80	7700	15.40	3.64	1.48
527410.001	NEWSW (LL)	Ulm No.2		10.0(2)			Channel B178396		USBM Printout		1.10	6520	13.04	1.69	
537221.001	NEWSW	Local (?)		3.0	5.00		Core 479		USGS Open File 1973		0.55	7128	14.26	0.77	

** Omitted because of possible lab error prior to 1913 ASTM standards

Table 7
Sulfur and Heating Values for the Sussex Deposit (DRB SUL3TU24)

Reference Number	Other Location Data	Published or Company Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Heating Value (BTU/Lb)		Percent Sulfur	Lbs S per Short Ton		Average MBTU/ST
										MBTU	per		MBTU	per	
377506.000	?	Upper bed		(?)				USBM IC8538	Basin No. 6			0.45	8350	16.70	0.54
417832.000		Ft. Union Fa coal	2.2	3.80	Mine	11059		USBM TP484, B85	Mine prospect (?)			1.54	8480	16.96	1.82
427720.001	SENN	Ft. Union Fa coal		12.00	Mine			USGS B417	Pugsley Mine (strip)						
427720.002	MMSE, MENE	Ft. Union "E" bed	5.0	20.40	Mine	10827		USGS B471, USBM TP484, B85	Pugsley Mine (deep)			0.49	9050	18.10	0.54
427720.003	?	Upper bed		11.8 (?)				USBM IC8538	Basin No. 4			0.57	9160	18.32	0.62
															0.88

Table 8

Sulfur and Heating Values for the Wynona-Verona Deposit (DRB SEC. 31U2E)

Page 1 of 2

Weighted
Averages

Reference Number	Other Data	Published or Company Red Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur (BTU/lb)	Heating Value per Short Ton	Lbs S per MMTU	MMBTU/ST
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PK bed

568208.002 SE	PK		11.5	12.60	Channel	D165047		MF-723	Outcrop	3.20	8320	16.64	3.85
540120.001 SEWH	PK		5.6		Face	D169073		MF-742	Outcrop & Dait	0.00	5810	15.62	3.05

16.64
3.85

U1a 2 (Lower U1a)

540020.002 SEWH	Lower U1a (U1a-2)		14.6		Face	D169277		MF-721	Outcrop & Dait	0.50	4910	9.82	1.02
540120.002 SEWH	Lower U1a				Face	D169071		MF-762	Outcrop & Dait	0.40	5960	11.92	0.57
540120.001 7	Lower U1a				Sample	** 0m.7		E1670029(1)	Bethesda Prospect, 14(17)1907	0.60	7420	15.24	0.79
558209.002	U. Healy (L. U1a)		166.0	174.0	6.1	6.10	Core	RP400A19549C	II	3.22	6558	13.12	4.91
558210.003	Healy (Lower)		150.0	160.0	10.2	10.10	Core	RP400A19539C	TII	2.26	7193	14.39	3.14
558210.002	Healy (upper)		111.0	120.0	6.0	9.00	Core	RP400A19541C	TII	2.13	6858	13.72	3.11
558216.003	U. Healy (L. U1a)		195.0	210.0	9.3	11.30	Core	RP400A19558C	IO	1.72	8023	16.05	2.14
558216.004	L. Healy (L. U1a)		244.0	257.0	8.1	8.60	Core	RP400A19556C	TII	1.91	6934	13.87	2.75
568126.002 SW	Lower U1a				Channel	D169057		MF-727	Outcrop	1.90	7880	15.76	2.41
568204.004	Healy		184.0	198.5	14.2	14.20	Core	RP400A19534		3.10	7471	14.94	4.15
568217.001	Healy		35.0	46.5	9.6	9.60	Core	RP400A19543C		4.80	7087	14.17	6.77
568233.002	Healy (upper)		58.0	64.5	3.1	3.10	Core	RP400A19548	1.3' shale omitted, .3' pyrite included	3.43	7257	14.51	4.73
568233.003	Healy (lower)		78.0	87.5	7.4	7.40	Core	RP400A19546		2.56	7028	14.06	3.64

C-12

U1a 1 (Upper U1a)

540020.001 SEWH	Upper U1a (U1a-1)		12.1	20.00		D169270		MF-721	Outcrop & Dait	0.50	5490	12.70	0.81
540020.002 SEWH	Upper U1a (U1a-1)		15.9	20.00		D169271		MF-721	Outcrop & Dait	0.80	5290	10.58	1.54
540120.001 SEWH	Upper U1a		11.6		Face	D169063		MF-742	Outcrop & Dait	0.60	4660	9.32	1.29
540126.001 NW	Upper U1a		12.1	32.60	Channel	D169054		MF-727	Outcrop & Dait	1.20	6290	12.58	1.91

* It was assumed that samples with heat values under 6500 Btu/lb were too badly weathered to use.

** Possible Lab Error Prior To 1913 ASTM Standards

Table 8

Sulfur and Heating Values for the Wyrno-Verona Deposit (DRB SULRTU26)

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Weighted

Averages

Reference Number	Other Locational Data	Published or Company	Depth Interval	Sample From	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur (RTU/Lb)	Heating Value per Short Ton	MMBTU per Lbs S	MMBTU/ST
548208-001	SE	Local above Uls	8.8			Face	D169044	MF-721		Outcrop * Dail	0.40	5300	10.3	0.75
548208-002	SE	Local above Uls	4.7			Face	D169044	MF-722		Outcrop * Dail	0.40	5000	9.98	0.70
548208-003	SE	Local above Uls	5.4			Face	D169044	MF-723		Outcrop * Dail	0.40	5416	11.22	1.42
558209-001		Rimrock (Int. Uls)	120.0	153.0	19.0	Core	RP4CDA19550C	S-216A	Mapco Inc.	II,	1.84	7099	14.20	2.59
558210-001		Rimrock	76.0	88.0	4.0	Core	RP4CDA19540C	S-214A	Mapco Inc.	ID	1.74	7482	14.94	2.33
558216-001	NE	Int. Uls (upper)	84.0	104.0	10.0	Core	RP4CDA69	S-80A	Mapco Inc.	6.2' shale omitted, no location	2.47	7814	15.63	3.16
558216-002	NE	Int. Uls (lower)	104.0	119.0	9.7	Core	RP4CDA69	S-80A	Mapco Inc.		2.26	7367	14.73	3.07
558244-002		Int. Uls	80.0	96.0	16.0	Core	RP4CDA69	S-80A	Mapco Inc.	* Dail	2.82	6977	12.45	1.64
558246-004		Rimrock (Int. Uls)	131.0	139.5	4.7	Core	RP4CDA19557C	S-207A	Mapco Inc.	ID	1.31	7974	15.95	1.64
558222-001		Bar N	116.0	131.0	15.0	Core	RP4CDA19551	S-206A	Mapco Inc.	ID	2.63	6921	13.84	3.83
558301-001		Uls	110.0	170.0	55.7	Core	RP4CDA65	S-34A	Mapco Inc.	WA 5A, IID	2.26	7370	14.74	3.07
558301-003		Uls	136.0	166.0	22.8	Core	RP71-408346	S-35A	Mapco Inc.	WA 3A, IID	2.34	7418	14.84	3.15
558301-004		Local above Uls	69.0	73.0	7.7	Core	RP4CDA19555	S-198A	Mapco Inc.	III * Dail	3.19	6426	12.06	1.92
558301-005		Uls	102.0	171.0	34.5	Core	RP4CDA19525C	S-200A	Mapco Inc.	WA 4A, 1.5' coal loss, IID	2.79	7095	14.19	3.93
558302-001		Local above Uls	81.0	85.5	4.5	Core	AN72-8499	S-41A	Mapco Inc.	* Dail	1.66	6462	12.21	1.65
558309-004		Uls	36.0	43.5	3.8	Core	RP4CDA19552C	S-224A	Mapco Inc.	WA 5A, IID	1.98	7822	15.64	2.53
558316-001		Uls	85.0	155.0	63.7	Core	RP4CDA67	S-53A	Mapco Inc.	III, .8' coal omitted, 3.7' ID	1.73	6441	13.28	2.41
558316-003		Uls	77.0	90.0	7.0	Core	RP4CDA19573C	S-235A	Mapco Inc.	.8' coal omitted	2.17	7545	15.09	2.88
558316-004		Uls	99.0	117.0	3.1	Core	RP4CDA19574C	S-235A	Mapco Inc.		1.69	7627	15.25	2.22
558316-005		Uls	126.0	141.5	9.1	Core	RP4CDA19575C	S-235A	Mapco Inc.		1.79	7946	15.89	2.25
568126-003	SE	Middle Uls	14.0			Channel	D169059	MF-727		Outcrop	1.40	7176	14.34	1.95
568204-003		Rimrock	80.0	92.5	12.3	Core	RP4CDA19533C	S-167A	Mapco Inc.	5' shale omitted	2.74	7384	14.77	3.71
568204-004		Rimrock	133.0	144.5	11.7	Core	RP4CDA19538	S-168A	Mapco Inc.	* Dail	2.48	6376	12.47	1.98
568207-001	SE	Wyrno	3.0			Channel	D165043	MF-723		Outcrop	1.50	7760	15.52	1.93
568208-001	SE	Bar N	4.8			Channel	D165046	MF-723		Outcrop	2.20	8070	16.14	2.73
568217-002		Bar N	101.0	111.5	6.8	Core	RP4CDA19542	S-182A	Mapco Inc.	1.7' shale and wood omitted	2.69	7450	14.90	3.61
568233-001		Rimrock	26.0	34.0	3.4	Core	RP4CDA19547	S-218A	Mapco Inc.		3.28	7416	14.83	4.42
568336-002		Uls	86.0	139.4	26.4	Core	RP4CDA19529C-31C	S-197A	Mapco Inc.	WA 2A, 13.1' interbeds omitted	2.93	7421	14.84	3.95
568441-005		Bar N	92.0	102.0	2.8	Core	RP4CDA19527	S-169A	Mapco Inc.	* Dail	2.86	6419	12.84	1.64

* It was assumed that samples with heat values under 6500 Btu/lb were too badly weathered to use.

there *was* other information on coal thickness and quality (of complete coal beds) available nearby, the analyses were weighted by linear footage sampled.

4. Canyon Deposit. The Canyon coal bed occurs in the Fort Union Formation in the northern part of the Powder River Coal Field, Wyoming (Figure 1). It averages 11 feet thick in this area; strippable coal is under 120 feet or less of cover. The strippable DRB for the Canyon coal deposit defined by Smith and others (1972) contains 184.9 million tons of strippable coal (Figure 2). Only two analyses are known for the Canyon coal bed in this area. One analysis represents only 25 percent of the seam; the other analysis is of questionable value (see note on Table 3). Analyses from a nearby area southeast of the Canyon deposit were used to calculate the heat value and sulfur content for this deposit.

5. Dry Cheyenne Deposit. The Dry Cheyenne deposit (Figure 3) contains 179.5 million tons of strippable coal in the F bed of the Wasatch Formation. (Smith and others, 1972). This bed has not been correlated with any others in the coal field. The average thickness of this coal bed is 7.5 feet and strippable coal occurs under 120 feet or less of cover. Since no analyses exist for the F bed, average analyses from the nearby Badger bed in the Glenrock/Dave Johnston coal deposit were used to characterize the Dry Cheyenne deposit (Table 4).

6. Lake De Smet/Healy Deposit. All coal beds in this deposit occur in the Eocene Wasatch Formation. As many as five coal beds, including the Ucross, Murray, Cameron, Healy, and Walters beds coalesce to form the thick Lake De Smet coal bed (Figure 1), which exceeds 250 feet in thickness near Lake De Smet (Glass and Jones, 1991). Although total resources for the area were calculated for coal beds at depths of up to 1,000 feet (Mapel, 1959), strippable coal resources are calculated to an overburden depth of only 200 feet (Smith, and others, 1972). Coal resources for the thickest two coal beds in the area, the Lake De Smet and Healy, are combined. Resources for the other coal beds in the area, including the Monument Peak, Walters, Upper and Lower Cameron, Murray, Ucross, and several unnamed local coal beds are also combined (as "other Wasatch" coal beds). None of the coal beds in this deposit are currently mined.

The Lake De Smet/Healy deposit (Figure 4) contains 1 billion tons of strippable coal in the Lake De Smet/Healy coal bed(s) and in other Wasatch coal beds (Smith and others, 1972). Mapel (1959) listed measured and indicated reserves for coal beds greater than

Figure 1. Correlation of coal beds in the Wasatch and Fort Union Formations, Powder River Coal Field, Wyoming (from Glass and Jones, 1991).

Figure 2. Canyon deposit, Spotted Horse area (based on Plate 1, U.S. Geological Survey Bulletin 1050) (after Smith and others, 1972).

Figure 3. Dry Cheyenne deposit, Glenrock area (based on Plate 4, U.S. Geological Survey Bulletin 806A) (after Smith and others, 1972).

Figure 4. Healy deposit (from Smith and others, 1972).

5 feet thick: approximately 79 percent of the reserves occur in the Lake De Smet/Healy coals; the remainder of the reserves occur in other Wasatch coals. These percentages were applied to the strippable DRB, with 790 million tons assigned to the Lake De Smet/Healy bed and 210 million tons assigned to the other Wasatch coal beds (Table 5).

7. Acme-Kleenburn Deposit. Strippable coal beds from the Fort Union Formation in this deposit include the Carney, Masters, Monarch, Dietz 1, 2, and 3, Smith, and Roland (Figure 1). Although overburden limits for strippable coal in this deposit have not been published, any single coal bed under less than 200 feet of cover is probably strippable. The original DRB for the Acme-Kleenburn deposit from Smith and others (1972) was revised upward by Glass (1985) to 125.0 million tons. The original DRB of Glass (1985) included strippable coal in just the Monarch and the Dietz No. 3 coal beds. Production and mining losses at Big Horn Coal Company's mine through December 31, 1990 leaves 79.3 million tons of remaining strippable DRB (see Table 2).

Since all the identified remaining DRB occurs within the Big Horn Coal Company property (Figure 5), coal quality for this remaining DRB is based on 36 analyses of delivered coal from that mine between January, 1986 and December, 1988. Weighted average values for these deliveries indicate that the remaining strippable DRB for the Monarch and Dietz #3 coal beds averages 18.75 million Btu/short ton and 0.50 lbs sulfur/million Btu.

8. Spotted Horse Deposit. This deposit contains strippable coal in the Smith and related coal beds of the Fort Union Formation; the Felix bed and a local bed below the Felix in the Wasatch Formation; and four additional beds in the Wasatch Formation above the Felix, including the Daly, Scott, Parnell, and Truman coal beds (see Figure 1 for approximate stratigraphic positions of some of these coal beds). Strippable coal in the Smith and local beds ranges in thickness from 5 to 13 feet and is less than 120 feet below the surface. The Felix coal bed averages 12.5 feet in thickness and is strippable where the overburden is less than 120 feet thick. Other strippable coal beds in the Wasatch Formation are locally 5 to 10 feet thick (Glass and Jones, 1991) and are less than 120 feet below the surface.

The Spotted Horse deposit contains 1,196.6 million tons of DRB coal (Glass, 1985). Part of the Felix coal resource area plus the Smith and local coal beds are shown in Figures 6 and 7, respectively. The additional resources reported by Glass (1985) for the

Figure 6. Felix deposit, Spotted Horse area (based on Plate 2, U.S. Geological Survey Bulletin 1050) (after Smith and others, 1972).

Figure 7. Smith-Local deposit, Spotted Horse area (based on Plate 2, U.S. Geological Survey Bulletin 1050) (after Smith and others, 1972).

Felix are located south of the area in Figure 6. Coal analyses used to characterize this deposit are listed in Table 6. The Smith coal bed of the Fort Union Formation was characterized by a single partial analysis. Local coal beds below the Smith were assigned the same quality as that used for the Smith coal bed. Only one analysis for the Felix coal bed was found within the area of the DRB, but because nearby townships showed similar values for the Felix, all the analyses were combined as a weighted average to represent the Felix bed in this deposit. For the other Wasatch Formation coals in this deposit, a single analysis was found for the Truman coal bed, one partial analysis was found for the Scott coal bed, and no analyses were found for the Parnell or Daly beds. A weighted average of analyses from the Truman, Scott, and two other coals from the Wasatch Formation was used to represent the Wasatch coals in this deposit (Table 6).

9. Sussex Deposit. The Sussex deposit (Figure 8) contains 13.6 million tons of coal in Fort Union Formation coal beds in Sussex Coal Basin No. 4 (Smith and others, 1972). A zone of uncorrelated coal beds in the area (see points J and K, Figure 9) contains beds up to 50 feet thick in places with an average thickness of 11.8 feet (Smith and others, 1972). Strippable coal is found in a band parallel to the outcrop at depths of 120 feet or less. Only four coal analyses were available for this deposit (Table 7); the data was insufficient to develop weighted average values.

10. Wyarno-Verona Deposit. The Wyarno-Verona deposit (Figure 9) contains 1.8 billion tons of potentially strippable coal in beds greater than 10 feet thick (Culbertson and Mapel, 1976). Most of these coal beds are shown in Figure 1. Analyses for the Wasatch Formation coal beds in this deposit are shown in Table 8. Two analyses of samples from the PK coal bed were available; unfortunately, one of these analyses was from a sample collected from a weathered outcrop and could not be used. The Ulm 2 or Lower Ulm coal bed, correlated with the Healy bed by Culbertson and Mapel (1976), is represented by 9 usable analyses. Four analyses were available for the Ulm 1 or Upper Ulm coal bed; unfortunately, all these analyses were of samples from weathered outcrops and could not be used to characterize the quality of this coal bed. The other Wasatch coals in this deposit were characterized by analyses of the Bar N, Dow, Rimrock, Intermediate Ulm, Ulm (undivided), Wyarno, and some local unnamed coal beds. Unfortunately, 8 of these 29 analyses were of samples from weathered or oxidized coal and could not be used with any reliability. The weighted average heat values and sulfur contents of these coals (based on the remaining 21 coal analyses) are 14.46 million Btu/short ton and 3.07 lbs sulfur/million Btu, respectively.

Figure 8. Location of Sussex deposit (modified from Figure 4 of Glass, 1976).

Figure 9. The Wyarno-Verona deposit (modified from Figure 5 of Culbertson and Mapel, 1976).

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**APPENDIX D: DEMONSTRATED RESERVE BASE OF STRIPPABLE
COAL IN THE ADAVILLE FORMATION, ADAVILLE
(KEMMERER) AND SOUTH HAYSTACK DEPOSITS,
HAMS FORK COAL FIELD, WYOMING.**

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1. Summary. The remaining demonstrated reserve base (DRB) of strippable coal in the Adaville and South Haystack deposits to January 1, 1991, is about 935 million short tons (Table 1). The Adaville deposit, which consists of two unmined permit areas and the active Kemmerer and Skull Point coal mining areas, contains nearly 870 million tons of coal. Another 65 million tons of coal in the DRB occurs in the South Haystack area. About 23 percent (218 million tons) of the total remaining DRB has a heating content of 20.00 - 22.99 million Btu/short ton; the other 716 million tons of coal has a heating content of 15.00 to 19.99 million Btu/short ton. About 42 percent (395 million tons) of the remaining DRB in the Adaville and South Haystack coal deposits contains less than 0.60 lbs sulfur/million Btu and almost 58 percent (538 million tons) of the remaining DRB contains 0.61 - 0.83 lbs sulfur/million Btu.

Table 1. Summary of remaining demonstrated reserve base (DRB) of the Adaville and South Haystack coal deposits through December 31, 1990 (in million short tons).

Seam	Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total All Sulfur Categories
		≤0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	>2.50	
Adaville Deposit - Twin Creek and North Block permit areas								
All Adaville beds	15-19.99	—	—	320.00	—	—	—	320.00
Adaville Deposit-Kemmerer and Skull Point mining areas								
Adaville No. 1	20-22.99	—	—	218.20	—	—	—	218.20
Beds above Adaville No. 1	15-19.99	—	331.54	—	—	—	—	331.54
South Haystack permit area								
Adaville No. 1 & No. 1A	15-19.99	—	—	—	1.85	—	—	1.85
Beds above Adaville No. 1	15-19.99	63.00	—	—	—	—	—	63.00
Subtotals	15-19.99	63.00	331.54	320.00	1.85	—	—	716.39
	20-22.99	—	—	218.20	—	—	—	218.20
Total All Sulfur Categories		63.00	331.54	538.20	1.85	—	—	934.59

2. Methodology. Original DRB tonnages were taken from Smith and others (1972) for the Adaville deposit and from Glass (1981) for the South Haystack area. Only the Adaville deposit required a tonnage adjustment due to mining and production losses

(Table 2). This was done by first subtracting coal resources contained in two unmined tracts (North Block and Twin Creek) from the original one billion tons of strippable DRB and then apportioning the remaining 680 million tons to the Adaville No. 1 coal bed and all the coal beds above the Adaville No. 1, respectively, on the basis of average thickness(es) within the area.

The Adaville No. 1 coal bed averages about 82 feet thick over most of the area while the total combined thickness of coal beds above the Adaville No. 1 averages about 118 feet (Figure 1). The 200-foot average thickness of all coal beds in the Adaville deposit is the same thickness used by Smith and others (1972) in their estimate of surface minable (strippable) resources for the deposit. Unique geologic conditions in this deposit (multiple, thick, relatively steeply-dipping coal beds or coal zones) allow for extraction of numerous coal beds in a large open pit operation. Coals can be recovered a total highwall height of up to 1,400 feet. In this deposit (as in many other coal deposits in Wyoming), "surface minable coal" is probably a more appropriate term than "strippable coal".

Table 2. Original demonstrated reserve base (DRB), mining losses, and remaining DRB, Adaville coal deposit (in short tons). Numbers in parentheses are negative.

A. Original DRB, Adaville area (from Smith and others, 1972)	1,000,000,000
B. Unmined DRB in Twin Creek and North Block permit areas	320,000,000
C. Original DRB remaining in Kemmerer/Skull Point mining area (A-B)	680,000,000
D. Original DRB for Adaville No. 1 in the Kemmerer/Skull Point mining area (41% of C)	278,800,000
Less coal production through 1990	(40,205,029)
Less mining losses (25% recovery factor for underground coal and 80% recovery factor for surface coal)	(20,393,103)
Remaining DRB for Adaville No. 1	218,201,868
E. Original DRB for all coal beds above Adaville No. 1 in the Kemmerer/Skull Point mining area (59% of C)	401,200,000
Less coal production through 1990	(55,725,469)
Less mining losses (80% recovery factor for surface coal)	(13,931,367)
Remaining DRB for coal beds above Adaville No. 1	331,543,164
F. Remaining DRB in the Kemmerer area (B+D+E) as of January 1, 1991.	869,745,032

Figure 1. Major coal beds in the Adaville Formation, Hams Fork Coal Field, Wyoming (from Glass, 1981).

Production and mining losses were calculated using a recovery factor of 80 percent for surface-mined coal and 25 percent for underground-mined coal. An adjustment for underground-mined coal was necessary because the Elkol underground coal mine, which operated from 1909 to 1950, produced from the Adaville No. 1 coal bed. This same coal bed was subsequently extracted by surface mining adjacent to the Elkol underground mine; both the underground coal produced and the remaining underground coal reserves are now included as part of the strippable coal reserve area. An 80 percent recovery factor means that 80 percent of the total coal in-place was recovered and 20 percent of the coal in-place was not recovered because of mining losses and other inefficiencies. The 25 percent recovery factor assigned to underground production from the Elkol mine was based on the relatively small portion of the 80 to 90-foot-thick Adaville No. 1 coal bed that was recovered through underground mining.

Sulfur contents and heating values for the Twin Creek, South Haystack, and North Block mining permit areas were derived from data contained in their respective mine plans. For the remaining areas, sulfur and heating values were based on weighted average analyses of core and channel samples as well as weighted average analyses of tippie and delivered samples of produced coal. Analytical data for all coal beds above the Adaville No. 1 bed were combined and an average sulfur content and heating value determined; analyses of the Adaville No. 1 coal bed were also averaged and the sulfur content and heating value determined. Average analyses that were weighted by the amount of resources present in each coal bed were available for the South Haystack coal deposit. For this area, average heating values and sulfur contents were assigned to the Adaville No. 1 coal bed(s) and to the coal beds above the Adaville No. 1.

3. Analyses. Coal analyses used in this report were taken from various published and unpublished sources (Tables 3 and 4). All analyses were evaluated on an individual basis. Analyses from uncorrelated coal beds or poorly located data points were not used. Where only partial thicknesses of a coal bed were sampled and analyzed and no other information was available nearby, the data were not considered representative of the entire coal bed and were not used in this study. Where only partial thicknesses of a coal bed were sampled and analyzed and there **was** other information on coal thickness and quality (of complete coal beds) available nearby, the analyses were weighted by linear footage sampled. Tippie and delivered coal samples were weighted according to the tonnage each collected sample represented.

Table 3. Sulfur and heating values from analyses of core and channel samples in the Adaville and South Haystack coal deposits, Haas Fork Coal Field, Wyoming

Reference Number	Other Locational Data	Published or Company	Depth Interval	Sample From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/Lb)	MMBTU per Short Ton	Lbs S per MMTU
South Haystack area														
1711731.007	Permit Area	Adaville #1		0.0		Core			South Haystack Mine Plan/EIS Average for bed within permit area		1.15	9908	19.82	1.16
1711731.008	Permit Area	Adaville #1A		0.0		Core			South Haystack Mine Plan/EIS Average for bed within permit area		1.06	9416	18.83	1.13
1711731.009	Permit Area	Adaville #2		0.0		Core			South Haystack Mine Plan/EIS Average for bed within permit area		0.33	9628	19.26	0.34
1711731.010	Permit Area	Adaville #3		0.0		Core			South Haystack Mine Plan/EIS Average for bed within permit area		0.37	9627	19.25	0.38
1711731.011	Permit Area	Adaville #4		0.0		Core			South Haystack Mine Plan/EIS Average for bed within permit area		0.33	9636	19.27	0.34
1711731.012	Permit Area	Adaville #5		0.0		Core			South Haystack Mine Plan/EIS Average for bed within permit area		0.31	9661	19.32	0.32
1711731.013	Permit Area	Adaville #6		0.0		Core			South Haystack Mine Plan/EIS Average for bed within permit area		0.33	9762	19.52	0.34
Kemper area														
2111617.005		Adaville No.1	275.0	290.0	15.0	27.50	Core	K73204	98-1	DFR77-828	0.50	6884	13.77	0.73
2111617.006		Adaville No.1	290.0	305.0	15.0	27.50	Core	K73205	98-1	DFR77-828	1.00	7331	14.66	1.36
2111617.007		Adaville No.1	58.0	75.0	17.0	28.00	Core	K73206	98-2	DFR77-828	0.60	10093	20.19	0.59
2111617.008		Adaville No.1	75.0	85.0	10.0	28.00	Core	K73207	98-2	DFR77-828	1.70	9962	19.92	1.71
2111617.009		Adaville No.1	110.0	115.0	5.0	10.00	Core	K73208	98-2	DFR77-828	4.20	9683	19.37	4.34
2111617.010		Adaville No.1	125.0	130.0	5.0	34.00	Core	K73209	98-3	DFR77-828	0.50	9114	18.23	0.55
2111617.011		Adaville No.1	130.0	150.0	20.0	34.00	Core	K73210	98-3	DFR77-828	0.50	9818	19.64	0.51
2111617.012		Adaville No.1	150.0	155.0	5.0	34.00	Core	K73211	98-3	DFR77-828	0.90	10226	20.45	0.88
2111617.013		Adaville No.1	165.0	175.0	9.0	9.00	Core	K73212	98-3	DFR77-828	3.40	9395	18.79	3.62
2111617.014		Adaville No.1	91.0	105.0	14.0	56.00	Core	K73213	98-4	DFR77-828	0.50	9619	19.24	0.52
2111617.015		Adaville No.1	105.0	120.0	15.0	56.00	Core	K73214	98-4	DFR77-828	0.50	9814	19.63	0.51
2111617.016		Adaville No.1	120.0	135.0	15.0	56.00	Core	K73215	98-4	DFR77-828	1.70	9582	19.16	1.77
2111617.017		Adaville No.1	137.5	148.0	10.5	56.00	Core	K73216	98-4	DFR77-828	2.90	7580	15.16	3.83
2111617.018		Adaville No.1	122.0	140.0	18.0	56.00	Core	K73217	98-5	DFR77-828	0.50	9183	18.37	0.54
2111617.019		Adaville No.1	140.0	155.0	15.0	56.00	Core	K73218	98-5	DFR77-828	0.70	9361	18.72	0.75
2111617.020		Adaville No.1	155.0	157.5	2.5	56.00	Core	K73219	98-5	DFR77-828	1.70	7935	15.87	2.14
2111617.021		Adaville No.1	163.0	177.5	14.5	56.00	Core	K73220	98-5	DFR77-828	2.90	8643	17.29	3.36
2111617.022		Adaville No.1	105.0	115.0	10.0	58.00	Core	K73221	98-6	DFR77-828	0.70	9161	18.32	0.76
2111617.023		Adaville No.1	115.0	140.0	25.0	58.00	Core	K73222	98-6	DFR77-828	0.50	9674	19.35	0.52
2111617.024		Adaville No.1	140.0	147.0	7.0	58.00	Core	K73223	98-6	DFR77-828	1.30	10042	20.08	1.29
2111617.025		Adaville No.1	155.0	168.0	13.0	58.00	Core	K73224	98-6	DFR77-828	3.30	9339	18.68	3.53
2111620.001		Adaville No.1		86.7	88.08	Channel			Elkol Mine		1.30	10530	21.06	1.23
2111620.003		Adaville No.1		80.0(2)	80.00(2)	Channel			Strip Coal R. WY PR181 USBM Generalized analyses of 12 samples		0.56	10250	20.50	0.55
2111620.005		Adaville No.1		190.0	100.00	Channel			Penn St. Printout PSDC 248		0.52	10234	20.47	0.51
2111620.011		Adaville No.1		12.0	83.00	Mine	3202		USBM R22, 23; USGS B332		0.51	10237	20.47	0.50
2111620.012		Adaville No.1		44.0	85.00	Mine	3203		USBM R22, 23; USGS B332		0.54	10237	20.47	0.50
2111620.013		Adaville No.1				Mine	3390		USBM R22, 23; USGS B332		0.49	10307	20.61	0.48
2111620.014		Adaville No.1		40.0(2)	64.00	Mine	2283		USBM R22, 23; USGS B332		0.50	9792	19.58	0.51
2111702.020		Adaville No.1		42.9(2)	42.90(2)	Channel	F-131		USBM R 1 2832		0.70	11810	23.62	0.59
2111617.004		Adaville No.1A	202.5	210.0	6.0	6.00	Core	K7320C	98-1	DFR77-828	0.50	7895	15.39	0.65
2111617.003		Adaville No.1B	175.0	180.0	4.0	4.00	Core	K7320C	98-1	DFR77-828	1.20	5786	11.57	2.07
2011727.001		Adaville No.1U		0.0	15.00(2)	Core			Skull Point Mine Plan/EIS Exploration Data, Mean Values		1.19	9974	19.95	1.19
2011727.002		Adaville No.1U		0.0	51.40(2)	Core			Skull Point Mine Plan/EIS Exploration Data, Mean Values		0.82	9979	19.96	0.82

Table 3 (continued).

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Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating value (BTU/Lb)	MMBTU per Short Ton	Lbs S per MMTU	MMBTU/Lbs S
2011727.003		Adaville No. 2	0.0	10.00(?)		Core			Skull Point Mine Plan/EIS	Exploration Data, Mean Values	0.91	9935	19.87	0.92	
2111600.001		Adaville No. 2	28.5	28.50					Penn St. Printout PSOC-472	Strip mine	0.60	10248	20.50	0.59	
2111617.002		Adaville No. 2	71.0	89.0	18.00	Core	K73201	98-1	DFR77-828		0.50	9271	18.54	0.54	
2111620.010		Adaville No. 2	15.0	15.75		Channel	D170262, K47200, 74-18			Sorensen Strip Mine	0.30	10100	20.20	0.30	
2011727.004		Adaville No. 2A	0.0	10.00(?)		Core			Skull Point Mine Plan/EIS	Exploration Data, Mean Values	0.71	9673	19.33	0.73	
2111617.001		Adaville No. 2A	21.0	30.0	9.0	Core	K73200	98-1	DFR77-828		0.70	8004	16.01	0.87	
2111620.009		Adaville No. 2LRIDER	3.7	3.70		Channel	D171853, K47196, 74-17		WGS R.I.11	Sorensen Strip Mine	0.50	9960	19.92	0.50	
2111620.008		Adaville No. 2LRIDER	3.9	4.25		Channel	D171852, K47374, 74-16		WGS R.I.11	Sorensen Strip Mine	0.50	10090	20.18	0.50	
2011727.005		Adaville No. 3	0.0	6.70(?)		Core			Skull Point Mine Plan/EIS	Exploration Data, Mean Values	0.84	9802	19.60	0.86	
2111620.007		Adaville No. 3	33.6	33.60		Channel	D170236, K47333, 74-15		WGS R.I.11	Sorensen Strip Mine	0.30	10400	20.80	0.29	
2111620.006		Adaville No. 3LRIDER	6.5	8.50		Channel	D171853, K47197, 74-14		WGS R.I.11	Sorensen Strip Mine	0.30	9780	19.56	0.31	
2111620.004		Adaville No. 3LRIDER	1.0	10.60		Channel	D171856, K47198, 74-13		WGS R.I.11	Sorensen Strip Mine	0.30	10330	20.66	0.29	
2011703.005		Adaville No. 4LB	12.0	12.20		Channel	K46426, 74-9		WGS R.I.11	Sorensen Strip Mine	0.70	9860	19.72	0.71	19.27
2111620.002		Adaville No. 4LB	6.6	6.95		Channel	D171854, K47199, 74-12		WGS R.I.11	Sorensen Strip Mine	0.40	9750	19.50	0.41	
2011703.003		Adaville No. 4LRIDER	11.5	11.50		Channel	K46428, 74-7		WGS R.I.11	Sorensen Strip Mine	1.00	9490	18.98	1.05	0.66
2111619.002		Adaville No. 4LRIDER	5.0	5.00		Channel	D171858, K47331, 74-10		WGS R.I.11	Sorensen Strip Mine	0.30	9350	18.70	0.32	
2011703.004		Adaville No. 4UB	5.0	5.00		Channel	K46427, 74-8		WGS R.I.11	Sorensen Strip Mine	1.30	9540	19.08	1.36	
2111619.003		Adaville No. 4UB	6.0	7.00		Channel	D171857, K47195, 74-11		WGS R.I.11	Sorensen Strip Mine	0.30	9910	19.82	0.30	
2111619.001		Adaville No. 5	8.5	8.50		Channel	D171855, K47332, 74-6		WGS R.I.11	Sorensen Strip Mine	0.40	10180	20.36	0.39	
2011727.006		Adaville No. 6A	0.0	2.50(?)		Core			Skull Point Mine Plan/EIS	Exploration Data, Mean Values	0.82	9081	18.16	0.90	
2011727.007		Adaville No. 6B	0.0	2.50(?)		Core			Skull Point Mine Plan/EIS	Exploration Data, Mean Values	0.49	9318	18.64	0.53	
2011710.003		Adaville No. 6LB	8.0	8.00		Channel	K47332, 74-5		WGS R.I.11	Sorensen Strip Mine	0.40	8340	16.68	0.72	
2011710.002		Adaville No. 6UB	8.8	8.80		Channel	D171861, K46568, 74-4		WGS R.I.11	Sorensen Strip Mine	0.60	8560	17.12	0.70	
2011703.002		Adaville No. 10LB	7.1	7.95		Channel	D171860, K46570, 74-3		WGS R.I.11	Sorensen Strip Mine	1.80	8980	17.96	2.00	
2011703.001		Adaville No. 10UB	4.8	4.80		Channel	D171859, K46569, 74-2		WGS R.I.11	Sorensen Strip Mine	0.90	9410	18.82	0.96	
2011710.001		Adaville No. 11	13.0	13.00		Channel	K46567, 74-1		WGS R.I.11	Sorensen Strip Mine	1.10	7920	15.84	1.39	
2111617.001	Permit Area	Adaville, all seams				Cores			Twin Creek mine plan/EIS	WA for all beds in permit area ²	0.65	9958	19.92	0.65	
2211632.001	Permit Area	Adaville, all seams				Cores			North Block mine plan/EIS	Avg. all beds in permit area	0.61	9550	19.10	0.64	

¹The actual number of core holes drilled is unknown, but 20 is assumed to be a reasonable minimum used to represent the mine.
²Average of 2 WA's (.49 and .82 percent) reported in same mine plan.

Table 4. Sulfur and heating values from analyses of tippie and delivered coal samples, Hams Fork Coal Field, Wyoming.

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur		Heating Value		MBTU		Lbs S		MBTU/S	
										Sulfur (ETU/Lb)		Value (Btu/Lb)		Short Ton		per		MBTU Lbs/MBTU	
2111702.001		Adaville No.1	0.0		Tippie			Elkol Strip Mine, ROM, 1A(10070)1942		0.60	10420	20.84	0.58						
2111702.002		Adaville No.1	0.0		Tippie			Elkol Strip Mine, ROM, 1A(10070)1951		0.60	9720	19.44	0.62						
2111702.003		Adaville No.1	0.0		Tippie			Elkol Strip Mine, ROM, 1A(10067)1952		0.70	10120	20.24	0.69						
2111702.004		Adaville No.1	0.0		Tippie			Elkol Strip Mine, ROM, 1A(10097)1954		0.60	10210	20.42	0.59						
2111702.005		Adaville No.1	0.0		Tippie			Elkol Strip Mine, ROM, 1A(13007)1956		0.80	10210	20.42	0.78						
2111702.006		Adaville No.1	0.0		Tippie			Elkol Strip Mine, ROM, 1A(13007)1958		0.60	10200	20.40	0.59						
2111702.007		Adaville No.1	0.0		Tippie			Elkol Strip Mine, ROM, 1A(13007)1961		0.60	9960	19.92	0.60						
2111702.008		Adaville No.1	0.0		Delivered			Elkol Strip Mine, ROM, 1A(2407)1974		0.60	10200	20.40	0.59						
2111702.009		Adaville No.1	0.0		Tippie			Elkol Strip Mine, 1 5/8", 1A(15507)1965		0.60	9960	19.92	0.60						
2111702.010		Adaville No.1	0.0		Tippie			Elkol Strip Mine, 1 5/8" Imp., 1A(307)1946		0.50	10500	21.00	0.48						
2111702.011		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 7x1 5/8", 1A(4677)1947		0.60	10730	21.86	0.55						
2111702.012		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 6x1 5/8", 3A(11167)1949		0.50	10200	22.04	0.45						
2111702.013		Adaville No.1	0.0		Tippie			Elkol Strip Mine, 1 5/8"x3/16", 1A(507)1958		0.60	10370	23.54	0.58						
2111702.014		Adaville No.1	0.0		Tippie			Elkol Strip Mine, 1 5/8"x3/16", 1A(557)1961		0.60	10100	20.20	0.59						
2111702.015		Adaville No.1	0.0		Tippie			Elkol Strip Mine, 1 1/4"x3/16", 1A(1507)1965		0.60	10170	20.34	0.59						
2111702.016		Adaville No.1	0.0		Tippie			Elkol Strip Mine, 1x3/16", 1A(1507)1951		0.50	9840	19.68	0.51						
2111702.017		Adaville No.1	0.0		Tippie			Elkol Strip Mine, 1 5/8"x0, 1A(1757)1946		0.60	10350	20.70	0.58						
2111702.018		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 1A(1547)1947		0.60	10680	21.36	0.56						
2111702.019		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 3A(3147)1951		0.70	10690	21.38	0.65						
2111702.020		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 10A(15527)1952		0.60	10220	20.44	0.59						
2111702.021		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 42A(141527)1954		0.60	10200	20.40	0.59						
2111702.022		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 76A(238507)1955		0.60	10080	20.12	0.60						
2111702.023		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 74A(266257)1956		0.60	10030	20.06	0.60						
2111702.024		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 78A(264257)1957		0.60	9980	19.92	0.60						
2111702.025		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 100A(244007)1958		0.60	9910	19.82	0.61						
2111702.026		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 46A(161357)1959		0.60	9990	19.98	0.60						
2111702.027		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 12A(18077)1952		0.60	10240	20.48	0.59						
2111702.028		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 61A(203557)1953		0.60	10130	20.26	0.59						
2111702.029		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1 5/8"x0, 1A(1557)1953		0.60	10080	20.16	0.60						
2111702.030		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 4A(31467)1951		0.60	10190	20.38	0.59						
2111702.031		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 12A(19547)1952		0.60	10260	20.52	0.58						
2111702.032		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 17A(144357)1954		0.70	10430	20.86	0.67						
2111702.033		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 17A(138287)1955		0.70	10510	21.02	0.67						
2111702.034		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 3A(19987)1956		0.70	10250	20.50	0.68						
2111702.035		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 16A(133687)1957		0.70	10250	20.50	0.68						
2111702.036		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 12A(102987)1958		0.60	10130	20.26	0.59						
2111702.037		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 9A(174487)1959		0.70	10400	20.80	0.67						
2111702.038		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 17A(125817)1960		0.60	10300	20.60	0.58						
2111702.039		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 12A(100437)1961		0.60	10230	20.46	0.59						
2111702.040		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 13A(107697)1962		0.60	10180	20.36	0.59						
2111702.041		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 11A(93487)1963		0.60	10010	20.02	0.60						
2111702.042		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 12A(97027)1964		0.60	10110	20.22	0.59						
2111702.043		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 12A(102207)1965		0.60	10370	20.74	0.58						
2111702.044		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 11A(92237)1966		0.60	10310	20.62	0.58						
2111702.045		Adaville No.1	0.0		Delivered			Elkol Strip Mine, 1x0, 13A(103487)1967		0.80	10250	20.50	0.78						

Table 4 (continued)

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (Btu/Lb)	MMBTU per Short Ton	Lbs S per MMBTU	MMBTU/ST LbsS/MMBTU
2111702.046		Adaville No.1		0.0		Delivered			EIA70070(L), USBM R17219	Elkol Strip Mine, 1x0, 128(9530T)1968	0.70	10250	20.50	0.68	
2111702.047		Adaville No.1		0.0		Delivered			EIA70070(L)	Elkol Strip Mine, 1x0, 144(11863T)1969	0.60	10070	20.14	0.60	
2111702.048		Adaville No.1		0.0		Tipple			EIA70070(L), USBM R14934	Elkol Strip Mine, 3/16"x0, 1A(1000T)1951	0.60	9360	18.72	0.64	
2111702.049		Adaville No.1		0.0		Tipple			EIA70070(L), USBM R16792	Elkol Strip Mine, 3/16"x0, 1A(60T)1965	0.60	9770	19.54	0.51	
2111702.050		Adaville No.1		0.0		Tipple			EIA70070(L)	Elkol Strip Mine, Face, 1A(1T)1911	0.60	10250	20.50	0.59	
2111702.051		Adaville No.1		0.0		Tipple			EIA70070(L)	Elkol Strip Mine, Face, 1A(1T)1911	0.60	10100	20.20	0.59	
2111702.052		Adaville No.1		0.0		Tipple			EIA70070(L)	Elkol Strip Mine, Face, 1A(1T)1918	0.60	9890	19.78	0.61	
2111702.053		Adaville No.1		0.0		Tipple			EIA70070(L)	Elkol Strip Mine, Face, 1A(1T)1918	0.70	10080	20.16	0.69	
2111702.054		Adaville No.1		0.0		Tipple			EIA70070(L)	Elkol Strip Mine, Face, 1A(1T)1924	0.60	10530	21.66	0.57	
2111702.055		Adaville No.1		0.0		Tipple			EIA70070(L)	Elkol Strip Mine, Face, 1A(1T)1944	0.60	11000	22.00	0.55	
2111702.056		Adaville No.1		0.0		Tipple			EIA70070(L)	Elkol Strip Mine, Face, 1A(1T)1944	0.80	10910	21.82	0.73	
		Adaville No.1		0.0		Tipple			EIA70070(L), USBM R230	Keystone No.1 deep mine, 3'jump(170T)1917	0.60	10510	21.02	0.57	
2011727.002		Adaville, all seams		0.0		Delivered			Skull Point Mine Plan/EIS	Oct76-Sept78, 1429360T	1.00	9791	19.58	1.02	19.58
2111702.057		Adaville, all seams		0.0		Tipple			EIA70070(L)	Passer (Elkol-Sorenson), 1.25x.25, (250T)	0.40	10330	20.66	0.39	
2111702.058		Adaville, all seams		0.0		Tipple			EIA70070(L)	Kesserer (Elkol-Sorenson), 1.25x.25, (250T)	0.40	9370	18.74	0.43	1.02
2011727.001		Adaville, various		0.0		Tipple			EIA70070(L)	Skull Point Strip Mine, RDM(1200T)1980	0.50	10380	20.76	0.48	18.61
2111631.001		Adaville, various		0.0		Tipple			EIA70070(L), USBM R16904	Sorensen Strip, RDM, (1000T)1966	0.20	8020	16.04	0.25	0.37

4. South Haystack deposit. This coal deposit (Figure 2) is located about 12 miles south of the Adaville coal deposit and contains seven surface-minable coal beds in the Upper Cretaceous Adaville Formation (Figure 1). The Adaville No. 1 and 1A coal beds (Table 3) contain 1.85 million tons of DRB coal with a heating value of 15.00 - 19.99 million Btu/short ton and a sulfur content of 0.84 - 1.67 lbs sulfur/million Btu (Table 1). The Adaville No. 2 through 6 coal beds contain a combined DRB of 63 million tons. Although these five coal beds are in the same heating value category as the Adaville Nos. 1 and 1A, the sulfur content of these five coal beds (less than 0.40 lbs sulfur/million Btu) is much lower than the sulfur content of the Adaville Nos. 1 and 1A (Table 1).

5. Adaville (Kemmerer) deposit. This coal deposit is located within a 20-mile long, north-south trending strip west of Kemmerer (Figure 3) and contains up to 32 coal beds in the Upper Cretaceous Adaville Formation. Figure 1 shows the major surface-minable Adaville Formation coal beds in this deposit. About 870 million tons of strippable DRB coal remain in this deposit. The Twin Creek and North Block permit areas contain about 320 million tons of the DRB in various Adaville coal beds (Table 1). The available data (Table 3) did not allow separate coal quality categories to be determined for the Adaville No. 1 or for the coal beds above the Adaville No. 1 in these areas. DRB coal in the Twin Creek and North Block permit areas contains 0.61 - 0.83 lbs sulfur/million Btu and from 15.00 - 19.99 million Btu/short ton (Table 1).

The 550 million tons of remaining strippable DRB in the Adaville deposit outside the Twin Creek and North Block permit areas can be separated into about 218 million tons of coal in the Adaville No. 1 coal bed and about 332 million tons of coal in beds above the Adaville No. 1 (Table 1). The Adaville No. 1 coal bed contains, on average, both a higher heating value and a higher sulfur content than coal beds above it. The coal from the Adaville No. 1 contains a heating value of 20 - 22.99 million Btu/short ton and a sulfur content of 0.61 - 0.83 lbs sulfur/million Btu. Coal beds above the Adaville No. 1 contain 15.00 - 19.99 million Btu/short ton and 0.41 - 0.60 lbs sulfur/million Btu. About 96 million tons of coal has been produced from the Adaville deposit through 1990; an additional 34 million tons of coal were lost through mining efficiencies and incomplete recovery (see Table 2).

Figure 2. Location map of the South Haystack strippable coal deposit, Uinta County, Wyoming (from Rocky Mountain Energy Company, 1981).

Figure 3. Location map of the Adaville strippable coal deposit, Lincoln County, Wyoming (from Smith and others, 1972).

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**APPENDIX E. DEMONSTRATED RESERVE BASE OF STRIPPABLE
COAL IN THE RED DESERT, CRESTON-CHEROKEE,
NORTHERN LITTLE SNAKE RIVER, JIM BRIDGER,
LEUCITE HILLS, BLACK BUTTE, AND SALT WELLS
DEPOSITS, GREEN RIVER COAL FIELD, WYOMING.**

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1. **Summary.** The remaining demonstrated reserve base (DRB) of strippable coal in the above seven deposits totals about 1.8 billion short tons (Table 1). Coals in these deposits occur in the Late Cretaceous Mesaverde Formation (or Group), and the Lance Formation; the Paleocene Fort Union Formation; and the Eocene Wasatch Formation. The Mesaverde is a group where it can be subdivided into separate formations. Of this total, almost 0.69 billion tons (38 percent) occurs in the Wasatch Formation of the Red Desert coal deposit and about 0.66 billion tons (36 percent) occurs in the Fort Union Formation in four of the coal deposits.

All but 145.8 million tons of the 1.8 billion tons of strippable coal has a heating value of 15.00 - 19.99 million Btu/short ton. Coal with a heating value of less than 15.00 million

Table 1. Summary of remaining demonstrated reserve base (DRB) of strippable coal deposits in the Green River Coal Field, Wyoming, through December 31, 1990 (in million short tons).

Coal Beds	Btu Content million BTU/ short ton	Sulfur content (lbs sulfur/million Btu)						Total all sulfur Categories
		≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	>2.50	
Red Desert Deposit								
Wasatch Fm. coals								
Hadsell 2	<15.00	---	---	---	---	---	39.80	39.80
Battle 2 & 3	15.00-19.99	---	---	---	---	38.10	---	38.10
Sourdough, Monument, & Tierney	15.00-19.99	---	---	---	---	---	458.90	458.90
Creston 2 & 3	15.00-19.99	---	---	---	---	---	125.60	125.60
Latham 3 & 4	15.00-19.99	---	---	---	---	---	70.70	70.70
Subtotal all beds	<15.00	---	---	---	---	---	39.80	39.80
	15.00-19.99	---	---	---	---	38.10	655.20	693.30
Creston-Cherokee Deposit								
Cherokee B&C (Fort Union Fm.)	15.00-19.99	---	---	---	---	200.90	---	200.90
Other Fort Union Fm. coals	15.00-19.99	---	---	---	---	159.10	---	159.10
Subtotal all beds	15.00-19.99	---	---	---	---	360.00	---	360.00
Northern Little Snake River Deposit								
Lance & Fort Union Fm. coals	15.00-19.99	---	223.60	---	---	---	---	223.60
Mesaverde Fm. coals	20.00-22.99	---	---	46.00	---	---	---	46.00
Jim Bridger Deposit								
Deadman coals (Fort Union Fm.)	15.00-19.99	---	---	151.20	---	---	---	151.20
Leucite Hills Deposit								
Almond Fm. coals	15.00-19.99	---	162.20	---	---	---	---	162.20
Black Butte Deposit								
Almond Fm. coals	15.00-19.99	---	15.40	---	---	---	---	15.40
Lance Fm. coals	15.00-19.99	---	---	36.00	---	---	---	36.00
Fort Union Fm. coals	15.00-19.99	---	37.10	---	---	---	---	37.10
Subtotal all beds	15.00-19.99	---	52.50	36.00	---	---	---	88.50
Salt Wells Deposit								
Almond Fm. coals	20.00-22.99	---	60.00	---	---	---	---	60.00
Summary, all deposits								
Subtotal all coal beds	<15.00	---	---	---	---	---	39.80	39.80
	15.00-19.99	---	438.30	187.20	---	398.10	655.20	1,678.80
	20.99-22.99	---	60.00	46.00	---	---	0.00	106.00
Total all sulfur categories		---	498.30	233.20	---	398.10	695.00	1,824.60

Btu/short ton occurs in the Wasatch Formation of the Red Desert deposit. Coal with a heating value of 20.00 - 22.99 occurs in the Mesaverde Formation (or Group) in the Northern Little Snake River and Salt Wells deposits.

Strippable coal with the lowest sulfur content in the Green River Coal Field (0.41 - 0.60 lbs sulfur/million Btu) occurs in four of the seven deposits and accounts for 27 percent of the total strippable coal in the field. Coals with sulfur contents greater than 1.68 lbs sulfur/million Btu occur in the Red Desert and Creston-Cherokee deposits and account for nearly 60 percent of the 1.8 billion tons of strippable coal.

Significant amounts of coal have been produced from only the Jim Bridger, Leucite Hills, and Black Butte strippable deposits. The remaining four coal deposits still contain the original DRB; therefore, no adjustments for production and mining losses are necessary for these deposits. A total of 161.7 million tons of coal has been depleted from the original strippable DRB through mining and production losses. Most of the depleted coal has been mined from deposits that contain low-sulfur coal reserves.

2. Methodology and assumptions. Original strippable DRB tonnages were taken from Smith and others (1972) and Glass (1981). Although some new coal resource estimates for additional strippable deposits in this coal field have been published since the above two reports, inclusion of new resource calculations was beyond the scope of this report. However, some coal quality data given in these new resource estimates were used to characterize the coal quality in some of the deposits discussed in this report.

The original DRB for the Jim Bridger, Leucite Hills, and Black Butte strippable coal deposits required tonnage adjustments for mining and production losses. Although some coal was produced in several other strippable deposits in this coal field, the tonnage was not significant and did not affect the DRB. A recovery factor of 90 percent was used for both the Jim Bridger and Black Butte deposits and a recovery factor of 85 percent was used for the Leucite Hills deposit. A 90-percent recovery factor means that 90 percent of the total coal in-place was recovered, and that 10 percent of the coal in-place was not recovered because of mining losses and other inefficiencies.

3. Analyses. Coal analyses used in this report were taken from various published and unpublished sources (Tables 2 through 8). Whenever possible, analyses from within a coal deposit were used to assign coal quality categories to the DRB. In some cases, however, analyses of nearby coal beds were used to characterize the strippable deposit. Analyses from 2,873 core, channel and tipple samples and about 308 coal deliveries were examined for these strippable deposits. A discussion of the coal analyses used in each area is included in the reports on individual deposits (below).

All analyses were evaluated on an individual basis where appropriate. Analyses from poorly located data points were not used. Analyses with anomalously low heating values due to weathering or high ash content were also not used. Where only partial thicknesses of a coal bed were sampled and analyzed and no other information was available nearby, the data were not considered representative of the entire coal bed and were not used in this study. Where only partial thicknesses of a coal bed were sampled and analyzed and there *was* other information on coal thickness and quality (of complete coal beds) available nearby, the analyses were weighted by linear footage sampled.

4. Red Desert deposit. The remaining demonstrated reserve base (DRB) of strippable coal in this deposit is 733.1 million short tons (Table 1). Because no coal has been mined in this deposit, the original strippable DRB (Smith and others, 1972) is also the remaining strippable DRB. Coal beds 5 feet or more in thickness and separated by not more than 120 feet of interburden were considered strippable. Two or more coal beds (each 5 feet thick or more) in the same stratigraphic section and separated by less than 120 feet of interburden, were also considered strippable if the depth to the uppermost coal bed was 120 feet or less. Strippable coal beds in the Eocene Wasatch Formation (Figures 1 and 2) are relatively high in sulfur and low in heating value: only 38.1 million tons of the total strippable DRB contains less than 2.50 lbs sulfur/million Btu; all of the DRB contains less than 19.99 million Btu/short ton (Table 1).

Analytical data for coal beds that comprise the strippable DRB were taken from published analyses of coal cores (Pipiringos, 1961, and Masursky, 1962). The Tierney coal bed(s) mentioned in Table 1 as part of the Sourdough, Monument and Tierney group of coal beds are western equivalents of some of the Sourdough beds in this area. Several coal beds that contained analytical data were not used in the DRB calculations because the beds were not of sufficient thickness. A weighted average for each coal bed was determined on the basis of linear footage sampled (Table 2). Each coal bed(s) was then

Table 2. Sulfur and heating values for the Red Desert strippable coal deposit, Green River Coal Field, Wyoming.

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Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur (BTU/Lb)	Heating Value (BTU/Lb)	Short Ton per MMTU	Lbs S per MMTU	MMBTU/ST	MA
Battle No. 2 and No. 3															
239417.001	Battle No. 3	Battle No. 3	14.40	21.30 Core	998725-998729	10	US65 810998	MA4A		1.69	8682	17.76	1.90		
239432.001	Battle No. 3	Battle No. 3	4.00	6.70 Core	E2091	17	US65 810998			2.10	9069	16.15	2.31		
239408.001	Battle No. 3	Battle No. 3	8.50	9.30 Core	E18718-E18720	18	US65 810998	MA3A		1.50	9237	18.47	1.62	17.67	
239422.001	Battle No. 3	Battle No. 3	4.00	5.00 Core	E23609	40	US65 810998			2.30	8580	17.16	2.68	2.04	
239427.001	Battle No. 3	Battle No. 3	3.40	6.30 Core	998732	11	US65 810998			2.80	8100	16.20	3.46		
249528.001	Battle No. 3	Battle No. 3	9.20	9.20 Core	997235	4	US65 81099A			1.80	9240	18.48	1.95		
239417.001	Battle No. 3	Battle No. 3	14.80	14.80 Core	998726-29	10	US65 81099A	MA4A		1.70	8872	17.74	1.92		
Monument No. 2 Bed															
239417.001	Monument No. 2	Monument No. 2	7.90	9.70 Core	998730-31	10	US65 810998	MA2A		1.46	9258	18.52	1.58		
239427.001	Monument No. 2	Monument No. 2	2.10	6.50 Core	998733	11	US65 810998			1.50	9450	18.90	1.59		
239422.001	Monument No. 2	Monument No. 2	4.90	15.80 Core	E18649	13	US65 810998			2.40	9029	18.04	1.55		
239408.001	Monument No. 2	Monument No. 2	8.20	8.20 Core	E19972	18	US65 810998			1.30	9270	18.54	1.40		
249433.001	Monument No. 2	Monument No. 2	4.60	6.40 Core	E19975	22	US65 810998			1.60	8070	16.14	1.98		
239428.001	Monument No. 2	Monument No. 2	3.40	3.60 Core	E22094	24	US65 810998			1.70	9130	18.26	1.86	17.23	
239413.001	Monument No. 2	Monument No. 2	4.20	7.80 Core	E23181	34	US65 810998			2.40	8650	17.30	2.77	2.25	
239423.001	Monument No. 2	Monument No. 2	7.70	11.10 Core	E2210-11	38	US65 810998	MA2A		1.90	6388	12.78	2.97		
239422.003	Monument No. 2	Monument No. 2	9.10	11.10 Core	E23510	40	US65 810998			2.70	8623	17.64	3.06		
239434.001	Monument No. 2	Monument No. 2	10.30	11.20 Core	E23660	43	US65 810998			2.80	8160	16.32	3.43		
249528.001	Monument No. 2	Monument No. 2	5.70	5.70 Core	997237	4	US65 81099A			1.60	8860	17.72	1.81		
239417.001	Monument No. 2	Monument No. 2	7.70	7.90 Core	998730-31	10	US65 81099A	MA2A		1.50	9258	18.52	1.62		
Monument No. 1 Bed															
239427.001	Monument No. 1	Monument No. 1	3.80	9.20 Core	998734	11	US65 810998			1.80	8970	15.94	2.38		
239434.001	Monument No. 1	Monument No. 1	1.70	1.70 Core	E22088	16	US65 810998			2.40	7640	15.28	3.14		
249432.001	Monument No. 1	Monument No. 1	9.90	14.50 Core	E22091-92	17	US65 810998	MA2A		1.40	9460	18.92	1.48	17.04	
239428.001	Monument No. 1	Monument No. 1	6.40	5.80 Core	E19973	19	US65 810998			2.10	6680	13.56	3.14	2.23	
249433.001	Monument No. 1	Monument No. 1	6.10	7.10 Core	E19976	22	US65 810998			2.00	8750	17.50	2.29		
249428.001	Monument No. 1	Monument No. 1	2.00	2.00 Core	E22094	24	US65 810998			3.00	7840	15.68	3.83		
Sourdough Monument Coal Bed															
239402.001	Sourdough Monument	Sourdough Monument	4.20	4.20 Core	E22095	29	US65 810998			1.90	7370	14.74	2.58	15.42	
239411.001	Sourdough Monument	Sourdough Monument	8.70	1.70 Core	E22095	31	US65 810998			2.30	7210	14.42	3.19	2.80	
239410.001	Sourdough Monument	Sourdough Monument	8.90	10.50 Core	E23179-80	32	US65 810998	MA2A		2.10	8368	16.74	2.51		

Table 2. Sulfur and heating values for the Red Desert strippable coal deposit, Green River Coal Field, Wyoming.

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Other	Published or	Depth														
Reference	Locational	Company	Interval	Sample	Sample	Sample	Drill									
Number	Data	Bed Designation	From To	Thickness	Type	Number	Hole	Data Source	Remarks	Sulfur	Heating Value (BTU/Lb)	Short Ton	MMBTU	Lbs S per	MMBTU/ST	MA
Sourough No. 2 Coal Bed																
239427.001		Sourough No. 2		6.30	11.60 Core	D98235-36	11	US65 B10998	MA2A	2.70	8996	17.99	3.00			
239428.001		Sourough No. 2		1.30	3.00 Core	E19214	12	US65 B10998		2.20	8600	17.20	3.72			
239432.001		Sourough No. 2		2.20	4.80 Core	E22089	17	US65 B10998		3.30	8910	17.82	3.70			
239403.001		Sourough No. 2		3.70	3.00 Core	E19974	19	US65 B10998		2.00	7910	14.62	2.85			
229422.001		Sourough No. 2		7.30	9.80 Core	E23611	40	US65 B10998		2.90	8660	17.36	3.34			
229434.001		Sourough No. 2		19.60	10.90 Core	E24661	43	US65 B10998		3.20	8170	16.34	3.92			
219403.001		Sourough No. 2		9.40	12.30 Core	E23466-68	45	US65 B10998	MA3A	2.90	8173	16.35	3.55	15.60		
219462.001		Sourough No. 2		8.40	8.30 Core	E24663-64	47	US65 B10998	MA2A	3.60	8072	16.44	4.46	3.68		
219410.001		Sourough No. 2		2.20	3.50 Core	E26284	50	US65 B10998		1.80	8020	16.04	2.24			
219413.001		Sourough No. 2		5.80	7.60 Core	E24665	51	US65 B10998		1.20	4440	8.88	2.70			
219316.001		Sourough No. 2		4.80	6.00 Core	E27441	53	US65 B10998		3.20	7710	15.82	4.85			
219322.001		Sourough No. 2		3.40	5.70 Core	E25392	55	US65 B10998		3.70	7700	15.40	4.81			
209503.001		Sourough No. 2		5.30	5.30 Core	E25608-09	59	US65 B10998	MA2A	3.20	6795	13.59	4.71			
Hadsell No. 4 Coal Bed																
219463.001		Hadsell No. 4		3.40	4.50 Core	E23469	45	US65 B10998	NOT USED IN DRB ESTIMATE	6.00	7770	15.54	7.72	14.83		
219462.001		Hadsell No. 4		3.20	3.20 Core	E23470	47	US65 B10998		5.70	6902	13.80	8.26	7.85		
219413.001		Hadsell No. 4		2.80	2.80 Core	E24662	51	US65 B10998		5.70	7570	15.14	7.53			
Hadsell No. 3 Coal Bed																
219563.001		Hadsell No. 3		1.70	1.70 Core	E26295	57	US65 B10998	NOT USED IN DRB ESTIMATE	7.20	6810	13.62	10.57			
Hadsell No. 2 Coal Bed																
219313.001		Hadsell No. 2		3.30	4.10 Core	E25610	49	US65 B10998		1.30	6510	13.02	2.00	14.37		
219316.001		Hadsell No. 2		2.80	4.30 Core	E27440	53	US65 B10998		2.70	8250	16.50	3.27	3.54		
209563.001		Hadsell No. 2		2.00	2.00 Core	E26286	59	US65 B10998		4.40	6810	13.62	6.46			
Hadsell No. 1 Coal Bed																
219716.001		Hadsell No. 1		2.10	2.10 Core	E27459	53	US65 B10998	NOT USED IN DRB ESTIMATE	3.00	6320	12.64	6.61	13.74		
219722.001		Hadsell No. 1		3.60	3.60 Core	E25607	55	US65 B10998		3.10	7330	14.46	4.24	3.23		
209563.001		Hadsell No. 1		3.00	3.00 Core	E26287	59	US65 B10998		3.00	6870	13.78	5.66			

Table 2. Sulfur and heating values for the Red Desert strippable coal deposit, Green River Coal Field Wyoming.

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Reference Number	Location	Published or Company Bed Designation	Depth Interval		Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Heating Value per Short Ton		MBTU Lbs/MBTU		
			From	To								Percent Sulfur	Value (BTU/Lb)	MBTU	Lbs 5 MBTU/ST	
Creston No. 3 Coal Bed																
209303.001		Creston No. 3	4.20		5.80	Core	E26288		59	USGS 810998		4.50	6850	13.26	6.79	13.19
209203.001		Creston No. 3	2.20		2.90	Core	E27921		65	USGS 810998		2.80	6530	13.06	4.29	5.93
Creston No. 2 Coal Bed																
219313.001		Creston No. 2	20.60		31.50	Core	E25611-14		49	USGS 810998	HA3A	1.80	8610	17.22	2.09	
209303.001		Creston No. 2	16.00		16.00	Core	E26289-91		59	USGS 810998	HA3A	1.90	7984	15.97	2.38	
209207.001		Creston No. 2	21.20		21.50	Core	E26665-67		62	USGS 810998	HA3A	2.60	7636	15.67	3.32	16.40
209217.001		Creston No. 2	7.60		12.00	Core	E29373		63	USGS 810998		2.60	7980	15.96	3.26	2.97
209206.001		Creston No. 2	25.20		42.80	Core	E30376-80, (-78)		64	USGS 810998	HA4A	2.70	8222	16.44	3.28	
209315.001		Creston No. 2	14.60		17.50	Core	E32281-82		70	USGS 810998	HA2A	3.10	8474	16.95	3.66	
Lathan No. 5 Coal Bed																
209227.001		Lathan No. 5	4.70		5.00	Core	E26668		62	USGS 810998	NOT USED IN DRB ESTIMATE	2.00	7420	14.84	2.70	
Lathan No. 4 Coal Bed																
219313.001		Lathan No. 4	10.40		19.60	Core	E25616		49	USGS 810998		2.00	8870	17.74	2.25	16.00
209207.001		Lathan No. 4	11.60		11.80	Core	E26669-70		62	USGS 810998	HA2A	2.60	6885	13.77	3.78	3.50
209413.001		Lathan No. 4	8.00		9.40	Core	E30944		66	USGS 810998		4.00	8500	17.00	4.71	
Lathan No. 3 Coal Bed																
209217.001		Lathan No. 3	3.40		4.40	Core	E29374		63	USGS 810998		3.00	8210	16.42	3.65	16.26
209413.001		Lathan No. 3	5.30		5.90	Core	E30945			USGS 810998		5.40	7980	15.96	6.77	4.70
209315.001		Lathan No. 3	6.40		7.50	Core	E32283		70	USGS 810998		2.90	8210	16.42	3.53	
Red Desert Area																
						Cores				RNE Coal Dev. Program	552 drill holes, 554 mill. tons, 200' DB	2.19	8100	16.20	2.70	16.20

Table 3. Sulfur and heating values for the Creston-Cherokee strippable coal deposit, Green River Coal Field, Wyoming.

Green River Coal Field, Wyoming.										Page 1 of 1		Weighted Averages				
Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (Btu/Lb)	Short Ton	Lbs S per ton	MBTU	Lbs S per ton	MBTU
199216.001	MMW	Cherokee A	90.30	93.10	2.80	2.80 Core	1-CCJ-C	Kennamer Coal Co	WA 3A	1.12	6594	13.19	1.70			
		Cherokee B		14.00	14.00 Core			USGS Nap C-73	Avg. 34 analyses	1.82	7714	15.43	2.36			
		Cherokee C		25.00	25.00 Core			USGS Nap C-73	Avg. 190 analyses	1.66	6293	16.59	2.00			
199216.002	MMW	Cherokee B and C	107.20	147.50	40.30	40.30 Core	1-CCJ-C	Kennamer Coal Co.	WA 9A	0.71	7154	14.31	0.99	16.23		
199230.001	2sec	Cherokee B and C		35.00	35.00 Cores			USGS OFR 79-1577	Avg. 65A	2.12	8083	16.61	2.65	2.19		
199234.001	2sec	Cherokee B and C		22.50	22.50 Cores			USGS OFR 79-1577	Avg. 24, high ash content, not used	3.31	5649	14.30	5.85			
199232.001		U. & L. Cherokee		36.00	36.00			Cherokee Mine Pl. NERCO 1977	WA for total coal reserves, 100 core holes	1.75	8000	16.00	2.19			
Other Fort Union Coals																
199222.001	2sec	High Point (LFU)		5.00	5.00 Cores			USGS OFR 79-1577	1A	3.33	7782	15.56	4.28			
199200.002	2sec	Low Butte (LFU)		8.00	8.00 Cores			USGS OFR 79-1577	Avg. 4A	3.57	7393	14.79	4.83			
189100.001	2sec	Chicken Springs (LFU)		3.50	3.50 Cores			USGS OFR 79-1577	Avg. 2A	1.99	8673	17.35	2.29			
129100.002	2sec	Fillmore Ranch (LFU)		22.00	22.00 Cores			USGS OFR 79-1577	Avg. 7A	0.40	8582	17.12	0.47	16.63		
189100.003	2sec	Muddy Creek (LFU)		7.50	7.50 Cores			USGS OFR 79-1577	Avg. 3A	0.50	8672	17.78	0.56	1.75		
189100.004	2sec	Separation Cr. (LFU)		8.00	8.00 Cores			USGS OFR 79-1577	Avg. 2A	0.46	8738	17.48	0.53			
129100.005	2sec	Red Rio (LFU)		10.50	10.50 Cores			USGS OFR 79-1577	Avg. 1A	0.45	8384	16.77	0.54			
189122.001	2sec	Fillmore Ranch (LFU)		19.50	19.50 Cores			USGS OFR 79-1577	Avg. 3A	0.48	8214	16.43	0.58			
159122.002	2sec	Muddy Cr. (LFU)		9.00	9.00 Cores			USGS OFR 79-1577	Avg. 1A	1.39	8199	16.40	1.70			
Other Fort Union Coals																
										RHE company data, 1976 100 drill holes, 150' overburden, 360A						
										1.50	8100	16.20	1.85	16.23		
														2.11		

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Table 4. Sulfur and heating values for the Northern Little Snake River strippable coal deposit, Green River Coal Field, Wyoming.

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Reference Number	Other Locational Data	Published or Company	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value per Short Ton	Lbs S per HHBTU	Average HHBTU/ST
Ft. Union, B and C													
L. Ft. Union													
205027.001 MESW		B, Fillmore Ranch (LFU)			Core	50-53	USGS DFR 79-116	USGS DFR 74-179	Aug. of 16 analyses	3.23	7642	15.28	4.23
209027.002 SWSE		E1, Olson Draw (LFU)			Core	RR-59	USGS DFR 79-116	Map C-68	Avg. of 4 analyses	0.87	8198	17.00	1.02
209035.001 MWNW		FU-undifferentiated			Core	RR-75	USGS DFR 79-116			0.42	8507	17.01	0.49
209029.001 SESE		B, Fillmore Ranch (LFU)		15.50	15.50 Core	RR-81	USGS DFR 79-116		From RHE Unpub. data	0.59	7653	15.31	0.77
199007.001 MSE		D1, Separation Cr. (LFU)		15.50	15.50 Core	RR-84	USGS DFR 79-116		From RHE Unpub. data	0.46	8109	16.22	0.57
209007.001 SESE		F2, Red Rim (LFU)		20.50	20.50 Core	RR-102	USGS DFR 79-116		From RHE Unpub. data	0.36	7332	13.66	0.49
209027.003 SESE		D1, Separation Cr. (LFU)		6.00	6.00 Core	RR-177	USGS DFR 79-116		From RHE Unpub. data	0.44	8432	16.86	0.52
209029.003 SESE		B, Fillmore Ranch (LFU)		16.00	16.00 Core	RR-181	USGS DFR 79-116		From RHE Unpub. data	0.25	8085	16.13	0.31
209033.001 MESN		E1, Olson Draw (LFU)			Core	RR-184	USGS DFR 79-116		From RHE Unpub. data	0.30	8682	17.36	0.35
									From RHE Unpub. data	0.31	8223	16.45	0.38
									From RHE Unpub. data	0.51	7984	15.97	0.64
China Butte-Fort Union Fa. coals													
A				4.60	4.60 Cores		RHE and Arch Min. Corp. 1977			1.18	8652	17.30	1.36
R				26.40	26.40 Cores		RHE and Arch Min. Corp. 1977			0.42	8555	17.31	0.49
C				8.60	8.60 Cores		RHE and Arch Min. Corp. 1977			0.41	8841	17.68	0.46
D				8.10	8.10 Cores		RHE and Arch Min. Corp. 1977			0.42	8375	16.75	0.50
D1				8.10	8.10 Cores		RHE and Arch Min. Corp. 1977			0.46	8788	17.58	0.52
F				9.50	9.50 Cores		RHE and Arch Min. Corp. 1977			0.44	8676	17.35	0.51
All Ft. Union					Cores		RHE Co. data, 1976			0.50	8700	17.40	0.57
Red Rim-Fort Union Fa. coals													
B1				11.30	11.30 Cores		Environmental Impact Statement 1983, 13A			0.50	8356	16.71	0.60
B2				5.00	5.00 Cores		Environmental Impact Statement 1983, 4A			0.40	8448	16.90	0.47
C				6.00	6.00 Cores		Environmental Impact Statement 1983, 5A			1.19	7745	15.49	1.54
D				5.50	5.50 Cores		Environmental Impact Statement 1983, 12A			0.40	8482	16.96	0.47
R1				8.50	8.50 Cores		Environmental Impact Statement 1983, 1A			0.52	9362	18.72	0.56
R2				7.00	7.00 Cores		Environmental Impact Statement 1983, 1A			0.34	9504	19.01	0.36
E				9.00	9.00 Cores		Environmental Impact Statement 1983, 15A			0.60	8168	16.34	0.73
R3				7.50	7.50 Cores		Environmental Impact Statement 1983, 1A			0.46	9646	19.29	0.50
F				15.30	15.30 Cores		Environmental Impact Statement 1983, 33A			0.30	8453	16.91	0.35
Pine				10.10	10.10 Cores		Environmental Impact Statement 1983, 6A			0.30	9562	19.12	0.31
G				12.00	12.00 Cores		Environmental Impact Statement 1983, 16A			0.36	9085	18.17	0.40
H				4.80	4.80 Cores		Environmental Impact Statement 1983			0.00			
All Seams							Environmental Impact Statement 1983, Avg. Red Rim Area			0.45	8560	17.12	0.53
All Ft. Union							RHE Co. data 1976			0.45	8500		
211 drill holes, 150' DB													

208506.001	Lance Fa.	8.00	8.00 Mine	#5324	USBR B22, TP484, USGS B341	Collected in 1907	0.34	9722	19.44	0.35	19.44	0.35
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Table 4. Sulfur and heating values for the Northern Little Snake River strippable coal deposit, Green River Coal Field, Wyoming.

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Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb) Short Ton	MMBTU per Ton	Lbs S per MMTU	Average
														MMBTU/ST
Atlantic Rim- Mesaverde Formation														
Almond Fa.-undifferentiated														
188911.001		A (Almond Fa)		4.70	Core			DFR79-1383	Avg. of 21, from Little Snake River Area	0.60	8510	17.02	0.71	
188911.002		B (Almond Fa)		4.90	4.90 Core			BLM Atlantic Rim Tract	5A, avg. thicknesses	0.72	10196	20.39	0.71	
188911.003		C (Almond Fa)		11.50	11.50 Core			BLM Atlantic Rim Tract	9A, avg. thicknesses	0.81	10601	21.20	0.86	
188911.004		D (Almond Fa)		9.10	9.10 Core			BLM Atlantic Rim Tract	17A, avg. thicknesses	0.89	10661	21.32	0.83	20.18
188911.005		DL (Almond Fa)		5.00	5.00 Core			BLM Atlantic Rim Tract	18A, avg. thicknesses	1.00	10362	20.72	0.97	0.79
188911.006		Almond Fa			Core			BLM Atlantic Rim Tract	5A, avg. thicknesses	0.68	10227	20.45	0.66	
									Tract Avg. is a WA	0.88	10466	20.93	0.84	

Table 5. Sulfur and heating values for the Jim Bridger strippable coal deposit, Green River Coal Field, Wyoming.

Reference Number	Other Data	Published or Company	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur (BTU/Lb) Short Ton	Heating Value per MMBTU	Lbs S per MMBTU	Averages MMBTU/ST
2110020.001		Deadman (U.B.)		4.57	31.40 face	74-20, K47372	WGS R111		Jim Bridger Strip Mine	0.50	9270	18.54	0.54
2110020.002		Deadman (I.B.)		4.82	31.40 face	74-21, K47371	WGS R111		Jim Bridger Strip Mine	0.50	7940	15.88	0.63
2110030.000		Deadman No. 2		15.00	15.00 channel		148, Penn St. Print	PSUC-465	Jim Bridger Strip Mine	0.73	9625	19.25	0.76
2110030.003		Deadman No. 2		15.00	15.00 channel		148, Penn St. Print	PSUC-465	Jim Bridger Strip Mine	0.48	10145	20.29	0.47
2110036.001	NH&W	Deadman	138.10 145.20	7.10	7.10 Core		146, Company Data		Jim Bridger Strip Mine	0.47	9350	18.70	0.50
2110036.002	NH&W	Deadman	179.70 187.30	7.80	7.80 Core		1-SCPR-C Keaneer Coal Co.	1A		0.73	9637	18.01	0.87
2110036.003	NH&W	Deadman	258.25 270.60	12.30	12.30 Core		1-SCPR-C Keaneer Coal Co.	WA 3A		0.50	9401	18.80	0.53
							1-SCPR-C Keaneer Coal Co.	WA 3A		0.47	8538	17.28	0.54
													18.89
													0.63
D-5				5.00			Mine plan 1984		234; average seam thickness	0.53	8915	17.83	0.59
D-4				8.00			Mine plan 1984		204; average seam thickness	0.56	9775	19.95	0.55
D-3				4.00			Mine plan 1984		64; average seam thickness	0.94	9178	18.36	1.02
D-2				3.00			Mine plan 1984		38; average seam thickness	0.57	9715	19.43	0.59
D-1				4.00			Mine plan 1984		94; average seam thickness	0.58	9244	18.49	0.63
Deadman				24.00	Channel		USGS DFR 77-360		Avg. 5 composite samples; Jim Bridger Mine	0.50	8850	17.65	0.57
Deadman				24.00			Mine plan 1984		Field average; average seam thickness	0.61	9473	18.95	0.64
Delivery/Production data													
		Deadman (combined)					DDE/EIA		FERC Form 423, 1983 3,887,000 tons	0.62	9422	18.84	0.66
		Deadman (combined)					DDE/EIA		FERC Form 423, 1984 4,462,000 tons	0.63	9511	19.08	0.66
		Deadman (combined)					DDE/EIA		FERC Form 423, 1985 7,160,000 tons	0.55	9539	19.06	0.58
		Deadman (combined)					DDE/EIA		FERC Form 423, 1986 6,480,000 tons	0.61	9481	18.96	0.64
		Deadman (combined)					DDE/EIA		FERC Form 423, 1987 6,601,000 tons	0.70	9596	19.19	0.75
		Deadman (combined)					DDE/EIA		FERC Form 423, 1988 6,412,000 tons	0.64	9521	18.84	0.68
		Deadman (combined)					DDE/EIA		FERC Form 423, 1989 6,023,000 tons	0.63	9344	18.69	0.67
		Deadman (combined)					DDE/EIA		FERC Form 423, 1990 5,858,000 tons	0.63	9609	19.22	0.66

Table C. Sulfur and heating values for the Leucite Hills strippable coal deposit, Green River Coal Field, Wyoming.

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Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur		Heating Value (Btu/Lb)	Moisture per Short Ton	Lbs S Moisture	Average Heating Value (Btu/Lb)
2010126.001	SN5H	Almond Coal Group	7.20	7.20	7.20 Mine	7087		US65 B381-B	Rocksprings Mine-WY Coal Co., 300' from Ent	0.55	10413	20.83	0.53		
2010126.002	SN5H	Almond Coal Group	7.20	7.20	7.20 Mine	7102		US65 B381-B	Rocksprings Mine-WY Coal Co., 1000' from Ent	0.55	10114	20.23	0.54		
2010126.003	SN5H	Almond Coal Group	7.20	7.20	7.20 Mine	7094		US65 B381-B	Rocksprings Mine-WY Coal Co., 500' from Ent	0.50	10220	20.44	0.49		
2010126.004	SN5H	Almond Coal Group	7.20	7.20	7.20 Mine	7095		US65 B381-B	Rocksprings Mine-WY Coal Co., 150' from Ent	0.56	10175	20.35	0.55		
2010126.005	SN5H	Almond Coal Group	6.40	6.40	6.40 Mine	7088		US65 B381-B	Rocksprings Mine-WY Coal Co., 50' from Ent	0.74	8334	16.67	0.89		
		Unnamed (Almond Fa.)	7.04	7.04	7.04 Mine			US65 B381-B	Rocksprings mine samples, Avg. 54	0.58	9855	19.70	0.59		
2010105.001		Unnamed (Almond Fa)	268.00	274.50	6.50 Core		9	Map C-120, RME Co. data		0.48	10358	20.72	0.46		
2010107.001		Unnamed (Almond Fa)	23.00	30.20	7.20 Core		11	Map C-120, RME Co. data		0.48	10249	20.50	0.47		
2010107.002		Lebar (Almond Fa)	48.00	53.80	5.80 Core		11	Map C-120, RME Co. data		0.35	10110	20.22	0.35		
2010115.001		Unnamed (Almond Fa)	61.00	65.80	4.80 Core		15	Map C-120, RME Co. data		0.66	9825	17.65	0.67		
2010123.001		Unnamed (Almond Fa)	113.00	117.00	4.00 Core		25	Map C-120, RME Co. data		0.78	9914	17.83	0.79		
2010123.002		Wyoming (Almond Fa)	179.00	184.90	5.90 Core		25	Map C-120, RME Co. data		0.54	9914	19.63	0.54		
2010123.003		Unnamed (Almond Fa)	221.00	227.50	6.50 Core		25	Map C-120, RME Co. data		0.58	10035	20.07	0.38		
2010127.001		Lebar (Almond Fa)	102.00	107.30	7.30 Core		29	Map C-120, RME Co. data		0.47	9893	17.38	0.49		
2010135.001		Unnamed (Almond Fa)	65.70	70.70	5.00 Core		37	Map C-120, RME Co. data		0.58	9840	19.68	0.59		
2010135.002		Unnamed (Almond Fa)	131.00	136.80	5.80 Core		37	Map C-120, RME Co. data		0.62	9802	17.60	0.63		19.91
E-14															
A-4 (Almond Fa)			5.60	5.60	5.60 Mine			BLM Pl. of Rocks Pro. 1982	Average seam thickness	0.48	9762	19.52	0.49		0.55
A-3 (Almond Fa)			4.60	4.60	4.60 Mine			BLM Pl. of Rocks Pro. 1982	Average seam thickness	0.49	9870	19.74	0.50		
A-2 (Almond Fa)			5.80	5.80	5.80 Mine			BLM Pl. of Rocks Pro. 1982	Average seam thickness	0.58	9359	18.72	0.62		
A-4 (Almond Fa)			4.00	4.00	4.00 Core			1980 Mine Plan	Avg. 10 cores	0.43	10008	20.02	0.43		
A-3 (Almond Fa)			3.70	3.70	3.70 Core			1980 Mine Plan	Avg. 20 cores	0.46	9770	19.54	0.47		
A-2 (Almond Fa)			6.50	6.50	6.50 Core			1980 Mine Plan	Avg. 25 cores	0.58	10051	20.10	0.58		
Delivery/Production data															
Almond Fa. all seams			14.20	14.20	14.20 Core			1980 Mine Plan	All seams average	0.51	9970	19.94	0.51	19.87	
Almond Fa.					Mine			RME company data, 1976	RME company data, 107 cores, 168at	0.60	9900	19.80	0.61	0.61	
Almond Fa.								DOE/EIA	FERC Form 423, 1985 194,000t	0.59	9775	19.55	0.66	Weighted Average	
Almond Fa.								DOE/EIA	FERC Form 423, 1986 151,000t	0.60	9827	19.81	0.61		
Almond Fa.								DOE/EIA	FERC Form 423, 1987 248,000t	0.68	9744	19.49	0.70	19.65	
Almond Fa.								DOE/EIA	FERC Form 423, 1988 425,000t	0.84	9792	19.59	0.86	0.69	
Almond Fa.								DOE/EIA	FERC Form 423, 1989 917,000t	0.70	9852	19.70	0.71		
Almond Fa.								DOE/EIA	FERC Form 423, 1990 1,485,000t	0.64	9836	19.67	0.65		

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Table 6. Sulfur and heating values for the Salt Wells strippable coal deposit, Green River Coal Field, Wyoming

Page 1 of 1

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating value (Btu/Lb)	MMBTU per Short Ton	Lbs S per MMBTU	Weighted Averages MMBTU/Lbs S
1410104.001 WNESE		Big Burn (ft. b.)	8-60 Channel	D1695-91				USGS PP1065B	USBR 440343, USGS 6742, weathered (not used)	0.50	6960.00	13.92	0.72	
1410216.001 WNESE		Little Valley (ft. b.)	14-70 Channel	D1695-93				USGS PP1065B	USBR 440344, USGS 137492, weathered (not used)	0.40	7690.00	15.38	0.52	
1410214.001 SESE		FT. Union Fa.	225.00	233.50	8.50	8.50 Core	80-1C	WGS R124		0.78	10130	20.26	0.77	20.72
1410122.001 WNW		FT. Union Fa.	232.00	242.00	10.00	10.00 Core	CRNE-1C	WGS R124		0.73	10120	20.24	0.72	
1410234.003 SESE		FT. Union Fa.	226.00	232.00	6.00	6.00 Core	MSR-12C	WGS R124		0.75	10430	20.86	0.72	0.77
1410221.001 SESE		FT. Union Fa.	209.00	214.00	5.00	5.00 Core	MSR-16C	WGS R124		1.07	10860	21.72	0.99	
1410221.002 SESE		FT. Union Fa.	248.00	251.00	2.40	2.50 Core	MSR-16C	WGS R124	NA	0.70	10340	20.68	0.68	
1410221.003 SESE		FT. Union Fa.	284.50	286.80	2.30	2.50 Core	MSR-16C	WGS R124		0.82	11020	22.04	0.74	
1410118.001 SESE		Almond	157.00	161.00	4.00	3.50 Core	CRNE-1C	WGS R124	Upper & lower parts of sample not coal	0.51	7800	14.00	0.73	
1410234.002 WNW		Almond	62.00	66.50	4.50	4.50 Core	MSR-14C	WGS R124	1.3 TII	2.82	10270	20.54	2.75	
1410208.001 SESE		Almond	213.00	217.80	4.80	3.50 Core	MSR-14C	WGS R124		1.10	9610	19.22	1.14	
1410208.002 SESE		Almond	362.00	367.00	5.00	5.00 Core	MSR-14C	WGS R124		0.73	11360	23.76	0.66	
1410208.003 SESE		Almond	422.20	424.00	1.80	1.80 Core	MSR-14C	WGS R124	NA	2.06	10980	21.76	1.89	
1410208.004 SESE		Almond	428.70	432.50	3.80	4.00 Core	MSR-14C	WGS R124		0.69	10570	21.14	0.65	
1410233.001 WNW		Almond	219.50	229.00	9.50	9.50 Core	PH-10C	WGS R124	Composite	0.63	11870	23.74	0.53	
1410233.002 WNW		Almond	265.10	275.00	9.50	9.50 Core	PH-10C	WGS R124	NA	0.53	11060	22.12	0.48	
1410233.003 WNW		Almond	265.50	275.00	9.50	9.50 Core	PH-10C	WGS R124	Composite	0.51	11120	22.24	0.46	
1410208.001 SESE		Almond	311.00	319.00	8.00	8.00 Core	PH-12C	WGS R124	Composite	0.52	11760	23.52	0.44	
1410208.002 SESE		Almond	358.00	364.00	6.00	6.00 Core	PH-12C	WGS R124	Composite	0.44	11940	23.88	0.37	21.07
1410218.001 SESE		Almond	141.00	145.50	4.50	4.50 Core	PH-16C	WGS R124	Composite	0.73	11010	22.02	0.66	0.62
1410218.002 SESE		Almond	170.00	175.00	5.00	5.00 Core	PH-16C	WGS R124	Composite	1.37	11620	23.24	1.18	
1410218.003 SESE		Almond	265.50	267.50	2.00	2.00 Core	PH-16C	WGS R124	Composite	0.89	11850	23.66	0.75	
1410218.004 SESE		Almond	316.00	321.50	5.50	5.50 Core	PH-16C	WGS R124	Composite	0.48	11860	23.72	0.40	
1410218.005 SESE		Almond	441.00	449.00	8.00	8.00 Core	PH-16C	WGS R124	Composite	0.51	11380	22.76	0.45	
1410218.006 SESE		Almond	212.00	218.00	6.00	6.00 Core	PH-17C	WGS R124	Composite	0.56	11650	23.26	0.48	
1410218.007 SESE		Almond	343.00	348.00	5.00	5.00 Core	PH-17C	WGS R124	Composite	0.51	11670	23.34	0.44	
1410218.008 SESE		Almond	452.20	457.00	4.80	3.00 Core	PH-17C	WGS R124	NA	0.59	9250	18.50	0.64	
1410104.001 WNESE		Shrike (Almond)			5.50 Channel	D169-95		USGS PP1065B	USBR 48347, USGS 68749	0.40	9470	18.94	0.42	
1410235.001 WNESE		Headmark (Almond)			9.30 Channel	D1695-94		USGS PP1065B	USBR 48346, USGS 49744	0.30	9210	18.42	0.33	
1410104.002 WNESE		Nagavik (Almond)			11.60 Channel	D1695-92		USGS PP1065B	USBR 48345, USGS 127420	0.20	8260	16.52	0.24	

Almond Fa.	Core	USGS exploration data	46 drill holes, 60 ft. 130' overburden	0.20	10230	22.50	0.49	20.79	0.56
Almond Fa.		Average Almond Fa.						20.76	0.57
		Average all roads (ftu and kdt)

Figure 2. Approximate stratigraphic position and correlation of coal beds and coal zones in the Red Desert strippable deposit. Black dots indicate coal beds with demonstrated reserve base coal (from Plate 1 of Masursky, 1962).

assigned an appropriate sulfur and heating value category; the amount of reserves in each coal bed(s) was taken from Smith (1972).

This deposit contains Rocky Mountain Energy Company's 554-million ton Red Desert exploration and development project. Analytical data from a 552-hole coal drilling and sampling program on this project indicates that the coal has an average sulfur content of 2.70 lbs sulfur/million Btu and a heating value of 16.20 million Btu/short ton. The coal analyses in this project area fall into the same sulfur and heating value categories as most of the coal samples collected by Pipiringos (1961) and Masursky (1962) and serve to verify the analytical data presented by those two authors.

5. Creston-Cherokee deposit. This deposit contains a remaining strippable DRB of 360 million short tons of coal (Table 1). Because no coal has been mined from this deposit, the original strippable DRB is also the remaining DRB. At least 4 strippable coal beds occur in the area (Figures 3 and 4). All the coals occur in the upper coal zone of the Fort Union Formation. The Cherokee B and C coal beds contain 200.9 million tons of DRB coal (Smith and others, 1972). After subtracting the resources in the Cherokee B and C coals from the 360 million tons of DRB coal reported by Glass (1981) for the entire area, the remaining 159.1 million tons of coal were assigned to the Cow Butte and Horse Butte coal beds.

The Cherokee B and C coal beds merge into a single, thick coal bed that averages 35.5 feet thick in the southwestern part of the area. Interburden where the two beds are separated can be up to 100 feet in the northwestern part of the area. Maximum overburden for the strippable area of the Cherokee coal beds is 140 feet. The Cow Butte and Horse Butte coal beds are up to 15 and 20 feet thick, respectively, and occur primarily in the eastern and northern parts of the area. Strippable coal for these two beds occurs where the overburden is less than 120 feet thick.

Analytical data from 499 analyses in the area (summarized in Table 3) show that the Cherokee coal beds contain about 2.19 lbs sulfur/million Btu and the other Fort Union coal beds contain about 1.75 lbs sulfur/million Btu. Sulfur contents and heating values for both the Cherokee and the other Fort Union coal beds, as well as averages for all coal beds in the deposit, are in the 15.00-19.99 million Btu/short ton category for heating content and in the 1.68-2.50 lbs sulfur/million Btu category for sulfur content. The Creston-Cherokee area contains almost 20 percent of the remaining strippable coal in the Green River Coal Field.

R92W.

R91W

0 1 2
SCALE IN MILES

Figure 3. Map showing location of estimated strippable reserves, Creston-Cherokee coal deposit, Sweetwater and Carbon Counties, Wyoming (outline from Rocky Mountain Energy Company, 1976).

Figure 4. Stratigraphic column of the Cherokee and other Fort Union Formation coal beds, Creston-Cherokee strippable coal deposit, Green River Coal Field, Wyoming (from Northern Energy Resources Company, 1977a).

6. Northern Little Snake River deposit. This deposit contains 223.3 million tons of remaining strippable DRB coal in the Lance and Fort Union Formations and about 46 million tons of remaining strippable coal in the Mesaverde Formation [or Almond Formation of the Mesaverde Group] (Table 1). Because no significant coal mining has occurred in this deposit, the total original DRB of 269.6 million short tons (Glass, 1981) is also the remaining DRB.

Most of the Fort Union Formation coals occur in the China Butte and Red Rim proposed mine areas (Figure 5). The coal beds occur in the lower coal zone of the Fort Union and are separated from the upper coal zone in the Creston-Cherokee area to the west by a middle non-coaly interval about 1,200 feet thick. The lower coal zone of the Fort Union is 1,400 to 1,500 feet thick and contains numerous minable coal beds. Correlations of coal beds and the current coal bed nomenclature for coal beds in the lower coal zone of the Fort Union in this area is given in Honey and Hettinger (1989). Coal bed designations used in the present report for the China Butte and Red Rim areas are those used by industry and may not follow those of Honey and Hettinger (1989).

In the China Butte area, six coal beds contain strippable resources. These coal beds are designated A, B, C, D, C1, and F in descending stratigraphic order. The average thicknesses of these coal beds are 4.6, 26.4, 8.6, 8.1, 8.1, and 9.5 feet respectively; the maximum overburden (or interburden)-to-coal ratio for a single, strippable coal bed is five to one, unless the maximum highwall height of 150 feet is reached first.

In the Red Rim area, as many as 12 coal beds are considered economically minable and are designated, in descending stratigraphic order, B₁, B₂, C, D, R₁, R₂, E, R₃, F, Pine, G, and H. The four thickest, most continuous coal beds are the F, G, B, and Pine, which average 15, 12, 11.3, and 10.1 feet thick, respectively. The maximum mining depth for strippable coal in this area is 150 feet or a 10:1 stripping ratio, whichever is reached first (Wyoming Department of Environmental Quality and U.S. Office of Surface Mining Reclamation and Enforcement, 1983).

Strippable coals in the Almond Formation of the Mesaverde Group are located in the Atlantic Rim proposed mine area (Figure 5). Coal beds in this area are designated A, B, C, D, and D₁, and range in thickness from 3.0 to 9.5 feet. Maximum overburden (or interburden)-to-coal ratio for a single, strippable coal bed is five to one, unless a maximum final highwall height of 150 feet is reached first. Correlations of the Almond Formation coals at Atlantic Rim with other areas or deposits have not been established

Figure 5. Map showing location of estimated strippable reserves, Northern Little Snake River coal deposit, Carbon County, Wyoming (compiled from Rocky Mountain Energy Company, 1976). Note: The Creston-Cherokee area is for reference only and is not part of the Northern Little Snake River strippable area.

Strippable coals in the Lance Formation account for only a small portion of the total coal resources in this deposit and are included with those resources in the Fort Union Formation. A single coal analysis for the Lance Formation in this area was not considered indicative of the coal in the entire formation, so this analysis was used in characterizing the Fort Union Formation coal. Strippable Lance Formation coal beds occur between the China Butte and the Atlantic Rim areas, as well as east of the Red Rim area, between the overlying Fort Union Formation and the underlying Lewis Shale. Coal thicknesses in the Lance probably do not exceed 10 feet and strippable coal is probably not above an overburden-to-coal ratio of five to one.

Some 429 coal analyses for individual coal beds were available for this deposit (Table 4 summarizes this data). Because the analytical data consists of average coal quality for each coal bed in a particular project area, average (instead of weighted average) quality for all coal beds was used in assigning coal quality categories to the reserves. The average heating value for combined Lance and Fort Union coal beds is 17.51 million Btu/short ton and the average sulfur content is 0.59 lbs sulfur/million Btu. Mesaverde Formation coals have slightly higher heat contents (20.14 million Btu/short ton) and slightly higher sulfur contents (0.79 lbs sulfur/million Btu) than the Lance and Fort Union coals.

7. Jim Bridger deposit. This deposit contains 151.2 million tons of remaining strippable DRB coal in the Deadman coal beds of the Fort Union Formation (Table 1). As many as five strippable coal beds in the Deadman coal zone of the lower Fort Union Formation coalesce into a single coal bed over 30 feet thick in the Jim Bridger mine. At least some of the coal beds in this deposit correlate with the Little Valley coal beds in the Black Butte area to the south (Glass, 1981). Strippable coal is found under less than 200 feet of overburden in this deposit. Original strippable resources of 250 million tons in this deposit (Figure 6) have been depleted by 98.8 million tons through coal production and mining losses. Cumulative coal production through 1990 was about 88.9 million tons; mining and production losses, using a 90 percent recovery factor, accounted for 9.8 million tons.

About 168 coal analyses, including 96 coal deliveries from 1983 through 1990, were used to categorize the reserves (Table 5 summarizes the data). Weighted average sulfur and Btu contents, based on linear footages of sampled coal beds, were calculated at 18.89 million Btu/short ton and 0.63 lbs sulfur/million Btu respectively. Weighted averages

Figure 6. Map showing location of estimated strippable reserves, Jim Bridger coal deposit, Sweetwater County, Wyoming (from Northern Energy Resources Company, 1977b).

based on tonnages of delivered coal were very similar to the weighted averages based on sampled coals. All coal in the deposit was therefore assigned to a single heating value category and a single sulfur category.

8. Leucite Hills deposit. The remaining strippable DRB for this deposit is 162.2 million short tons of coal (Table 1). The original strippable DRB assigned to this deposit (Glass, 1983) included both Fort Union Formation and Almond Formation coal beds but the location map of the deposit (Figure 7) indicates that only coal beds in the Almond Formation are present in this deposit. Coal resources in the Fort Union Formation occur to the east of the Leucite Hills and are part of the adjacent Jim Bridger strippable deposit (described above). The Leucite Hills deposit contained an original strippable DRB of 168 million tons. Cumulative total coal production of 4.9 million tons plus mining losses of 0.7 million tons (based on a recovery factor of 85 percent) have depleted the original DRB by about 5.8 million tons.

The Almond Formation of the Mesaverde Group contains five coal beds in the Leucite Hills area. None of these coal beds have been correlated with other areas or deposits. Three of these beds, the A2, A3, and A4, are of minable thickness (over 2.5 feet thick). The A2, A3, and A4 coal beds average 6.5, 3.7, and 4.0 feet thick, respectively, within the deposit. The maximum overburden-to-coal ratio for strippable coal in this deposit is estimated at 10 to 1, or a final highwall for all three coal beds (combined) of about 150 feet.

Analytical data were available from 247 coal analyses (summarized in Table 6), including quality data from 72 coal deliveries from 1985 through 1990. Because of the number of different coal beds in this deposit, an average (not a weighted average) heating value and sulfur content was calculated for the deposit. This average is very close to two averages for the entire deposit reported in a mine plan for the area and from other company data. Although a weighted average based on delivered tonnages placed the coal in a higher sulfur content category than the category determined from coal core analyses, the delivered coal tonnage was probably not large enough to be representative of the entire deposit. Therefore, the coal in this deposit was assigned to the sulfur and the heating categories on the basis of the coal cores and not the delivered coal analyses.

9. Black Butte deposit. Approximately 88.5 million tons of remaining strippable DRB coal are present in coal beds of the Fort Union, Lance and Almond Formation in

this deposit (Table 1 and Figure 8). The Almond and Lance Formations contain coals with the lower sulfur contents (from 0.41 to 0.60 lbs sulfur/million Btu) and account for about 59 percent of the remaining strippable DRB in this deposit. Coals in the Fort Union Formation contain 0.61 - 0.83 lbs sulfur/million Btu.

Strippable coal resources are estimated for coal beds over three feet thick and under less than 200 feet of overburden. Three to four minable coal beds in the Almond Formation of the Mesaverde Group have been named the D, C, A1, and A beds at Black Butte. The A1 and A coal beds merge to form the Lebar coal bed, which is correlative with the Mourning Dove bed mapped by the U.S. Geological Survey (Glass and Jones, 1991). As many as five minable coal beds occur in the Lance Formation at Black Butte: the Overland, Gibraltar, Black Butte, Maxwell, and Hall. These coals are each from 4 to 10 feet thick; the lower two coal beds have been correlated with the French and Bluff coal beds mapped by the U.S. Geological Survey (Glass and Jones, 1991). The lower part of the Fort Union Formation at Black Butte contains several minable coal beds, the Lower Little Valley and the Upper Little Valley. These beds reach a total combined thickness of about 25 feet and have been correlated with the Deadman coal(s) in the Jim Bridger deposit to the north. Additional strippable coal beds exist in the Black Butte area in the Fort Union and Wasatch Formations, but none of these are currently mined and none are included in the present resource estimates.

Original strippable DRB was reported as 82.6 million tons (Glass, 1981) but this estimate only includes coal resources that were dedicated to Black Butte Coal Company's contract with Idaho Power and Light. An additional 63.0 million tons should be added to this total to include coal resources dedicated to Black Butte Coal Company's contract with Commonwealth Edison (Black Butte Coal Company, 1976). The original strippable DRB for this deposit should be adjusted upward to 145.6 million tons. Original DRB for coal beds in each formation were tabulated from a "disturbance, mining and reclamation schedule" that appears on a mine map (Black Butte Coal Company, 1976). Cumulative coal production, by formation, plus mining and production losses (based on a 90 percent recovery factor) were used to calculate the remaining DRB as follows:

STATE LOCATION MAP

Figure 8. Location map of estimated strippable reserves, Black Butte coal deposit, Sweetwater County, Wyoming (from Rocky Mountain Energy Company, 1982). Stippled areas indicate locations of pits for recovering strippable coal.

Calculations for remaining strippable DRB, in millions of tons.

Numbers in parentheses are negative.

	Fort Union Formation	Lance Formation	Almond Formation	Total All Formations
A. Original Strippable DRB	79.2	48.8	17.6	145.6
B. Coal Production	(37.9)	(11.5)	(2.0)	(51.4)
C. Mining Losses	<u>(4.2)</u>	<u>(1.3)</u>	<u>(0.2)</u>	<u>(5.7)</u>
D. Production and Mining Losses (B+C)	(42.1)	(12.8)	(2.2)	(57.1)
E. Remaining strippable DRB (A+D)	37.1	36.0	15.4	88.5

Analytical data from 1,016 coal analyses (summarized in Table 7), including about 140 coal deliveries, were used to calculate weighted average sulfur contents and heating values by formation. The remaining strippable DRB for each formation was then assigned to the appropriate coal quality category. Weighted average heating values and sulfur contents from coal delivery data were not in agreement with average in-place coal quality: the average heating value of coal delivered from 1983 through 1990 is 19.09 million Btu/short ton, which is less than an average of 19.47 million Btu/short ton for all currently mined coal beds; the average sulfur content of coal deliveries was about 0.87 lbs sulfur/million Btu, which is more than the average of 0.68 lbs sulfur/million Btu for all mined coal beds. Apparently, the coal delivery data is not indicative of the coal quality "in place" and was not used to characterize the strippable reserves in this deposit.

10. Salt Wells deposit. The 60 million tons of remaining strippable DRB coal in this deposit occurs in the Almond Formation of the Mesaverde Group (Table 1). Because this deposit has not been mined, the original strippable DRB is also the remaining strippable DRB. The coals in this deposit are higher in heat content than most strippable coals in this coal field: their heating value is between 20.00 and 22.99 million Btu/short ton. The sulfur content of coals in this deposit is between 0.41 and 0.60 lbs sulfur/million Btu, amongst the lowest for strippable coals in the Green River Coal Field.

Strippable coal resources for the Almond Formation include coal beds over 2.5 feet thick (following the thickness limits for minable coal at Leucite Hills) and under less than 150 feet of overburden. Roehler (1974, 1979 a-c) has mapped and named 15 coal beds in this deposit that are over 2.5 feet thick (Figure 9). In places, 12 of these coal beds are from 5 to 10 feet thick; two coal beds are over 10 feet thick in places.

The Salt Wells strippable coal deposit consists of both privately-owned coal and Federal coal on the southeast flank of the Rock Springs uplift (Figure 10). Approximately 75 coal analyses were available for this deposit (Table 8). Although analyses for strippable coal beds in the Fort Union Formation were compiled for this report, no reserve base tonnages were available for these coal beds. An average of two weighted averages from exploration projects on both private and Federal coal lands was used to assign the Almond Formation coal resources to the appropriate sulfur and heating value categories. The average sulfur content for coal in the Almond Formation is 0.56 lbs sulfur/million Btu and the average heating value is 20.76 million Btu/short ton.

Figure 9. Approximate stratigraphic position and nomenclature for coal beds in the Almond Formation, Salt Wells strippable deposit, Green River Coal Field (modified from Roehler, 1979a-c).

Figure 10. Location map of estimated strippable reserves, Salt Wells coal deposit, Sweetwater County, Wyoming (from Rocky Mountain Energy Company, 1982).

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1. Summary. The remaining demonstrated reserve base (DRB) of strippable coal in the Hanna and Bighorn Coal Fields is 566.02 and 17.99 million short tons, respectively (Tables 1A and 1B). Coal deposits in the four mining districts of the Hanna Coal Field (Figure 1) occur in the Late Cretaceous Almond Formation (of the Mesaverde Group) and Medicine Bow Formation, the Late Cretaceous and early Tertiary (Paleocene) Ferris Formation, and the early Tertiary (Paleocene and Eocene) Hanna Formation (Figure 2). Strippable coal in the Bighorn Coal Field occurs in the Fort Union Formation (Paleocene). In the Hanna Coal Field, about 353 million tons (62 percent) of the total occurs in the Hanna Formation and about 196 million tons (35 percent) of the total occurs in the Ferris Formation.

Approximately 72 percent (410 million tons) of the 566.02 million tons of strippable DRB in the Hanna Coal Field is in the 20.00-22.99 million Btu/short ton heating content category; the remaining 28 percent (155.78 million tons) of the total has a heating content of 15.00-19.99 million Btu/short ton. The Hanna Formation contains most of the higher heating value coals; only a small amount of coal in the Hanna Formation is less than 20.00 million Btu/short ton. Strippable coals in the Bighorn Coal Field contain heating values from 20.00 to 22.99 million Btu/short ton.

The Hanna Coal Field contains strippable coal in each of the six sulfur content categories. About 71 percent of the reserves in this coal field contain less than 0.84 lbs sulfur/million Btu and nearly half the coal in the field contains 0.41-0.60 lbs sulfur/million Btu. The highest sulfur coals in the coal field occur in the Hanna Formation of the Carbon Mining District. Most of the lowest sulfur coals in the coal field occur in the Ferris Formation of the Seminoe Mining District. All of the strippable coal in the Bighorn Coal Field contains 0.41-0.60 lbs sulfur/million Btu.

Significant amounts of coal have been produced from all mining districts except the Corral Creek Mining District in the Hanna Coal Field. Since the last estimate of 648.29 million tons of remaining strippable DRB (Glass, 1979), about 45.4 million tons of coal have been depleted (through production and mining losses) from reserves in the Hanna Mining District and about 36.87 million tons of coal have been depleted from reserves in the Seminoe Mining District. The remaining strippable DRB for the Hanna Coal Field is now estimated at 566.02 million short tons.

Table 1A. Summary of remaining demonstrated reserve base (DRB) of strippable coal deposits in the Hanna Coal Field, Wyoming, through December 31, 1990 (in million short tons).

Coal Beds	Btu Content million BTU/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
		≤0.40	0.41-0.80	0.81-0.83	0.84-1.87	1.88-2.50	>2.50	
Corral Creek Mining District								
Medicine Bow Formation	15.00-19.99	--	1.08	--	--	--	--	1.08
Almond Formation	20.00-22.99	--	16.00	--	--	--	--	16.00
Subtotal		--	17.08	--	--	--	--	17.08
Carbon Mining District								
Hanna Formation	15.00-19.99	--	--	--	--	19.38	13.92	33.30
	20.00-22.99	0.88	84.68	--	--	--	--	85.56
Subtotal		0.88	84.68	--	--	19.38	13.92	118.86
Hanna Mining District								
Hanna Formation	15.00-19.99	--	2.19	--	6.38	7.32	--	15.89
	20.00-22.99	7.59	20.41	67.15	84.24	33.20	--	212.59
Subtotal		7.59	22.60	67.15	90.62	40.52	--	228.48
Seminole Mining District								
Hanna Formation	20.00-22.99	--	5.31	--	--	--	--	5.31
Ferris Formation	15.00-19.99	--	92.10	11.37	--	2.04	--	105.51
	20.00-22.99	46.61	44.17	--	--	--	--	90.78
Subtotal		46.61	141.58	11.37	--	2.04	--	201.60
All Formations and Districts								
Subtotal	15.00-19.99	--	95.37	11.37	6.38	28.74	13.92	155.78
Subtotal	20.00-22.99	55.08	170.57	67.15	84.24	33.20	--	410.24
Total		55.08	265.94	78.52	90.62	61.94	13.92	566.02
Mining District Totals								
Corral Creek		--	17.08	--	--	--	--	17.08
Carbon		0.88	84.68	--	--	--	--	85.56
Hanna		7.59	22.60	67.15	90.62	40.52	13.92	198.29
Seminole		46.61	141.58	11.37	--	2.04	--	201.60
Total		55.08	265.94	78.52	90.62	61.94	13.92	566.02
Formation Totals								
Hanna		8.47	112.59	67.15	90.62	56.90	13.92	352.65
Ferris		46.61	138.27	11.37	--	2.04	--	198.29
Medicine Bow		--	1.08	--	--	--	--	1.08
Almond		--	16.00	--	--	--	--	16.00
Total		55.08	265.94	78.52	90.62	61.94	13.92	566.02

Table 1B. Summary of remaining demonstrated reserve base (DRB) of strippable coal deposits in the Bighorn Coal Field, Wyoming, through December 31, 1990 (in million short tons).

Coal Beds	Btu Content million BTU/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
		≤0.40	0.41-0.80	0.81-0.83	0.84-1.87	1.88-2.50	>2.50	
Fort Union Fm.	20.00-22.99	--	17.99	--	--	--	--	17.99

Figure 1. Coal mining districts in the Hanna Coal Field, Carbon County, Wyoming (from Figure 2 of Glass and Roberts, 1979).

Figure 2. Generalized stratigraphic columns for the Hanna Coal Field of southcentral Wyoming (from Glass and Roberts, 1979).

Production and mining losses of 0.61 million tons from the Grass Creek strippable coal deposit in the Bighorn Coal Field have reduced the 18.60 million tons of reserves originally estimated for this field to 17.99 million short tons.

2. Methodology and assumptions. The last estimate of strippable DRB for the Hanna Coal Field (Glass and Roberts, 1979) was made on a bed-by-bed basis for each mining district in the coal field. Strippable coal in this field includes coal beds 5 feet thick or more (plus thinner beds that are currently being surface mined) that lie between 0 and 200 feet of cover. The 1979 estimate incorporated mining and production losses to January 1, 1978. Additional mining and production losses from that date through December 31, 1990, are included in the present estimate.

For the present report, all available coal analyses were compiled by coal bed. Average or weighted average sulfur and heating values were determined for each coal bed, and where appropriate, average analyses used by Glass and Roberts (1979) were revised. Production and mining losses for each coal bed were calculated using a recovery factor of 80 percent. An 80-percent recovery factor means that 80 percent of the total in-place coal reserves was recovered, and that 20 percent of the in-place coal reserves was not recovered because of mining losses and other inefficiencies. A recovery factor 88 percent was used for the strippable coal deposit in the Bighorn Coal Field. The remaining demonstrated reserve base for each coal bed was then assigned to the appropriate sulfur and heating value category. Coal beds with no analytical data were assigned sulfur and heating values based on the average sulfur content and heating value for all coal beds in the same formation within a coal mining district.

Coal bed nomenclature follows that of Glass and Roberts (1979). Industry-derived coal production, coal delivery, and analytical data were adjusted to conform to that report. Some industry-derived production data contained coal bed names not included in earlier reports; these bed names were incorporated into the terminology used by Glass and Roberts (1979) and the production and mining losses subtracted from the reserves estimated by Glass and Roberts (1979). No additional strippable coal reserves were added to those of Glass and Roberts (1979).

3. Analyses. Coal analyses used in this report were taken from various published and unpublished sources (Tables 2-6). Whenever possible, analyses located within a strippable coal deposit were used to assign coal quality categories to the DRB. In some

cases, however, analyses of nearby coal beds, analyses from adjacent underground mines, or analyses from deep drill holes were used to characterize a specific coal bed or a coal deposit. Analyses from 237 core, channel, and tipple samples and about 604 coal deliveries were used to characterize the strippable DRB in the Hanna Coal Field. Analyses from 60 core, channel, and tipple samples were used to characterize the strippable DRB in the Bighorn Coal Field.

Coal delivery data reported by mine (Table 7) could not be used to characterize a specific coal bed because the data represents aggregate production from more than one coal bed. The coal delivery data was used, instead, to verify coal quality at the mine. Sulfur and heating values from coal deliveries reported from each mine were weighted by the tonnage of each delivery; a weighted average for all deliveries for all years was then determined. In-place coal quality at the mine was determined by averaging the analyses of individual coal beds within the mine.

All analyses were evaluated on an individual basis where appropriate. Analyses from poorly located data points were not used. Analyses with anomalously low heating values due to weathering or high ash contents were also not used. Where only partial thicknesses of a coal bed were sampled and analyzed and no other information was available nearby, the data was not considered representative of the entire coal bed and were not used in this study. Where only partial thicknesses of a coal bed were sampled and analyzed and there *was* other information on coal thicknesses and quality (of complete coal beds) available nearby, the analyses were weighted by linear footage sampled.

4. Corral Creek Mining District. Strippable coal beds in the Medicine Bow and Almond Formations (Figure 3) account for 17.08 million tons of the DRB for the Hanna Coal Field. Analyses are available from three channel samples of Medicine Bow Formation coals and from core samples of Almond Formation coals at an exploration/development project (Table 2). The Medicine Bow Formation contains three strippable coal beds (Figures 4 and 5; Table 8) and the Almond Formation contains seven strippable coal beds (Figures 6 and 7; Table 8). Coal beds with an estimate of strippable DRB tonnage, but with no coal analyses, were assigned to coal quality categories based on an average heating value and sulfur content for all coal beds in either the Almond or the Medicine Bow Formations in this mining district.

Table 2. Sulfur and heating values for the Coral Creek Mining District, Hanna Coal Field.

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur
Medicine Bow Formation											
258521.001 SW SE		Penn-Wyoming (Kmb)		4.80		mine	3919 (1908 data)		USBM B22; USBM TP 484	USGS E.318; T&R; Penn-Wyoming Mine	0.58
258531.001 NE SW		Miller (Kmb)		10.50	11.50	mine	3917 (1908 data)		USBM B22; USBM TP 484	USGS E.318; T&R; Miller Mine	0.79
248581.981		O'Brien-Goring (Kmb)		3.20	4.80		K-555438K-5914		WGS RH-27; O'Brien-Spring Mine	Weathered, not used in DRB estimate	0.50
Almond Formation											
									BLM Tract Summary Report	Tract average, Almond Formation	0.55

District average—all formations and beds

Average Med

iCreek Mining District, Hanna Coal Field.

id or any position	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb)	MMBTU per Short Ton	Lbs S per MMBTU	Million Btu per short ton/ lbs. sulfur
19 (Kmb)	4.30 10.50	4.30 10.50	11.50	mine mine	3918 (1908 data) 3917 (1908 data)		USBM B-22:USBM TP 484 USBM B-22:USBM TP 484	USGS B-318:T&R;Penn-Wyoming Mine USGS B-318:T&R;Miller Mine	0.28 0.79	9130 10517	18.28 21.03	0.31 0.75	
20 (Kmb)	8.20	8.20	4.90		K-55540&K-55914		WGS-TP-27-019men-Spring Mine	Weathered, not used in DRB estimate	0.30	5980	11.89	0.50	
Weighted Average Medicine Bow Formation.									19.65/0.53				
Tract average, Almond Formation									0.55	11081	22.16	0.50	22.16/0.50

BLM Tract Summary Report

Average Medicine Bow and Almond Formations 20.91/0.52

Table 3. Sulfur and heating values for the Carbon Mining District, Hanna Coal Field.

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Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value BTU/Lb	MAASTU per Short Ton	Use 8 MAASTU
Carbon 4														
				10.10				WGS RI 17			0.54	10560	21.12	0.51
Carbon 5														
				6.36				WGS RI 17			0.33	10540	21.06	0.31
228034.101		Carbon 6, rider	150.00	120	1.20	Core	76-4K72359.D180040	WGS-C1 WGS RI 16			2.70	9600	19.20	2.81
228034.102		Carbon 6, rider	164.30	186.10	1.80	Core	76-5K72360.D180041	WGS-C1 WGS RI 16			5.20	9500	18.00	5.40
228034.103		U. Carbon 6	214.70	217.00	2.30	Core	76-5K72361.D180042	WGS-C1 WGS RI 16			2.30	9500	18.18	2.40
228034.104		L. Carbon 6	238.60	247.90	1.80	Core	76-16K72362.D180043	WGS-C1 WGS RI 16		Not used in DRB estimate.	2.70	9140	10.28	3.20
228035.101		U.A.L. Carbon 6	252.50	241.00	6.20	Core	76-14K72370	WGS-C3 WGS RI 16			1.90	9240	18.48	2.00
Carbon 7														
228034.105		U. Carbon 7, U.A.L.	273.80	277.80	4.00	Core	76-85.9.D180044	WGS-C1 WGS RI 16		Weighted average, 2 analyses	7.39	7029	14.06	10.91
228035.102		L. Carbon 7	285.10	272.00	3.80	Core	76-15.16	WGS-C3 WGS RI 16		Weighted average, 2 analyses	5.00	9440	16.86	5.30
228034.106		L. Carbon 7	284.30	285.60	1.30	Core	76-10K72365	WGS-C1 WGS RI 16			3.00	9830	19.86	3.06
228035.103		L. Carbon 7	283.20	285.20	2.00	Core	76-17K72372	WGS-C3 WGS RI 16			1.50	10550	21.10	1.40
Carbon 8														
228034.107		Bed 111	468.70	463.00	4.30	Core	76-11K72366	WGS-C1 WGS RI 16			1.90	6330	12.86	3.00
228035.104		Bed 111	448.60	462.00	3.40	Core	76-18K72373	WGS-C3 WGS RI 16		Weighted average bed 111.	2.80	7690	15.70	3.51
Carbon 9														
218032.101		U. Bed 109	476.60	526.80	1.80	Core	76-16K72374	WGS-C3 WGS RI 16		Not used in DRB estimate.	0.90	3070	10.14	1.78
218032.102		U.A.L. Bed 109	100.90	110.95	7.75	Core	76-12.13	WGS-C2 WGS RI 16		Weighted average, 2 analyses	2.80	8750	17.50	3.20
Carbon 10														
208005.101 SW NE		Finch	67.00	75.00	8.00	Core	No. 655 Wyo. Coal. Fin.	3MS-CH461 U.P. Resources, CTRE analysis		TAR-ID of bed from G.Glass maps	0.59	10765.00	21.59	0.61
208005.102 SE NE		Finch	59.00	65.30	6.30	Core	No. 657 Wyo. Coal. Fin.	1AS-CH462 U.P. Resources, CTRE analysis		TAR-ID of bed from G.Glass maps	0.67	10892.00	21.92	0.61
208005.103 NE NW		Finch	88.16	98.63	9.70	Core	No. 659 Wyo. Coal. Fin.	2AS-CH463 U.P. Resources, CTRE analysis		TAR-Presumed Finch from given info.	0.53	11247.00	22.49	0.47
208005.104 SW NW		Finch	58.00	68.63	10.60	Core	No. 661 Wyo. Coal. Fin.	4AS-CH463 U.P. Resources, CTRE analysis		TAR-Presumed Finch from given info.	0.52	11322.00	22.84	0.48
218032.101 NE SE		Finch			18.6	T(7)		USSEM printout TAR		Ek Mountain Mine, Calc. ROM, (1942)	0.60	11480.00	22.90	0.52
218032.102 SE NE		Finch			18.6	T(7)		USSEM printout TAR		Gary Mine, Calc. ROM, (1942)	0.60	11380.00	22.72	0.53
218032.103 SE NE		Finch			18.6	T(7)		USSEM printout TAR		Gary Mine, Calc. ROM, (1942)	0.60	11060.00	22.12	0.71
218032.104 SE NE		Finch			18.6	D(7)		USSEM printout TAR		Gary Mine, Calc. ROM, (1942)	0.60	10830.00	21.86	0.64
218032.105 SE NE		Finch			18.6	D(7)		USSEM printout TAR		Gary Mine, Calc. ROM, (1942)	0.70	10650.00	21.84	0.64
218032.106 SE NE		Finch			14.30	D(7)		USSEM TP 464-TAR		J. Johnson drift mine, USSEM (1923)	0.90	11180.00	22.32	0.65
218032.107 SE NE		Finch	40.00		8.00	mine	93465			Weighted average Finch bed				
Carbon 11														
207908.101 NW SE		Johnson	233.00	244.60	5.40	mine	22800	USSEM TP 464 & USSEM BUL 123		TAR-Presumed Johnson Bed	0.85	10807.00	21.61	0.76
208005.102 SW NE		Johnson	207.66	220.75	11.80	Core	No. 658 Wyo. Coal. Fin.	1AS-CH462 U.P. Resources, CTRE analysis		TAR-ID of bed from G.Glass maps	0.47	11205.00	22.47	0.48
208005.103 SE NE		Johnson	204.75	244.08	9.30	Core	No. 659 Wyo. Coal. Fin.	2AS-CH463 U.P. Resources, CTRE analysis		TAR-Presumed Johnson from given info.	0.53	11025.00	22.05	0.48
208005.104 SE NW		Johnson	228.00	238.75	11.80	Core	No. 660 Wyo. Coal. Fin.	4AS-CH463 U.P. Resources, CTRE analysis		TAR-ID of bed from G.Glass maps	0.45	11390.00	22.70	0.53
208005.105 SW NW		Johnson	91.00	111.00	12.80	Core	#992.559 Wyo. Coal. Fin.	1AS-CH414 U.P. Resources, CTRE analysis		TAR-Presumed Johnson, WA 2 core analysis	0.86	11021.00	22.04	0.80
217921.101 NE NW		Johnson	58.00	58.00	19.00	Core	#994.559 Wyo. Coal. Fin.	2AS-CH415 U.P. Resources, CTRE analysis		TAR-Presumed Johnson, WA 2 core analysis	0.86	11242.00	22.46	0.61
217921.102 S line SW NW		Johnson	50.00		18.80	mine	A14123 USGS (1929)	USSEM TP 464		TAR-Presumed Johnson, WA 2 core analysis	0.70	11500.00	23.10	0.61
218032.101		Johnson				T(7)		USSEM printout TAR		Carbon County Mine, (drift) Mine	0.90	11550.00	23.10	0.65
218032.102 NE SW(7)		Johnson								Weighted average Johnson bed				

Mining District average, all coal beds.

Depth Interval		Sample Thickness	Sample Type	Sample Number	Dip Hole	Data Source	Remarks	Percent Subr	Heating Value (BTU/lb)	MMSTU per Short Ton	Use 8 per MMSTU	Million Btu per short ton
From	To	Thickness	Type	Number	Hole	Source						
Mining District, Hanna Coal Field.												
10.10												
WGSR RI 17												
8.35												
WGSR RI 17												
152.00	160.20	1.20	Core	76-4, K7259, D118040	WGSR-C1	WGSR RI 16		2.70	9800	19.20	2.81	
164.30	182.10	1.80	Core	76-5, K7260, D118041	WGSR-C1	WGSR RI 16		5.20	9800	18.00	5.47	
214.70	217.00	2.30	Core	76-8, K7261, D118042	WGSR-C1	WGSR RI 16		2.30	9800	18.18	2.40	
233.90	251.90	1.80	Core	76-11, K7262, D118043	WGSR-C1	WGSR RI 16	Not used in DRB estimate.	2.70	9140	10.28	3.23	
232.50	241.00	8.50	Core	76-14, K72370	WGSR-C3	WGSR RI 16		1.90	9240	18.48	2.06	
Weighted average Carbon No. 6 bed 18.65 / 2.91												
273.80	277.80	4.00	Core	76-65, D118044	WGSR-C1	WGSR RI 16		7.39	7029	14.06	10.51	
288.10	272.00	3.90	Core	76-15, 153.16	WGSR-C3	WGSR RI 16	Weighted average, 2 analyses	5.00	9440	18.06	5.30	
284.30	285.80	1.30	Core	76-10, K72365	WGSR-C1	WGSR RI 16	Weighted average, 2 analyses	3.00	9800	18.06	3.05	
283.20	285.20	2.00	Core	76-17, K72372	WGSR-C3	WGSR RI 16		1.50	10550	21.10	1.42	
Weighted average Carbon No. 7 bed 17.64 / 6.21												
468.70	463.00	4.30	Core	76-11, K72366	WGSR-C1	WGSR RI 16		1.90	6330	12.66	3.00	
468.60	462.00	3.40	Core	76-18, K72373	WGSR-C3	WGSR RI 16		2.60	7620	15.70	3.31	
Weighted average bed 111 14.00 / 3.14												
498.90	508.90	1.90	Core	76-19, K72374	WGSR-C3	WGSR RI 16	Not used in DRB estimate.	0.90	3670	10.14	1.76	
100.90	110.95	7.75	Core	76-13, 13.13	WGSR-C2	WGSR RI 16	Weighted average, 2 analyses	2.80	8790	17.90	3.20	
Weighted average bed 100 17.50 / 3.20												
67.00	75.00	8.00	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.59 0.67 0.53 0.52	10795.00 10992.00 11247.00 11522.00	21.59 21.92 22.46 22.94	0.95 0.81 0.47 0.46	
59.00	65.30	6.30	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.60 0.60 0.60 0.60	11460.00 11460.00 11460.00 11460.00	22.80 22.80 22.80 22.80	0.82 0.82 0.82 0.82	
59.00	68.53	9.70	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.60 0.60 0.60 0.60	11380.00 11380.00 11380.00 11380.00	22.72 22.72 22.72 22.72	0.83 0.83 0.83 0.83	
59.00	68.53	9.70	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.60 0.60 0.60 0.60	11060.00 11060.00 11060.00 11060.00	22.12 22.12 22.12 22.12	0.72 0.72 0.72 0.72	
59.00	68.53	9.70	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.60 0.60 0.60 0.60	10650.00 10650.00 10650.00 10650.00	21.86 21.86 21.86 21.86	0.95 0.95 0.95 0.95	
59.00	68.53	9.70	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.60 0.60 0.60 0.60	10650.00 10650.00 10650.00 10650.00	21.84 21.84 21.84 21.84	0.94 0.94 0.94 0.94	
40.00	40.00	8.00	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.50 0.50 0.50 0.50	11100.00 11100.00 11100.00 11100.00	22.32 22.32 22.32 22.32	0.45 0.45 0.45 0.45	
Weighted average Frisch bed 22.19 / 0.57												
233.00	244.00	5.40	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.85 0.47 0.53 0.57	10807.00 11205.00 11025.00 11390.00	21.61 22.47 22.05 22.67	0.79 0.42 0.46 0.33	
237.86	237.75	13.10	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.48 0.48 0.48 0.48	11021.00 11021.00 11021.00 11021.00	22.04 22.04 22.04 22.04	0.80 0.80 0.80 0.80	
234.75	244.08	9.30	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.85 0.85 0.85 0.85	11242.00 11242.00 11242.00 11242.00	22.46 22.46 22.46 22.46	0.80 0.80 0.80 0.80	
238.00	238.75	11.80	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.70 0.70 0.70 0.70	11500.00 11500.00 11500.00 11500.00	23.10 23.10 23.10 23.10	0.61 0.61 0.61 0.61	
91.00	111.00	12.00	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.50 0.50 0.50 0.50	11500.00 11500.00 11500.00 11500.00	23.10 23.10 23.10 23.10	0.43 0.43 0.43 0.43	
55.00	55.00	19.00	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.50 0.50 0.50 0.50	11500.00 11500.00 11500.00 11500.00	23.10 23.10 23.10 23.10	0.43 0.43 0.43 0.43	
50.00	50.00	8.00	Core	No. 655 Wyo Coal. No. 657 Wyo Coal. No. 659 Wyo Coal. No. 661 Wyo Coal.	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	34S:CH451 UP Resource, CT&E analysis 14S:CH452 UP Resource, CT&E analysis 24S:CH453 UP Resource, CT&E analysis 44S:CH454 UP Resource, CT&E analysis	T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps T&R:ID of bed from G. Glass maps	0.50 0.50 0.50 0.50	11500.00 11500.00 11500.00 11500.00	23.10 23.10 23.10 23.10	0.43 0.43 0.43 0.43	
Weighted average Johnson bed 22.46 / 0.53												

Mining District average, all coal beds. 18.36 / 2.17

Table 4. Sulfur and heating values for the Hanna Mining District, Hanna Coal Field.

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb)
228108.001		Bed 76		7.80	11.20	Core	74-14		Arch Miner. Core An. Report WGS RI 27	Semirite No. 2 mine; T&R Semirite No. 2 mine	0.80	9760
228132.003		Bed 76									0.70	10090
											Weighted average of bed	
228129.002	General loc.	Bed 77			5.10				DES S. Central Wyo. T&R		1.42	9990
											Weighted average of bed	
228129.003	General loc.	Bed 76			8.00				DES S. Central Wyo. T&R		0.89	10085
											Weighted average of bed	
228116.001 SW 1/4		Bed 79	528.00	549.00	22.40	Core	H69C-79 K94743 (USBM)	H69C	RME Accu-labs analysis; T&R	Probably Bed 79 is 78 on report; Composite	1.01	10027
228116.001 SE SE		Bed 79							G. Glass. Sample N. PK T&R	Bed 77; #D197316; #77-10; Semirite #2; WGS RI 27	1.10	11105
228102.001 SWS WNE		Bed 79, upper 7.5'			7.50	Channel?	K94746 USBM		G.B. Glass collector; T&R	USGS #D197319; WGS Field #77-4; Rosebud PE 6	1.00	10078
											Weighted average of bed	
228136.001		Bed 79-A	50.00	58.80	6.80	13.65 Channel	C-44280		Unpub. USBM printout; T&R	Public Mine; (1945)	0.80	10402
											Weighted average of bed	
228103.001 SE SW		Bed 80	57.00	70.95	13.95	16.65 Channel	K-47599 USBM		WGS RI 11:74-24; T&R	Rosebud pit 4; WGS-24	1.20	10480
228103.002		Bed 80				Drill Cut			T&R	Rosebud pit 4	0.88	10888
228103.003		Bed 80				Drill Cut			T&R	Rosebud pit 4; Hole drilled to 12.7 ft	1.05	10427
228103.004		Bed 80				Drill Cut			T&R	Rosebud pit 4; Hole drilled to 12.7 ft	1.05	10097
228103.005		Bed 80				Drill Cut			T&R	Rosebud pit 4	1.05	10092
228103.006		Bed 80				Drill Cut			T&R	Rosebud pit 4	1.05	10707
228103.007		Bed 80				Drill Cut			T&R	Rosebud pit 4	1.05	10483
228103.008		Bed 80				Drill Cut			T&R	Rosebud pit 4	0.82	10748
228103.009		Bed 80				Drill Cut			T&R	Rosebud pit 4	1.07	10082
228108.002 sec. 17		Bed 80	13.75		4.41	13.75 Channel			Penn St. Printout PSOC-087	T&R	1.05	10093
228120.001 sec. 207		Bed 80				7 Channel			Penn St. printout PSOC-088	7 Ship mine; sample 63' semirite zone; T&R	1.15	9841
228129.004 General loc.		Bed 80							DES S. Central Wyo. T&R	Listed as bed 79 but is probably 80	0.88	10460
228134.002 NW 1/4		Bed 80							Rosebud Coal Sales; T&R	Rosebud PE No. 6; Typ. production analysis	0.70	11910
228134.004 SW 1/4		Bed 80							WGS RI 11: T&R	Rosebud No. 8 Mine	0.57	12208
228115.002 SW		Bed 80	100.30	118.10	18.10	18.10 Channel			RME-Hazen Research; T&R	Average of composites	0.93	11309
228118.003 SW 1/4		Bed 80	1632.20	1642.50	10.50	77 Core	H69CA-80	H69CA	RME-Hazen Research; T&R	Average of composites	0.80	11305
228117.001 NW 1/4		Bed 80	273.50	299.00	26.50	Core	H69C-80	H69C	RME-Hazen Research; T&R	Average of composites	0.58	11928
228123.002 SW 1/4		Bed 80	335.00	556.00	21.60	Core	H69C-80	H69C	RME Accu-labs analysis; T&R	Composite No. H69	0.99	11898
228123.003 SE SE NW		Bed 80	1180.50	1180.00	19.50	Core	ALR4-281-2104 Comp.	H69C	RME-Hazen Research; T&R	Average of composites	0.55	10028
228123.004 SE SW		Bed 80	1832.00	1853.50	21.50	Core	H69C-80	H69C	RME-Hazen Research; T&R	Composite	0.78	10865
228123.005		Bed 80	577.50	590.00	12.50	Core	H71C	H71C	RME Accu-labs analysis; T&R	Average of composites	0.51	10712
228123.006		Bed 80	958.00	977.00	19.00	Core	H71C	H71C	RME-Hazen Research; T&R	Average of composites	0.47	10841
228135.004 NW 1/4		Bed 80	577.00	590.00	13.00	Core	H67C	H67C	RME-Hazen Research; T&R	Average of composites	1.00	10738
228135.006		Bed 80	1012.00	1027.20	10.00	10.00 Channel	H67C	H67C	Penn St. Printout; T&R	Ship mine?	0.86	10885
228136.002		Bed 80							Penn St. Printout; T&R	Ship mine?		
228136.003		Bed 80				10.00 Channel	PSOC-491 PSOC-499				Weighted average of bed	

Mining District, Hanna Coal Field

Core by Location	Depth Interval From	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/Lb)	MMSTU Short Ton	MMSTU per million Btu	Lbs Sulfur per MMSTU	Million Btu per short ton/ Lbs. sulfur
	7.80	11.20	Core	74-14		Arch Miner. Core An. Report WGS RI 27	Seminole No. 2 mine; T&R Seminole No. 2 mine	0.80 0.70	9760 10860	19.52 21.38	0.61 0.85		20.12 / 0.63
							Weighted average of bed 78						
								1.42	9880	19.78	1.44		19.78 / 1.44
							Weighted average of bed 77						
								0.89	10085	20.17	0.86		20.17 / 0.86
							Weighted average of bed 78						
								0.89	10085	20.17	0.86		20.17 / 0.86
							Weighted average of bed 79						
								1.01	10827	21.85	0.93		21.85 / 0.93
							Probably Bed 79 is 78 on report; Composite Bed 77; #D197316; #77-10; Seminole #2, WGS 1; 27 USGS #D197312; WGS Field #77-4; Rosebud Pit 6	1.10 1.00	11105 10578	22.21 21.15	0.98 0.85		21.80 / 0.86
							Weighted average of bed 79						
								0.80	10420	20.84	0.77		20.84 / 0.77
							Weighted average of bed 78-A						
								0.80	10420	20.84	0.77		20.84 / 0.77
							Weighted average of bed 78-A						
								1.20	10480	20.80	1.15		20.80 / 1.15
							Rosebud pit 4S; WGS-24	0.88	10886	21.88	0.82		21.88 / 0.82
							Rosebud pit 4	1.05	10427	20.86	1.01		20.86 / 1.01
							Rosebud pit 4; Hole drilled to 12.7 ft	1.05	10307	20.81	1.02		20.81 / 1.02
							Rosebud pit 4; Hole drilled to 12.7 ft	1.05	10582	21.10	1.00		21.10 / 1.00
							Rosebud pit 4	1.05	10707	21.41	0.98		21.41 / 0.98
							Rosebud pit 4	1.05	10483	20.83	1.00		20.83 / 1.00
							Rosebud pit 4	0.82	10748	21.80	0.88		21.80 / 0.88
							T&R	1.07	10582	20.70	1.03		20.70 / 1.03
							78 ft mine; sample 53' semibre zone; T&R	1.05	10803	21.81	0.97		21.81 / 0.97
							Lined as bed 79 but is probably 80	1.15	10411	18.88	1.18		18.88 / 1.18
							Rosebud Pit No. 6; Typ. production analysis	0.88	10480	20.80	0.94		20.80 / 0.94
							Rosebud No. 8 Mine	0.70	11510	23.02	0.61		23.02 / 0.61
							Average of composites	0.97	12308	24.82	0.46		24.82 / 0.46
							Average of composites	0.93	11309	22.82	0.82		22.82 / 0.82
							Average of composites	0.80	11505	22.79	0.83		22.79 / 0.83
							Composite No. 140	0.58	11858	23.92	0.49		23.92 / 0.49
							Average of composites	0.89	11886	23.78	0.83		23.78 / 0.83
							Average of composites	0.55	10828	21.88	0.80		21.88 / 0.80
							Composite	0.78	10885	21.97	0.71		21.97 / 0.71
							Average of composites	0.51	10712	21.42	0.48		21.42 / 0.48
							Average of composites	0.47	10841	21.08	0.43		21.08 / 0.43
							Ship mine?	1.00	10736	21.47	0.93		21.47 / 0.93
							Ship mine?	0.86	10885	21.37	0.92		21.37 / 0.92
							Weighted average of bed 80						
								0.86	10885	21.37	0.92		21.37 / 0.92

Table 4. Sulfur and heating values for the Hanna Mining District, Hanna Coal Field.

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/Lb)	MMBTU per Short Ton
238134.001	NE NW	Bed 82	73.80	84.85	11.25 channels?	WGOS-23		WGOS RI 11; T&R	Rosebud No. 5 Mine, weathered Rosebud Pit 5, Av. of 8 A, with no thickness	1.00	10830	21.1
238134.003	Bed 82	Bed 82	1161.00	1168.70	Core	H63CA		Rosebud; T&R	Average of composites	0.81	10501	21.1
238115.002	SW SW	Bed 82	1804.00	1814.80	Core	H64C-82		RME-Hazen Research; T&R	Average of composites	1.25	10949	21.1
238115.003	Bed 82	Bed 82	43.00	48.83	Core	H68-82		RME-Hazen Research; T&R	Average of composites	0.85	11831	23.1
238117.002	Bed 82	Bed 82	1464.50	1473.00	Core?	H68-82		Rosebud Pit 5	Average of 8 & BTU values on 6 pages, not WA	1.73	10180	20.1
238134.005	SE SE NW	Bed 82	672.00	680.30	Core	H61C-82		RME-Hazen Research; T&R	Average of composites	0.81	10501	21.1
238123.001	SW SW	Bed 82	204.00	210.00	Core	H71C-82		RME-Hazen Research; T&R	Average of composites	0.92	11220	22.4
238135.003	Bed 82	Bed 82	204.00	210.00	Core	H72C-82		RME-Hazen Research; T&R	Average of composites	1.06	8755	17.8
238135.005	NW NW	Bed 82	204.00	238.00	Core	H72C-82		RME-Hazen Research; T&R	Average of composites	1.06	8666	18.3
238135.008	SE NW	Bed 82	204.00	212.00	Core	H67C-82		RME-Hazen Research; T&R	Average of composites	1.06	9000	19.0
238135.007	Bed 82	Bed 82	621.00	629.00	Core	H72C-81		RME-Hazen Research; T&R	Probably Bed 82, is 81 on report	1.18	10413	20.1
238135.004	Bed 82	Bed 82	621.00	629.00	Core	H65C-82		RME-Hazen Research; T&R	Average of composites	1.25	9881	18.3
					Core	K84744 (USBM)		USGS#D187317; WGOS Field#77-11	T&R; Rosebud Pit 9	1.70	10186	20.3
Weighted average of bed 82												
238123.001	SW SW	Bed 83	437.50	443.25	Core	H60-78		RME-Hazen Research; T&R	Probably Bed 83, is 79 on report; Composite	0.82	10887	21.7
238123.005	SE SE NW	Bed 83	1075.50	1082.00	Core	H61C-84		RME-Hazen Research; T&R	Probably Bed 83, is 84 on report; Composite	0.85	11223	22.4
238135.001	Bed 83	Bed 83	322.00	328.00	Core	H65C-84		RME-Hazen Research; T&R	Composite	0.59	9830	18.8
238125.002	Bed 83	Bed 83	308.00	315.00	Core	H71CA-84		RME-Hazen Research; T&R	Probably Bed 83, is 84 on report; Composite	0.72	8235	16.8
238115.004	SW	Bed 83	837.00	841.00	Core	H63C-78		RME-Hazen Research; T&R	Probably Bed 83, is 78 on report; Composite	0.54	11300	22.6
Weighted average of bed 83												
238115.008	NW NW	Bed 84?	1482.00	1470.00	Core	H64C-84		RME-Hazen Research; T&R	May be Bed 83? Calculated composite	0.81	11724	23.4
238123.009	SE SE NW	Bed 84	690.25	694.40	Core	H61C-85		RME-Hazen Research; T&R	Probably Bed 84, is 85 on report; Composite	0.75	10520	21.0
Weighted average of bed 84												
248135.008		Bed 86(?)		4.00	4.40 Mine	3780		USBM B22 & TP484; USGS B316	Coulter Mine; T&R; (1909)	2.27	10245	20.4
Weighted average of bed 86												
228103.001	SW/E	Hanna No. 1			Tipple			USBM Unpub. pitribout	(1954)ROM; Nugget No. 5 mine; T&R	0.80	10880	21.7
228108.001	NW/NW	Hanna No. 1			Tipple			Unpub. USBM pitribout	T&R; Hanna No. 4--A underground mine (1952)	0.26	11200	22.4
228110.001	SW/E	Hanna No. 1			Delivered			Unpub. USBM pitribout	T&R; Nugget mine; run of pits 1, 2, 5	0.90	10880	21.9
228110.003	SW/E	Hanna No. 1			Delivered			Unpub. USBM pitribout	T&R; Nugget mine; run of pits 1, 2, 5	0.40	10870	21.7
228110.004	SW/E	Hanna No. 1			Delivered			Unpub. USBM pitribout	T&R; Nugget mine; run of pits 1, 2, 5	0.40	11480	22.8
228110.005	SW/E	Hanna No. 1			Tipple			Unpub. USBM pitribout	T&R; Nugget mine; run of pits 1, 2, 5	0.40	11020	22.0
228110.006	SW/E	Hanna No. 1			Tipple			Unpub. USBM pitribout	T&R; Nugget mine; run of pits 1, 2, 5	0.40	11130	22.2
228116.001	SW/E	Hanna No. 1			Tipple			Unpub. USBM pitribout	T&R; Nugget mine; run of pits 1, 2, 5	0.30	10840	21.6
228116.002	SW/E	Hanna No. 1			Tipple			Unpub. USBM pitribout	T&R; Nugget No. 2 mine	0.50	10860	21.9
228120.002	SW/NW	Hanna No. 1		5.00	3805 USBM (1909)			USGS B.316; Hanna No. 1 Slope mine	T&R; Nugget No. 2 mine	0.40	11080	22.0
228120.003	SW/NW	Hanna No. 1		9.30	3606 USBM (1909)			USGS B.316; Hanna No. 1 Slope mine	USGS B.316; Hanna No. 1 Slope mine	0.49	11302	22.6
228120.004	SW/NW	Hanna No. 1		4.00	3607 USBM (1909)			USGS B.316; Hanna No. 1 Slope mine	USGS B.316; Hanna No. 1 Slope mine	0.39	11248	22.5
228129.001	General loc.	Hanna No. 1			18.70			DES S. Central Wyo.; T&R	USGS B.316; Hanna No. 1 Slope mine	0.44	11070	22.1
Weighted average of Hanna No. 1												

Mining District, Hanna Coal Field.

Mining District, Hanna Coal Field.										Lbs	MMBTU	MMBTU	MMBTU	
Location	Depth Interval	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/Lb)	Sulfur	per	per	per	
										Short Ton	Short Ton	Short Ton	Short Ton	
	73.80	84.85	11.25 chert/ core?	WGS-23	H63CA	WGS RI 11;T&R	Rosebud No. 5 Mine;weathered	1.00	10830	1.00	21.06	0.92		
	1161.00	1166.70	Core	H63CA-82	H63CA	Rosebud;T&R	Rosebud Pt 5;Av. of 6 A within thickness	0.81	10501	0.81	21.00	0.77		
	1804.00	1814.80	Core	H64C-82	H64C	RME:Hazen Research;T&R	Average of composites	1.25	10646	1.25	21.90	1.14		
	43.00	48.83	Core	H68-82	H68	RME:Hazen Research;T&R	Average of composites	0.95	11831	0.95	23.06	0.95		
			Core	H68-82		RME:Hazen Research;T&R	Average of composites	1.73	10180	1.73	20.32	1.70		
			Core?			Rosebud;Pt 5	Average of 8 & BTU values on 3 pages, not WA	0.81	10501	0.81	21.00	0.77		
	1464.50	1473.00	Core	H61C-82	H61C	RME:Hazen Research;T&R	Average of composites	0.82	11220	0.82	22.44	0.82		
	672.00	680.30	Core	H71C-82	H71C	RME:Hazen Research;T&R	Average of composites	1.06	8755	1.06	17.51	1.21		
	204.00	210.00	Core	H72C-82	H72C	RME:Hazen Research;T&R	Average of composites	1.08	9666	1.08	19.71	1.10		
	230.00	238.00	Core	H67C-82	H67C	RME:Hazen Research;T&R	Average of composites	1.09	9500	1.09	18.00	1.15		
	204.00	212.00	Core	H72C-81	H72C	RME:Hazen Research;T&R	Probably Bed 82 is 81 on report	1.18	10413	1.18	20.83	1.11		
	821.00	828.00	Core	H65C-82	H65C	RME:Accu-labs analysis;T&R	Probably Bed 82 is 81 on report	1.25	9891	1.25	19.38	1.29		
			Core				RME:Hazen Research;T&R	Average of composites	1.70	10186	1.70	20.37	1.87	
			7.80		K94744 (USBM)		USGS#D197317;WGS Field#77-11	T&R;Rosebud Pt 9	Weighted average of bed 82				20.80 / 1.04	
	437.50	443.25	Core	H60-78	H60	RME:Accu-labs analysis;T&R	Probably Bed 83 is 79 on report;Composite	0.82	10887	0.82	21.79	0.75		
1073.50	1082.00	Core	H61C-84	H61C	RME:Accu-labs analysis;T&R	Probably Bed 83 is 84 on report;Composite	0.95	11223	0.95	22.45	0.85			
322.00	328.00	Core	H65C-84	H65C	RME:Accu-labs analysis;T&R	Composite	0.99	9830	0.99	18.86	0.99			
309.00	315.00	Core	H71CA-84	H71C	RME:Accu-labs analysis;T&R	Probably Bed 83 is 84 on report;Composite	0.72	8255	0.72	16.81	0.87			
837.00	841.00	Core	H63C-78	H63C	RME:Accu-labs analysis;T&R	Probably Bed 83 is 78 on report;Composite	0.54	11300	0.54	22.60	0.48			
							Weighted average of bed 83				20.58 / 0.74			
1482.00	1470.00	Core	H64C-84	H64C	RME:Hazen Research;T&R	May be Bed 83;Calculated composite	0.81	11724	0.81	23.45	0.89			
680.25	684.40	Core	H61C-85	H61C	RME:Accu-labs analysis;T&R	Probably Bed 84 is 85 on report;Composite	0.75	10520	0.75	21.04	0.71			
							Weighted average of bed 84				22.63 / 0.70			
4.00		4.40 Mine	3780			USBM B22 & TP484;USGS B316	Coulter Mine;T&R; (1909)	2.27	10245	2.27	20.49	2.22		
							Weighted average of bed 89				20.49 / 2.22			
Tipple							USBM Unpub. printout	0.80	10880	0.80	21.76	0.74		
Tipple							USBM Unpub. printout	0.26	11200	0.26	22.40	0.23		
Delivered							T&R;Hanna No.4--A underground mine (1952)	0.80	10880	0.80	21.96	0.46		
Delivered							T&R;Nugget mine run of pits 1,2,5	0.40	10870	0.40	23.76	0.37		
							T&R;Nugget mine run of pits 1,2,5	0.40	11469	0.40	22.95	0.35		
							T&R;Nugget mine run of pits 1,2,5	0.40	11020	0.40	22.04	0.36		
							T&R;Nugget mine run of pits 1,2,5	0.40	11130	0.40	22.28	0.36		
							T&R;Nugget mine run of pits 1,2,5	0.30	10840	0.30	21.86	0.28		
							T&R;Nugget mine run of pits 1,2,5	0.50	10890	0.50	21.98	0.45		
							T&R;Nugget No.2 mine	0.40	11060	0.40	22.16	0.36		
							T&R;Nugget No.1 mine	0.49	11302	0.49	22.60	0.43		
							USGS B.316; Hanna No.1 Slope mine	0.39	11248	0.39	22.50	0.35		
							USGS B.316; Hanna No.1 Slope mine	0.44	11070	0.44	22.14	0.40		
							USGS B.316; Hanna No.1 Slope mine	0.73	10286	0.73	20.55	0.71		
							Weighted average of Hanna No.1 bed				22.00 / 0.42			

Table 4. Sulfur and heating values for the Hanna Mining District, Hanna Coal Field.

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/Lb) S
228104.001	SWSW	Hanna No. 2	63.50	98.50	35.40	Channel	WGS-26, K-47945		WGS RI 11; T&R	Old Monolith mine	0.40	11350
228104.002	center SW	Hanna No. 2			33.00	Shot pile	D168586		BLM EMRIA No.2 p.38	Sammee 2:T&R	0.70	10850
228106.003		Hanna No. 2	90.00	98.80	5.80	Tipple	93486 (USBM)		Unpub. USBM printout	T&R;(1955); Rosebud No.3 mine	0.28	11180
228106.004	NW/NW	Hanna No. 2			15.20	Mine			USBM TP-484; T&R	F.D. McMillen Mine (1927)	0.80	10400
228118.001	SESW	Hanna No. 2			18.35	Tipple	A2823 USBM(1924)		Unpub. USBM printout	T&R; Hanna No. 4-A underground mine (1952)	0.38	11300
228118.002	SESW	Hanna No. 2			6.65	Channel	A2824 USBM(1924)		USBM TP 484 : T&R	Hanna #4 Deep mine	0.30	11400
228119.001		Hanna No. 2				Delivered	7		USBM TP 484 : T&R	Hanna #4 Deep mine	0.50	11000
228119.002	KENN	Hanna No. 2	390.00	408.70	18.70	Channel	3160 USBM(1909)		USBM TP 484 &B 22:T&R	ROM. av. of 2;(1909); Hanna No.2 mine	0.28	10730
228119.003		Hanna No. 2	370.00			Channel	3163 USBM(1909)		USBM TP 484 &B 22:T&R	18.7'-rimd.bench sample; Hanna No.2 Deep min.	0.23	11102
228119.004		Hanna No. 2	390.00			Run/mine	3364 USBM(1909)		USBM TP 484 &B 22:T&R	Hanna No.2 Deep Mine	0.28	10755
228119.005		Hanna No. 2	390.00	398.00	8.00	Channel	3610 USBM(1909)		USBM TP 484 &B 22:T&R	Hanna No.2 Deep Mine	0.28	10708
228119.006		Hanna No. 2	390.00	395.40	5.40	Channel	3610 USBM(1909)		USBM TP 484 &B 22:T&R	Hanna No.2 Deep Mine	0.38	10890
228119.307		Hanna No. 2	390.00	398.50	8.50	Channel	7131 USBM(1909)		USBM TP 484 &B 22:T&R	Hanna No.2 Deep Mine	0.37	10838
228132.301		Hanna No. 2	390.00		22.00	Channel			Penn St. Printout:PSOC-513	Hanna No.2 Deep Mine	0.25	10856
228132.302		Hanna No. 2			22.00	Channel			Penn St. Printout:PSOC-514	T&R; Sample #1 of 2 locations 8' apart mine?	0.56	10809
										T&R; Sample #2 of 2 locations 8' apart mine?	0.87	9890
										Weighted average of Hanna		
228213.102	E1/2	Hanna No. 5				Tipple			Unpub. USBM printout:T&R	Rosebud No. 1 and 2 mines	0.50	11170
228213.103	E1/2	Hanna No. 5			12.00	Channel	PSOC-479		Unpub. USBM printout:T&R	Rosebud No. 1 and 2 mines	0.40	10910
228213.101	Sec.137;SESW	Hanna No. 5			7.80	Channel	77-12		Penn St. F.O.; T&R	(1976)	0.34	9850
228107.101		Hanna No. 5 U.B.							WGS RI 27	Sammee No.2 mine south; K-64745	0.80	11180
										Weighted average of Hanna		

Mining district

Mining District, Hanna Coal Field.

Ad or any location	Depth Interval		Sample Thickness	Swam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sublr	Heating Value (BTU/Lb)	MMBTU per Short Ton	Lbs Sublr per MMBTU	Million Btu per short ton/ Btu. sulfur
	From	To												
	63.50	98.80	35.40	35.40	Channel	WGS-28, K-47645 D109596		WGS RI 11; T&R BLM EMRIA No.2 p.38 Unpub. USBM printout USBM TP 484; T&R	Old Morrell mine Sarnioe 2; T&R T&R (1968); Rosebud No.3 mine F.D. McMillen Mine (1923) T&R; Hanna No.4 - A underground mine (1952) Hanna #4 Deep mine Hanna #4 Deep mine ROM, av. of 2 (1908); Hanna No.2 mine 18.7' - mid-bench sample; Hanna No.2 Deep min.	0.40 0.70 0.28 0.80 0.36 0.30 0.50 0.28 0.23 0.28 0.26 0.38 0.37 0.25 0.58 0.87	11350 10850 11180 10400 11300 11480 11000 10750 11102 10755 10708 10880 10858 10866 10800 9890	22.70 21.30 22.36 20.80 22.80 22.82 22.00 21.46 22.20 21.51 21.41 21.78 21.28 21.71 21.82	0.35 0.68 0.23 0.77 0.32 0.28 0.45 0.24 0.21 0.26 0.34 0.35 0.35 0.23 0.51 0.67	
	90.00	98.80	8.80	8.80	Tipple	93468 (USBM)		Unpub. USBM printout USBM TP 484; T&R						
			18.35	33.80	Channel	A2823 USBM (1924)		Unpub. USBM printout						
			6.65	33.80	Channel	A2824 USBM (1924)		USBM TP 484; T&R						
	380.00	408.70	18.70	34.00	Channel	3160 USBM (1908)		USBM TP 484; T&R						
	380.00			34.00	Run/mine	3163 USBM (1908)		USBM TP 484; 8.8 22; T&R						
	380.00			34.00	Run/mine	3398 USBM (1908)		USBM TP 484; 8.8 22; T&R						
	380.00	398.00	8.00	32.80	Channel	3610 USBM (1908)		USBM TP 484; 8.8 22; T&R						
	380.00	395.40	5.40	5.80	Channel	7130 USBM (1908)		USBM TP 484; 8.8 22; T&R						
	380.00	398.50	8.50	8.75	Channel	7131 USBM (1908)		USBM TP 484; 8.8 22; T&R						
			22.00	22.00	channel			Penn St. Printout: PSOC-513						
			22.00	22.00	channel			Penn St. Printout: PSOC-514						
									T&R; Sample #1 of 2 locations 8' apart; mine?					
									T&R; Sample #2 of 2 locations 8' apart; mine?					
									Weighted average of Hanna No.2 bed					21.78 / 0.37

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Mining district average, all coal beds: 21.11 / 0.87

Table 5. Sulfur and heating values for the Seminoe Mining District, Hanna Coal Field.

Reference Number	Other Locational Data	WGS RI 17 Pulverized Bed Designation	Depth Interval From	To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value per Short T	MMBTU/lb
228322.001		Bed 25	150.00			8.60				Seminole #1 Active Mine file	T&R; Avg. 7=FC adjust. to total 100%	0.63	9085	16
228324.002		Bed 25	150.00			9.50				Seminole #1 Active Mine file	T&R; Avg. 7=FC adjust. to total 100%	0.43	9422	16
228401.003		Bed 25	150.00			10.00				Seminole #1 Active Mine file		0.37	9640	16
228412.001	ENW	Bed 25			11.00		Channel?	K8846 USBM (1976-77)		G.L. Glass Collector; T&R	WGS Field #76-1; USGS #D183107; Sem. No. 1 mine	0.40	9793	16
228412.002		Bed 25	150.00			11.00				Seminole #1 Mine file	T&R	0.31	9646	16
228412.003		Bed 25					Core			Arch Mineral Corp. Analysis	T&R; Seminoe No. 1 mine	0.30	9600	16
228412.004		Bed 25					Core			Arch Mineral Corp. Analysis	T&R; Seminoe No. 1 mine	0.30	9600	16
228230.002	General	Bed 25	48.10	56.00	8.80	10.50				DES S. Central Wyo.	T&R	0.63	9329	18
228402.001		Bed 25				8.80		4837 (Arch Min. #)	370.00 Arch Min. Analysis Report 4837		T&R	0.28	9736	18
Weighted average of 16														
228230.001	N1/2	Bed 26	88.00	94.00	8.00	7	Core		30-24-B	Energy Development Co.	Location very questionable; T&R	0.49	9775	18
228230.003	General	Bed 26	150.00			10.10				DES S. Central Wyo.	T&R	0.64	9050	18
228323.004		Bed 26	150.00			9.80				Seminole #1 Active Mine file	T&R; Avg. 7=FC adjust. to total 100%	0.60	9386	18
228324.003		Bed 26				9.20				Seminole #1 Active Mine file	T&R; Avg. 7=FC adjust. to total 100%	0.43	9837	18
Weighted average of 18														
228307.002	Center SW	Bed 26				21.00	Shot pile	D186587 (USBM)		BLM EMRIA No. 2 p. 35	T&R file; Seminoe No. 1 Strip mine	0.30	10330	20
228322.002		Bed 26	150.00			4.10				Seminole #1 Active Mine file	T&R; Avg. 7=FC adjust. to total 100%	0.89	9881	18
228323.001		Bed 26	150.00			5.70				Seminole #1 Active Mine file	T&R; Avg. 7=FC adjust. to total 100%	0.58	8828	17
228323.002		Bed 26	150.00			11.30				Seminole #1 Active Mine file	T&R; Avg. 7=FC adjust. to total 100%	0.57	9308	18
228402.002		Bed 26	150.00			18.30				Seminole #1 Active Mine file	T&R	0.26	10117	20
228412.005		Bed 26					Core			Arch Mineral Corp. Analysis	T&R; Seminoe No. 1 mine	0.30	10050	20
228401.002		Bed 26	150.00			19.80				Seminole #1 Active Mine file	T&R; Seminoe No. 1 mine	0.29	9881	18
228230.004	General	Bed 26				8.80				DES S. Central Wyo.	T&R	0.66	8571	17
228308.001	S. e. 87	Bed 26				20.70	Channel			Penn State p.out; PSOC-507	Sampled in 2 sections 450' apart; T&R file	0.28	10310	20
228308.002		Bed 26				20.70	Channel			USBM Coal Analysis Report	T&R; Seminoe No. 1 mine, WGS RI 11	0.23	10515	21
228307.003		Bed 26	150.00	154.00	19.00		Channel	K-47848 USBM (1974)		USBM Coal Analysis Report	T&R; Avg. 7=FC adjust. to total 100%	0.40	10180	20
228315.002		Bed 26 of WGS			4.00					Seminole #1 Active Mine file	Sample thickness, top 7.2'; T&R file	0.74	9880	18
228308.003		Bed 267			7.20		Channel			Penn State p.out 510		0.26	10791	21
Weighted average of 21														
228315.001		Bed 31	150.00			21.10				Seminole #1 Active mine file	T&R; WA of 3 benches; Seam thick = total	0.35	10122	20
228412.008		Bed 31			7.20		Channel	K-47848 USBM (1974)		USBM Coal Analysis Report	T&R; WGS RI 11; outcrop; WGS 74-33	0.50	8340	18
228323.005		Bed 31			8.00			79-1		Seminole No. 1 mine	outcrop, K-47848	0.60	9840	18
228307.004	NESE	Bed 31			8.30		channel	74-32		WGS RI 11	outcrop, K-47848	0.40	9860	18
228322.003		Bed 31 all benches	150.00			15.80				Seminole #1 Active Mine file	T&R; WA of Analyses of 3 benches	0.34	9882	18
228428.001	NW/SE	Bed 31 (7)				9.80				DEC Manual; Abandoned mines	Proj. 17; Pl. 1; Sect. 108167-19; T&R; Crans	0.30	10760	21
228304.001		Bed 31, 2 benches	150.00			11.70				Seminole #1 Active Mine file	T&R; WA of Analyses of 2 benches	0.44	10232	20
228323.003		Bed 31, 3 benches	150.00			16.30				Seminole #1 Active Mine file	T&R; WA of Analyses of 3 benches	0.57	10186	20
Weighted average of 18														
228307.005		Bed 32			4.00		channel	74-30		WGS RI 11	outcrop, K-47850	0.70	9840	18
228307.006	NESE	Bed 32			5.50			74-31		WGS RI 11	outcrop, K-47848	0.30	9080	18
228307.007	SE NW	Bed 32 and 31	16.70			16.70	Channel	K-47848 50.51 USBM (1974)		WGS RI 11, T&R	S & BTU/B=WA f bench + mid bench + up bench	0.44	9881	18
Weighted average of 18														

thing District, Hanna Coal Field.

Depth Interval	Sample To	Sample Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/lb)	MMBTU per Short Ton	Lbs Sulfur per MMTU	Million Btu per short ton/ Lbs. sulfur per MMTU
150.00		8.00				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.83	9085	18.19	0.89	
150.00		9.50				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.43	9422	18.64	0.46	
150.00		10.00				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.37	9540	19.08	0.39	
150.00	11.00	11.00	Channel	K89486 USBM (1978-77)		G.L.B. Glass Collector: T&R	WGS Field #76-1; USGS #D163106; Sem. No. 1 mine	0.40	9783	19.59	0.41	
		11.00				Seminole #1 Mine file	T&R	0.31	9546	19.09	0.32	
			Core			Arch Mineral Corp. Analysis	T&R; Seminoe No. 1 mine	0.30	9900	19.80	0.30	
		10.50				Arch Mineral Corp. Analysis	T&R; Seminoe No. 1 mine	0.30	9650	19.30	0.31	
49.10	59.00	8.90		4937 (Arch Min. #)	370.00 Arch Min. Analysis Report 4937	DES S. Central Wyo.	T&R	0.63	9359	18.66	0.68	
							T&R	0.28	9736	19.47	0.27	
							Weighted average of bed 25					19.12 / 0.43
88.00	94.00	8.00	?		30-24-8	Energy Development Co.	Location very questionable; T&R	0.49	9775	18.55	0.50	
150.00		10.10	Core			DES S. Central Wyo.	T&R	0.64	9050	18.10	0.71	
150.00		8.80				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.50	9388	18.78	0.53	
150.00		9.20				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.43	9637	19.27	0.45	
							Weighted average of bed 26					18.86 / 0.55
150.00		21.00	Shot pile	D169597 (USBM)		BLM EMRIA No. 2 p.35	T&R file; Seminoe No. 1 Ship mine	0.30	10330	20.06	0.29	
150.00		4.10				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.89	9961	19.32	0.71	
150.00		5.70				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.58	9828	17.85	0.68	
150.00		11.30				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.57	9308	18.61	0.61	
150.00		18.30				Seminole #1 Active Mine file	T&R	0.28	10117	20.23	0.28	
150.00		19.80	Core			Arch Mineral Corp. Analysis	T&R; Seminoe No. 1 mine	0.30	10050	20.10	0.30	
		8.90				Seminole #1 Active Mine file	T&R	0.29	9961	19.78	0.29	
		20.70				Penn State p.out PSOC-507	T&R file	0.86	8571	17.14	1.00	
		20.70	Channel			Penn State p.out PSOC-508	Sampled in 2 sections 450' apart; T&R file	0.28	10310	20.62	0.27	
		18.00	Channel	K-47848 USBM (1974)		USBM Coal Analysis Report	T&R; Seminoe No. 1 mine, WGS RI 11	0.28	10315	21.03	0.27	
150.00	154.00	4.00				Seminole #1 Active Mine file	T&R Avg. 7=FC adjust. to total 100%	0.40	10180	20.36	0.39	
		7.20	Channel			Penn State p.out 510	Sample thickness. top 7.2'; T&R file	0.74	9680	19.08	0.74	
							Weighted average of bed 28	0.28	10791	21.59	0.28	
							Weighted average of bed 29					20.06 / 0.39
150.00		21.10				Seminole #1 Active Mine file	T&R; WA of 3 benches; Seem thick = total	0.35	10122	20.24	0.35	
		7.20	Channel	K-47848 USBM (1974)		USBM Coal Analysis Report	T&R; WGS RI 11; outcrop; WGS 74-33	0.50	8340	18.68	0.80	
		8.00		79-1		WGS RI 27	Seminole No. 1 mine	0.80	9940	19.88	0.80	
150.00		8.30		74-32		Seminole #1 Active Mine file	outcrop, K-47848	0.40	9860	18.90	0.40	
		15.80	Channel			DEQ Manual; Abandoned mines	T&R; WA of Analyses of 3 benches	0.34	9862	19.78	0.34	
150.00		9.50				Seminole #1 Active Mine file	Proj. 7; P.L. 1; Sect. 10; 847-10; T&R; Ore	0.30	10760	21.52	0.28	
150.00		11.70				Seminole #1 Active Mine file	T&R; WA of Analyses of 2 benches	0.44	10232	20.46	0.43	
150.00		11.30				Seminole #1 Active Mine file	T&R; WA of Analyses of 3 benches	0.37	10196	20.39	0.36	
							Weighted average of bed 31					20.02 / 0.40
							Weighted average of bed 32					19.16 / 0.47
4.00		4.00	Channel	74-30		WGS RI 11	outcrop, K-47850	0.70	9940	19.88	0.70	
5.50		5.50	Channel	74-31		WGS RI 11	outcrop, K-47848	0.30	9080	18.16	0.33	
16.70		16.70	Channel	K-47848, 50.51 USBM (1974)		WGS RI 11, T&R	S & BTU file; WA of bench + mid bench + up bench	0.44	9881	19.32	0.46	
							Weighted average of bed 32					19.16 / 0.47

Table 5. Sulfur and heating values for the Seminole Mining District, Hanna Coal Field.

Reference Number	Other Locational Data	WGS RI 17 Published Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/Lb)	MMBTU per Short Ton
228401.001		Bed 33		7.85	8.15		78-2		WGS RI 27	K-68487, Seminole No. 1 Mine	0.40	9788	18.81
												Weighted average of 5	
228318.003		Bed 34	150.00		8.80				Seminole #1 Active mine file	T&R	0.61	9825	19.86
												Weighted average of 5	
228316.002 SENW		Bed 37			7.90	Channel?	K64738, D197311		T&R, Seminole No. 1 mine	WGS Field #77-8 (up), 77-9 (D), WGS RI 27	0.60	9540	19.08
												Weighted average of 5	
228425.001 NW SW		Bed 44			7.50	mine	5808 (1906 data)		USBM B.22:USGS 8.316	T&R; sample from abandoned mine	0.33	10413	20.83
												Weighted average of 5	
228218.001 NENE		Bed 50	300.00	9.40	18.25	Channel	WGS 74-29		WGS RI 11; T&R	Vanguard No. 2 mine; K-48217; fresh sample	0.40	10070	20.14
228308.004		Bed 50	150.00		5.60				Sem. #1 Active mine file	T&R	0.34	9827	19.25
228309.002		Bed 50			8.10				Seminole #1 Active mine file	T&R; FC adjust. to total 100%	0.34	9854	18.11
228314.001		Bed 50	150.00		12.50				Seminole #1 Active mine file	T&R; Avg. 7-FC Adjust. to total 100%	0.48	9291	18.88
228316.001		Bed 50	150.00		8.50				Seminole #1 Active mine file	T&R	0.36	9488	18.82
												Weighted average of 5	
228305.004		Bed 51		7.10	7.30	Channel?	K64738 USBM (1977-78)		T&R; Glass, WGS RI 27	WGS Field #77-3; USGS #D197308; Seminole #1 mine	0.50	9888	20.08
228306.001 NWNE		Bed 51		7.85	8.15	Channel?	K6468 USBM (1976-77)		T&R; Glass, WGS RI 27	WGS Field #78-3; USGS #D183110; Sem. #1 mine	0.60	10097	20.89
228305.001		Bed 51		8.20			78-3		WGS RI 27	K-68486, Seminole No. 1 mine	0.60	10300	20.60
228306.002		Bed 51	150.00		6.50				Sem. #1 Active mine file	T&R	0.51	10048	20.08
228308.003		Bed 51	150.00		7.50				Sem. #1 Active mine file	T&R file	0.51	10231	20.80
												Weighted average of 5	
228305.003		Bed 52		2.50	2.90	Channel?	K64741 USBM (1977-78)		T&R; Glass, WGS RI 27	WGS Field #77-13; USGS #D197314; Sem. #1 mine	0.50	10435	20.87
												Weighted average of 5	
228305.002		Bed 53		7.20	7.20	Channel			Penn State p.out PSOC-488	T&R	0.50	10709	21.42
228306.003 near center		Bed 53		7.20	7.20	Channel	PSOC-483		Penn St. Printout	T&R; channel whole seam sample	0.47	10882	21.30
												Weighted average of 5	
228308.006		Bed 54	150.00		5.20				Sem. #1 Active mine file	T&R	0.81	9284	18.87
228309.001 SENW		Bed 54			4.00	Channel?	K64737 USBM (1977-78)		Glass Collector; T&R	WGS Field #77-5; USGS #D197308; Seminole #1 mine	1.30	8825	17.85
228306.002		Bed 54	150.00		5.40				Seminole #1 Active mine file	T&R; Avg. 7	0.81	9284	18.87
												Weighted average of 5	
228317.001 SW SW		Bed 60		3.80	3.80		K64738 USBM (1977-78)		T&R; G. Glass collector	USGS #D197310; WGS Field #77-8; Med. Bow Mine	0.80	10405	20.81
												Weighted average of 5	

Mining District, Hanna Coal Field.

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Table 5. Sulfur and heating values for the Seminoe Mining District, Hanna Coal Field.

Reference Number	Other Locational Data	WGSI RI 17 Published Bed Designation	Depth Interval From To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Percent Sulfur	Heating Value (BTU/Lb) Short
228317.002 SW SW		Bed 81		7.10			K-4740 USBM (1977-78)		T&R; G. Glass collector	USGS #D19731S; WGSI Field #77-7; Med. Bow Mine	0.70	9139
Weighted average of 1											0.70	9139
228329.001		Bed 82		9.35	9.35		K-54483 USBM (1975)		T&R; Glass, WGSI RI 27	Med. Bow Mine	0.80	10880
Weighted average of 2											0.80	10880
228329.002		Bed 83		5.20	5.20		K-54484 USBM (1975)		T&R; Glass, WGSI RI 27	Med. Bow Mine	0.80	10840
Weighted average of 3											0.80	10840
228303.001		Bed 84	150.00	6.30	6.30				Sem. #1 Active file	T&R	0.37	10286
228304.001		Bed 84	150.00	7.20	7.20				Sem. #1 Active file	T&R	0.34	10483
228310.001		Bed 84	150.00	6.40	6.40				Seminoe #1 Active mine file	T&R; Avg. 7=FC adjust to total 100%	0.47	10286
228311.001		Bed 84	150.00	4.50	4.50				Seminoe #1 Active mine file	T&R; Avg. 7=FC adjust to total 100%	0.48	9888
228329.003		Bed 84		6.20	6.20		K-54485 USBM (1975)		T&R; Glass, WGSI RI 27	Med. Bow Mine	0.40	10880
Weighted average of 4											0.40	10880
228302.001		Bed 85	150.00	6.80	6.80				Sem. #1 Active file	T&R	0.56	10279
228304.002		Bed 85	150.00	7.20	7.20				Sem. #1 Active file	T&R	0.45	10629
228311.002		Bed 85	150.00	7.90	7.90				Seminoe #1 Active mine file	T&R; Avg. 7=FC adjust to total 100%	0.43	10314
228312.001		Bed 85	150.00	11.10	11.10				Seminoe #1 Active mine file	T&R; Avg. 7=FC adjust to total 100%	0.43	10383
228333.001		Bed 85		9.70	9.70	75-16			WGSI RI 27; is Bed 85 in T&R?	K-58216 (USBM), Medicine Bow Strip Mine	0.80	10330
228208.001		Bed 85		6.65	7.65 channel	74-28			WGSI RI 11	Vanguard No. 1 mine, K-48218	0.80	11150
Weighted average of 5											0.80	11150
228204.001 Sall. 47		Brooks							(7) T&R	Energy Strip Mine	0.70	11179
228209.001 NW NE		Brooks							WGSI RI 11	1 Sample A; Rimrock #3 Min., weathered; T&R	0.90	10830
228210.001		Brooks Rider	62.80 70.10	7.50 1.40	7.50 Channel 1.40	WGSI-27 75-15			WGSI RI 27	Rim Rock Mine	1.10	8250
Weighted average of 6											1.10	8250
228230.006 ?		Dana	107.80 121.00	13.20	Core			30-24-B	Energy Devel. Co. - Hazen Lab	T&R	0.48	9612
228230.005 General		Lower Dana		4.50	4.50				DIES 8, Central Wyo Seminoe 1	T&R	0.70	9435
228230.007		Upper Dana		9.90	9.90				DIES 8 Central Wyo., T&R	General Location	0.64	9377
Weighted average of 7											0.64	9377

Mining District average

- Mining District, Hanna Coal Field.

Mining District average, all coal beds 20.07 / 0.33

Mining District average, all coal beds 20.07 / 0.53

Table 6. Sulfur and heating values for the Grass Creek stripable coal deposit, Bighorn Coal Field, Hot Springs County, Wyoming.

Reference Number	Other Locational Data	Published or Company Bed Designation	Depth Interval From	To	Sample Thickness	Seam Thickness	Sample Type	Sample Number	Drill Hole	Data Source	Remarks	Pen Su
469028.000		Mayfield			32.00	32.00	Mine		5770	USGS PP145, TP484	1907 Grass Creek mine	
469000.001	SE area	Mayfield			8.00	30.00	Mine		14756	USGS PP145, TP484	1907 Grass Creek mine	
	NW area	Mayfield			20.80	20.80	Core			Western Energy Co. mine plan	Average of 32 analyses	
		Mayfield			20.80	20.80	Core			Western Energy Co. mine plan	Average of 4 analyses	
		Mayfield			20.80	20.80	mine			USBM April 1958, T&R		
		Mayfield			20.80	20.80	mine			USBM Nov.25, 1964		
469028.001		Mayfield			20.80	20.80	Tipple			USBM Printout (1955)	Grass Creek Mine, calc. ROM	
469028.002		Mayfield			20.80	20.80	Tipple			USBM Printout (1956)	Grass Creek Mine, calc. ROM	
469028.003		Mayfield			20.80	20.80	Tipple			USBM Printout (1958)	Grass Creek Mine, calc. ROM	
469028.004		Mayfield			20.80	20.80	Tipple			USBM Printout (1953)	Grass Creek Mine, calc. ROM	
												Weight
459001.001	NW area	Ft. Union (Gwynn)			4.00	8.25	Mine		17830	USBM B123 (1913)	Gwynn Prospect	
		Gwynn			13.20	13.20	Core			Western Energy Co. mine plan	Average of 15 analyses	
												Weight

Deposit Average	20.13 / 0.42
All Seams	

Table 7. Coal delivery data for Hanna Coal Field mines (From FERC Form 423 data).

Seminole II Year	Tonnage	Percent S	Heating Value (BTU/Lb)	MMBTU per Short Ton	Lbs S per MMBTU	Tonnage X		Million Btu		Million Btu per Short Ton/ Lbs. Sulfur	
						Lbs Sulfur per Million Btu	per Short Ton	per Short Ton	per Short Ton	per Short Ton	per Million Btu
1984	1,745,544	0.71	10,506	21.01	0.68	1,178,646	36,677,371				
1985	905,265	0.67	10,669	21.34	0.63	568,495	19,316,545				
1986	867,400	0.66	10,742	21.48	0.61	532,940	18,635,222				
1987	845,700	0.78	10,944	21.89	0.71	602,747	18,510,682				
1988	1,382,900	0.75	10,982	21.96	0.68	944,432	30,374,016				
1989	686,430	0.61	10,612	21.22	0.57	394,574	14,568,790				
	6,433,239		Totals and weighted totals			4,222,834	138,082,624				
			Weighted average for mine deliveries							21.46 /	0.66
			Summary of all beds in mine (from data sheets)							21.43 /	0.70

Hanna Basin Year	Tonnage	Percent S	Heating Value (BTU/Lb)	MMBTU per Short Ton	Lbs S per MMBTU	Tonnage X		Million Btu		Million Btu per Short Ton/ Lbs. Sulfur	
						Lbs Sulfur per Million Btu	per Short Ton	per Short Ton	per Short Ton	per Short Ton	per Million Btu
1990	20,280	1.13	10,190	20.38	1.11	22,489	413,306				
	20,280		Totals and weighted totals			22,489	413,306				
			Weighted average for mine deliveries							20.38 /	1.11

Carbon (Shoshone #1) Year	Tonnage	Percent S	Heating Value (BTU/Lb)	MMBTU per Short Ton	Lbs S per MMBTU	Tonnage X		Million Btu		Million Btu per Short Ton/ Lbs. Sulfur	
						Lbs Sulfur per Million Btu	per Short Ton	per Short Ton	per Short Ton	per Short Ton	per Million Btu
1983	1,244,700	0.52	11054	22.11	0.47	585,529	27,517,828				
1984	1,297,300	0.48	11095	22.19	0.43	561,247	28,787,087				
1985	988,611	0.43	11128	22.26	0.39	382,012	22,002,526				
1986	212,995	0.49	11366	22.73	0.43	91,824	4,841,802				
1987	69,300	0.53	11327	22.65	0.47	32,426	1,569,922				
1988	837,384	0.49	11299	22.60	0.43	363,146	18,923,204				
1989	1,248,768	0.48	11202	22.40	0.43	535,091	27,977,398				
1990	1,060,781	0.52	11222	22.44	0.46	491,540	23,808,169				
	4,880,607		Totals and weighted totals			3,042,815	155,427,936				
			Weighted averages for mine deliveries							22.33 /	0.44
			Summary of all beds in mine (from data sheets)							21.88 /	0.78

Table 7. Coal delivery data for Hanna Coal Field mines (From FERC Form 423 data).

Medicine Bow Year	Tonnage	Percent S	Heating Value (BTU/Lb)	MMBTU per Short Ton	Lbs S per MMBTU	Tonnage X		Million Btu		per Short Ton/ Lbs. Sulfur	
						Lbs Sulfur per Million Btu	per Short Ton	per Short Ton	per Short Ton	per Short Ton	per Million Btu
1983	822,640	0.64	10,360	20.72	0.62	508,195	17,045,101	17,045,101			
1984	511,550	0.64	10,118	20.24	0.63	323,574	10,351,726	10,351,726			
1985	278,790	0.64	10,116	20.23	0.63	176,380	5,640,479	5,640,479			
1986	3,270	0.27	10,324	20.65	0.26	855	67,519	67,519			
1987	10,000	0.58	10,400	20.80	0.56	5,577	208,000	208,000			
1988	180,686	0.46	10,544	21.09	0.44	78,827	3,810,306	3,810,306			
1989	1,309,390	0.40	10,362	20.72	0.39	505,458	27,135,798	27,135,798			
1990	1,668,923	0.44	10,416	20.83	0.42	704,998	34,767,004	34,767,004			
	4,785,249					2,303,864	99,025,934	99,025,934			
Totals and weighted totals											
Weighted average for mine deliveries											
Summary of all beds in mine (from data sheets)											
							20.69 /	0.48			

Rosebud Year	Tonnage	Percent S	Heating Value (BTU/Lb)	MMBTU per Short Ton	Lbs S per MMBTU	Tonnage X		Million Btu		per Short Ton/ Lbs. Sulfur	
						Lbs Sulfur per Million Btu	per Short Ton	per Short Ton	per Short Ton	per Short Ton	per Million Btu
1983	794,794	0.75	10,693	21.39	0.70	557,463	16,997,464	16,997,464			
1984	1,081,001	0.81	10,650	21.30	0.76	822,170	23,025,321	23,025,321			
1985	550,577	0.85	10,936	21.87	0.78	427,936	12,042,220	12,042,220			
1986	685,097	0.71	10,822	21.64	0.66	449,472	14,828,239	14,828,239			
1987	757,726	0.65	11,129	22.26	0.58	442,557	16,865,465	16,865,465			
1988	834,748	0.59	11,318	22.64	0.52	435,149	18,895,356	18,895,356			
1989	31,664	0.71	10,809	21.62	0.66	20,799	684,512	684,512			
1990	145,000	0.93	10,634	21.27	0.87	126,810	3,083,860	3,083,860			
	4,880,607					3,282,356	106,422,439	106,422,439			
Totals and weighted totals											
Weighted average for mine deliveries											
Summary of all beds in mine (from data sheets)											
							21.81 /	0.67			

Seminole Year	Tonnage	Percent S	Heating Value (BTU/Lb)	MMBTU per Short Ton	Lbs S per MMBTU	Tonnage X		Million Btu		per Short Ton/ Lbs. Sulfur	
						Lbs Sulfur per Million Btu	per Short Ton	per Short Ton	per Short Ton	per Short Ton	per Million Btu
1983	866,776	0.70	10,229	20.46	0.68	593,160	17,732,503	17,732,503			
	866,776					593,160	17,732,503	17,732,503			
Totals and weighted totals											
Weighted average for mine deliveries											
Summary of all beds in mine (from data sheets)											
							20.46 /	0.68

Figure 4. Coal nomenclature in the northern portion of the Corral Creek Mining District of the Hanna Coal Field (modified from U.S. Geological Survey Open-file Report 78-061) (from Glass and Roberts, 1979).

Figure 5. Coal nomenclature in the eastern portion of the Corral Creek Mining District of the Hanna Coal Field (modified from U.S. Geological Survey Open-file Report 78-060) (from Glass and Roberts, 1979).

Table 8. Summary of remaining demonstrated reserve base (DRB) of strippable coal deposits in the Corral Creek Mining District through December 31, 1990 (in million short tons).

Seam	Btu content million Btu/ short ton	<0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	>2.50	Total all sulfur Categories
Medicine Bow Formation								
*WH 10	15-19.99	--	0.17	--	--	--	--	0.17
Penn-Wyoming	15-19.99	--	0.67	--	--	--	--	0.67
*MB 18	15-19.99	--	0.24	--	--	--	--	0.24
Subtotal	15-19.99	0.00	1.08	--	--	--	--	1.08
Total all categories		0.00	1.08	--	--	--	--	1.08
* Analysis of specific coal bed not available; value is average for all coal beds in the Medicine Bow Formation in the deposit.								
Almond Formation								
LH 8	20-22.99	--	1.65	--	--	--	--	1.65
*LH 4	20-22.99	--	3.57	--	--	--	--	3.57
*WH 6	20-22.99	--	1.48	--	--	--	--	1.48
*WH 4	20-22.99	--	0.53	--	--	--	--	0.53
*WH 3	20-22.99	--	1.61	--	--	--	--	1.61
*WH 2	20-22.99	--	3.22	--	--	--	--	3.22
*WH 1	20-22.99	--	3.94	--	--	--	--	3.94
Subtotal	20-22.99	--	16.00	--	--	--	--	16.00
Total all categories		--	16.00	--	--	--	--	16.00
All Formations								
Subtotal	15-19.99	--	1.08	--	--	--	--	1.08
Subtotal	20-22.99	--	16.00	--	--	--	--	16.00
Total all categories		--	17.08	--	--	--	--	17.08
* Analysis of specific coal bed not available; value is average for all coal beds in the Almond Formation in the deposit.

Figure 6. Coal nomenclature in the central portion of the Corral Creek Mining District of the Hanna Coal Field (modified from U.S. Geological Survey Open-file Report 78-061) (from Glass and Roberts, 1979).

Figure 7. Coal nomenclature in the southern portion of the Corral Creek Mining District of the Hanna Coal Field (modified from U.S. Geological Survey Open-file Report 78-062) (from Glass and Roberts, 1979).

Coal beds in the Medicine Bow Formation contain heating values in the 15.00 - 19.99 million Btu/short ton category and sulfur contents in the 0.41 - 0.60 lbs sulfur/million Btu category. Only 1.08 million tons of strippable DRB coal occur in the Medicine Bow Formation. Coal beds in the Almond Formation contain higher heating contents (20.00 - 22.99 million Btu/short ton) but the same sulfur contents as the coal beds in the Medicine Bow Formation. About 16 million tons of strippable DRB coal occurs in the Almond Formation. No significant mining has occurred in this district so the DRB was not adjusted for production and mining losses.

5. Carbon Mining District. Strippable coal beds occur in the Hanna Formation of this mining district (Figures 8 and 9) and account for 118.86 million tons of strippable DRB in the Hanna Coal Field. Coal analyses from 30 core, channel, or tipple samples (Table 3) were used to assign sulfur and heating value categories to the reserves of eight strippable coal beds (Table 9). The coal beds with the lowest heating values also contain the highest amounts of sulfur. Remaining strippable reserves of 33.3 million tons of coal occur in the two highest sulfur categories. Coal with heating values of 20.00 - 22.99 million Btu/short ton contain the lower sulfur coals in the mining district. Most of the coal in this heating value category contains 0.41-0.60 lbs sulfur/million Btu.

6. Hanna Mining District. Strippable coal beds in the Hanna Formation in this district (Figures 10 and 11) account for 228.48 million tons (or 40 percent) of remaining strippable DRB in the Hanna Coal Field. Analyses from 87 core, channel, and tipple samples and about 400 coal deliveries (Table 4) were used to characterize the 23 coal beds that contain strippable coal.

Only 15.89 million tons of remaining DRB coal, in four coal beds, contain from 15.00 to 19.99 million Btu/short ton (Table 10). The other 212.59 million tons of remaining DRB coal in this district contain from 20.00 to 22.99 million Btu/short ton. This district has strippable coals that occur in all but the highest sulfur category (Table 10). The 0.61-0.83 and the 0.84-1.67 lbs sulfur/million Btu categories contain most of the strippable DRB. Only the Hanna No. 1, Hanna No. 2, Hanna No. 5, and Bed 72 contain strippable coal reserves in the two lowest sulfur content categories.

The 273.88 million tons of remaining strippable DRB coal in the Hanna Mining District (Glass and Roberts, 1979) as of January 1, 1978, has been depleted by an additional 45.40 million tons as of December 31, 1990. Coal extracted through

TRACE OF COAL BED OUTCROP		
CS		
ABBREVIATIONS		
CARDON NO. 6 COAL	CS	
DES NO. 100	100	
DES NO. 100	100	
FINCH COAL	F	CARDON NO. 4 (
JOHNSON RIVER COAL	JR	
JOHNSON COAL	J	CARDON NO. 3 (

¹ This coal may be equivalent to the Finch coal
² This coal may be equivalent to the Johnson coal

TRM
 TRM

Figure 8. Location map of estimated strippable coal reserves, Carbon Mining District, Hanna Coal Field, Carbon County, Wyoming (from Plate 1 of Glass and Roberts, 1979).

Figure 9. Coal nomenclature in the Carbon Mining District of the Hanna Coal Field (from Glass and Roberts, 1979).

underground mines in this district has not depleted these totals for strippable coal; coal analyses from some of the underground mines were used to help characterize some of the coal beds.

7. Seminole Mining District. Strippable coal beds in the Hanna and Ferris Formations in this district (Figures 11 and 12) account for 201.6 million tons (or 35.6 percent) of the remaining strippable DRB in the Hanna Coal Field. Analyses from 79 core, channel, and tippie samples and 204 coal deliveries (Table 5) were used to characterize the 47 coal beds that contain strippable coal.

Recent coal production data reported for beds known to industry as Beds 38, 52, and 62 of the Ferris Formation were assigned to Beds 33, 53, and 61, respectively, of Glass and Roberts (1979). Production and mining losses for these beds were subtracted from original strippable reserves estimated by Glass and Roberts, 1979.

Table 9. Summary of remaining demonstrated reserve base (DRB) of the strippable coal deposits in Carbon Mining District through December 31, 1990 (in million short tons).

Seam	Btu content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)					Total all sulfur Categories
		<0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	
Hanna Formation							
Carbon 6	15-19.99	--	--	--	--	--	1.06
109	15-19.99	--	--	--	--	--	12.86
*105	15-19.99	--	--	--	--	2.01	2.01
Finch	20-22.99	--	15.64	--	--	--	15.64
*Johnson Rider	15-19.99	--	--	--	--	17.37	17.37
Johnson	20-22.99	--	68.60	--	--	--	68.60
Carbon 4	20-22.99	--	0.44	--	--	--	0.44
Carbon 5	20-22.99	0.88	--	--	--	--	0.88
Subtotal	15-19.99	--	--	--	--	19.38	12.86
Subtotal	20-22.99	0.88	84.68	--	--	--	106.00
Total all categories		0.88	84.68	--	--	19.38	118.86

* Analysis of specific coal bed not available; value is average for all coal beds in the Hanna Formation in the deposit.

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Figure 11. Coal bed nomenclature in the Hanna and Seminole Mining Districts, Hanna Coal Field (from Glass and Roberts, 1979).

Table 10. Summary of remaining demonstrated reserve base (DRB) of strippable coal deposits in the Hanna Mining District through December 31, 1990 (in million short tons).

Seam	Btu content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)					Total all sulfur Categories
		<0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	
Hanna Formation							
89	20-22.99	--	--	--	--	5.43	5.43
RME 93	20-22.99	--	--	--	--	27.77	27.77
*RME 92	20-22.99	--	--	--	5.07	--	5.07
*88	20-22.99	--	--	--	0.37	--	0.37
87	15-19.99	--	--	--	--	0.79	0.79
*86	20-22.99	--	--	--	5.59	--	5.59
84	20-22.99	--	--	1.40	--	--	1.40
83	20-22.99	--	--	8.84	--	--	8.84
82	20-22.99	--	--	--	29.98	--	29.98
Hanna 1	20-22.99	--	20.41	--	--	--	20.41
80	20-22.99	--	--	17.59	--	--	17.59
79	20-22.99	--	--	--	28.87	--	28.87
78	20-22.99	--	--	19.44	--	--	19.44
77	15-19.99	--	--	--	6.38	--	6.38
Hanna 2	20-22.99	4.58	--	--	--	--	4.58
76	20-22.99	--	--	19.88	--	--	19.88
*75	20-22.99	--	--	--	9.17	--	9.17
74	15-19.99	--	--	--	--	6.53	6.53
*73	20-22.99	--	--	--	1.12	--	1.12
Hanna 5	20-22.99	3.01	--	--	--	--	3.01
L.B.Hanna 5	20-22.99	--	--	--	2.39	--	2.39
72	15-19.99	--	2.19	--	--	--	2.19
*71	20-22.99	--	--	--	1.68	--	1.68
Subtotal							
Subtotal	15-19.99	--	2.19	--	6.38	7.32	15.89
	20-22.99	7.59	20.41	67.15	84.24	33.20	212.59
Total all categories							
		7.59	22.60	67.15	90.62	40.52	223.48

* Analysis of specific coal bed not available; value is average for all coal beds in the Hanna Formation in the deposit.

EXPLANATION

Figure 12. Location map of estimated strippable coal reserves, Seminoe Mining District, Hanna Coal Field, Carbon County, Wyoming (from Plate 3 of Glass and Roberts, 1979).

The Brooks coal bed is the only strippable Hanna Formation coal in the Seminole Mining District. This coal bed only accounts for 5.31 million tons of reserves. The remaining 196.29 million tons in the mining district occur in Ferris Formation coal beds (Table 11). Most of the strippable DRB coal in the Ferris Formation contains less than 0.60 lbs sulfur/million Btu; only 13.41 million tons of the DRB for the Ferris Formation occurs in the higher sulfur categories. Strippable coals in the Ferris Formation occur in two heating value categories: almost 54 percent (105.51 million tons) of the Ferris Formation DRB contains 15.00-19.99 million Btu/short ton and about 46 percent of the Ferris Formation DRB contains 20.00-22.99 million Btu/short ton.

Glass and Roberts (1979) estimated 238.47 million tons of remaining strippable DRB coal for the Seminole Mining District as of January 1, 1978. Production and mining losses (based on an 80 percent recovery factor) from January 1, 1978 through December 31, 1990, have depleted the strippable DRB by 36.87 million tons. The remaining strippable DRB for the Seminole Mining District is 201.60 million tons as of December 31, 1990.

8. Grass Creek strippable deposit, Bighorn Coal Field. The only strippable coal in this field occurs in the lower 600 feet of the Fort Union Formation (Paleocene) in the southwestern part of the field (Figure 13).

Two coal beds, the Gwynn and the Mayfield, are of strippable thickness (4 feet thick or greater) in the area. The Gwynn coal bed ranges from 6.5 to 31.8 feet thick and averages 13.2 feet thick. The Mayfield coal bed, which overlies the Gwynn, is from 4.0 to 32.3 feet thick and averages 20.8 feet thick. The two coal beds are separated by an average interburden thickness of 140 feet. Maximum overburden on top of the Mayfield coal bed in the area is 200 feet.

Original strippable reserves of 18.6 million tons for this coal deposit were published by Glass, Westervelt, and Oviatt (1975). Production and mining losses have depleted these reserves by slightly more than 0.59 million tons. The remaining strippable DRB of 17.99 million tons of coal (Table 1B) occurs in the Mayfield and the Gwynn coal beds. Analyses from 60 core, channel and tipple samples (Table 6) were used to characterize the coal beds in this deposit.

Table 11. Summary of remaining demonstrated reserve base (DRB) of strippable coal deposits in the Seminole Mining District through December 31, 1990 (in million short tons).

Coal Bed	Btu Content million Btu/ short ton	Sulfur Content (lbs sulfur/million Btu)						Total all sulfur categories
		<0.40	0.41-0.60	0.61-0.83	0.84-1.07	1.08-2.50	>2.50	
Hanna Formation								
Brooks	20-22.99	--	5.31	--	--	--	--	5.31
Ferris Formation								
*66	15-19.99	--	0.10	--	--	--	--	0.10
65	20-22.99	--	14.94	--	--	--	--	14.94
64	20-22.99	12.21	--	--	--	--	--	12.21
63	20-22.99	--	5.52	--	--	--	--	5.52
62	20-22.99	--	0.63	--	--	--	--	0.63
*61A	15-19.99	--	1.31	--	--	--	--	1.31
61	15-19.99	--	--	5.42	--	--	--	5.42
60	20-22.99	--	7.04	--	--	--	--	7.04
*58	15-19.99	--	0.29	--	--	--	--	0.29
*56	15-19.99	--	5.47	--	--	--	--	5.47
54	15-19.99	--	--	--	--	2.04	--	2.04
53	20-22.99	--	1.65	--	--	--	--	1.65
51	20-22.99	--	9.75	--	--	--	--	9.75
50	15-19.99	--	12.38	--	--	--	--	12.38
46	20-22.99	3.49	--	--	--	--	--	3.49
44	20-22.99	2.68	--	--	--	--	--	2.68
38	15-19.99	--	--	0.63	--	--	--	0.63
37	15-19.99	--	--	1.16	--	--	--	1.16
*35	15-19.99	--	0.52	--	--	--	--	0.52
34	15-19.99	--	--	0.70	--	--	--	0.70
33	15-19.99	--	7.42	--	--	--	--	7.42
31	20-22.99	9.58	--	--	--	--	--	9.58
30	20-22.99	1.45	--	--	--	--	--	1.45
28	20-22.99	5.30	--	--	--	--	--	5.30
27	20-22.99	--	2.75	--	--	--	--	2.75
26	15-19.99	--	7.34	--	--	--	--	7.34
25	15-19.99	--	6.84	--	--	--	--	6.84
Dana	15-19.99	--	2.27	--	--	--	--	2.27
*C	15-19.99	--	2.38	--	--	--	--	2.38
*F	15-19.99	--	2.20	--	--	--	--	2.20
*B	15-19.99	--	2.61	--	--	--	--	2.61
*130	15-19.99	--	--	3.46	--	--	--	3.46
129	20-22.99	10.12	--	--	--	--	--	10.12
128	20-22.99	1.78	--	--	--	--	--	1.78
*127	15-19.99	--	9.37	--	--	--	--	9.37
*124	15-19.99	--	9.00	--	--	--	--	9.00
*123	15-19.99	--	14.03	--	--	--	--	14.03
*122	15-19.99	--	2.10	--	--	--	--	2.10
*121	15-19.99	--	0.57	--	--	--	--	0.57
E	20-22.99	--	1.89	--	--	--	--	1.89
*D	15-19.99	--	1.73	--	--	--	--	1.73
*A	15-19.99	--	3.74	--	--	--	--	3.74
*H	15-19.99	--	0.08	--	--	--	--	0.08
*G	15-19.99	--	0.35	--	--	--	--	0.35
Ferris Formation Subtotal	15-19.99	--	92.10	11.37	--	2.04	--	105.51
Subtotal	20-22.99	46.61	44.17	--	--	--	--	90.78
All categories		46.61	136.27	11.37	--	2.04	--	196.29
Total all formations Subtotal	15-19.99	--	92.10	11.37	--	2.04	--	105.51
Subtotal	20-22.99	46.61	49.48	--	--	--	--	96.09
All categories		46.61	141.58	11.37	--	2.04	--	201.60

* Analysis of specific coal bed not available; value is average for all coal beds in the Ferris Formation in the deposit.

GRASS CREEK KNOWN COAL LEASING AREA

- Proposed KCLA boundary
- Coal outcrop, showing measured coal thickness
- Mine

Geology from U. S. Geol. Survey Prof. Paper 145, 1926, and Bull. 1241-A, 1966

Figure 13. Location map of the Grass Creek strippable coal deposit, Bighorn Coal Field, Hot Springs County, Wyoming (from U.S. Geological Survey, 1974).

The Mayfield coal bed has a weighted average heating value of 20.02 million Btu/short ton and a weighted average sulfur content of 0.43 lbs sulfur/million Btu. The Gwynn coal bed, which underlies the Mayfield, contains slightly less sulfur than the Mayfield and slightly higher Btu content. Because the estimates of strippable DRB for this deposit include the combined Mayfield and Gwynn coal beds, the weighted averages for both beds were combined. Coals in the Grass Creek deposit contains heating values of 20.00 - 22.99 million Btu/short ton and sulfur contents of 0.41 - 0.60 lbs sulfur/million Btu.

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