UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TEXT TO ACCOMPANY:

COAL RESOURCE OCCURRENCE

AND

COAL DEVELOPMENT POTENTIAL

MAPS

OF THE

WALKER CREEK SCHOOL QUADRANGLE,

CONVERSE COUNTY, WYOMING

BY

INTRASEARCH INC.

DENVER, COLORADO

OPEN FILE REPORT 79-472

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CONVERSION TABLE

TO CONVERT	MULTIPLY BY	TO OBTAIN
inches	2.54	centimeters (cm)
feet	0.3048	meters (m)
miles	1.609	kilometers (km)
acres	0.40469	hectares (ha)
tons (short)	0.9072	metric tons (t)
cubic yards/ton	0.8428	cubic meters per metric tons
acre feet	0.12335	hectare-meters
Btu/lb	2.326	kilojoules/kilogram (kJ/kg)
Btu/lb	0.55556	kilocalories/kilogram (kcal/kg)
Fahrenheit	5/9 (F-32)	Celsius

I. Introduction

This report and accompanying maps set forth the Coal Resource Occurrence (CRO) and Coal Development Potential (CDP) of coal beds within the Walker Creek School Quadrangle, Converse County, Wyoming. This CRO and CDP map series includes 3 plates (U. S. Geological Survey Open-File Report 79-472). The project is compiled by IntraSearch Inc., 1600 Ogden Street, Denver, Colorado, under KRCRA Northeastern Powder River Basin, Wyoming Contract Number 14-08-0001-17180. This contract is a part of a program to provide an inventory of unleased federal coal in Known Recoverable Coal Areas (KRCRA's) in the western United States.

The Walker Creek School Quadrangle is located in Converse County, in eastern Wyoming. It encompasses parts of Townships 34 and 35 North, Ranges 68 and 69 West, and covers the area: 42°52'30" to 43°00' north latitude; 105°00' to 105°07'30" west longitude.

The Walker Creek Road, a maintained gravel road, trends southwest across the northwestern portion of the quadrangle. Two other maintained gravel roads provide access the the study area. Minor roads and trails that branch from the aforementioned roads constitute an avenue of access to much of the Walker Creek School Quadrangle. The closest railroad is the Chicago North Western trackage approximately 10 miles (16 km) to the south at Shawnee, Wyoming.

Walker Creek flows northeastward through the northwestern portion of the quadrangle, providing the major drainage for the study area. Cottonwood Creek and Twentymile Creek flow northeastward through the southeastern portion of the quadrangle. A maximum elevation of 5162 feet (1573 m) above sea level is located in the southeastern portion of the study area. Minimum elevations of 4640 feet (1414 m) above sea level occur in the valley floor of Walker Creek at the northern quadrangle boundary.

The ten to twelve inches (25 to 30 cm) of annual precipitation that falls in this semi-arid region accrues principally in the springtime. Summer and fall precipitation usually originates from thunderstorms, and infrequent snowfalls of six inches (15 cm) or less generally characterize winter precipitation. Although temperatures ranging from less than -25°F (-32°C) to more than 100°F (38°C) have been recorded near Douglas, Wyoming, average wintertime minimums and summertime maximums approach +5° to +15°F (-15° and -9°C) and 75° to 90°F (24° to 32°C), respectively.

Surface ownership is divided among fee, state, and federal categories with the state and federal surface generally leased to ranchers for grazing purposes. Details of surface ownership are available at the Converse County Courthouse in Douglas, Wyoming. Details of mineral ownership on federal lands are available from the U. S. Bureau of Land Management in Cheyenne, Wyoming. Federal coal ownership within the KRCRA is shown on Plate 2 of the Coal Resource Occurrence maps. The non-federal coal ownership comprises both fee and state coal resources.

The Coal Resource Occurrence and Coal Development Potential program pertains to unleased federal coal and focuses upon: 1) the delineation of lignite, subbituminous coal, bituminous coal, and anthracite at the surface and in the subsurface on federal land; 2) the identification of total tons in place as well as recoverable tons; 3) categorization of these tonnages into measured, indicated, and inferred reserves and resources, and hypothetical resources; and 4) recommendations regarding the potential for surface mining, underground mining, and in-situ gasification of the coal beds. This report evaluates the coal resources of all unleased federal coal beds in the quadrangle which are 5 feet (1.5 m) or greater in thickness and occur at depths down to

3000 feet (914 m). No resources or reserves are computed for leased federal coal, state coal, fee coal, or lands encompassed by coal prospecting permits and preference right lease applications.

II. Geology

Regional. The thick, economic coal deposits of the Powder River Basin in northeastern Wyoming occur mostly in the Tongue River Member of the Fort Union Formation, and in the lower part of the Wasatch Formation. Approximately 3000 feet (914 m) of the Fort Union Formation, that includes the Tongue River, Lebo, and Tullock Members of Paleocene age, are unconformably overlain by approximately 700 feet (213 m) of the Wasatch Formation of Eocene age. These Tertiary formations lie in a structural basin flanked on the east by the Black Hills uplift, on the south by the Hartville and Casper Mountain uplifts, and on the west by the Casper Arch and the Big Horn Mountain uplift. The structural configuration of the Powder River Basin originated in Late Cretaceous time, with episodic uplift thereafter. The Cretaceous Cordillera was the dominant positive land form throughout the Rocky Mountain area at the close of Mesozoic time.

Outcrops of the Wasatch Formation and the Tongue River Member of the Fort Union Formation cover most of the areas of major coal resource occurrence in the Powder River Basin. The Lebo Shale Member of the Fort Union Formation is mapped at the surface northeast of Recluse, Wyoming, east of the principal coal outcrops and associated clinkers (McKay, 1974), and presumably projects into the subsurface beneath much of the basin. One of the principal characteristics for separating the Lebo and Tullock Members (collectively referred to as the Ludlow Member east of Miles City, Montana) from the overlying Tongue River Member is the color differential between the lighter-colored upper portion and the

somewhat darker lower portion (Brown, 1958). Although geologists working with subsurface data, principally geophysical logs, in the basin are trying to develop criteria for subsurface recognition of the Lebo-Tullock and Tongue River-Lebo contacts, no definitive guidelines are known to have been published. Hence, for subsurface mapping purposes, the Fort Union Formation is not divided into its members for this study.

During the Paleocene epoch, the Powder River Basin tropic to subtropic depositional environment included broad, inland flood basins with extensive swamps, marshes, freshwater lakes, and a sluggish but active northeastward discharging drainage system, superimposed on a near base level, emerging sea floor. Much of the vast areas where organic debris collected was within a reducing depositional environment. Localized uplifts began to disturb the near sea level terrain of northeastern Wyoming following retreat of the Cretaceous seas. However, the extremely fine-grained characteristics of the Tongue River Member clastics suggest that areas of recurring uplift peripheral to the Powder River Basin were subdued during major coal deposit formation.

The uplift of areas surrounding the Powder River Basin created a structural basin of asymmetric characteristic, with the steep west flank located on the eastern edge of the Big Horn Mountains. The axis of the Powder River Basin is difficult to specifically define, but is thought to be located in the western part of the Basin, and to display a north-south configuration some 15 to 20 miles (24 to 32 km) east of Sheridan, Wyoming. Thus, the sedimentary section described in this report lies on the east flank of the Powder River Basin, with gentle dips of two degrees or less disrupted by structural configurations thought to relate to tectonic adjustment and differential compaction.

Some coal beds in the Powder River Basin exceed 200 feet (61 m) in thickness. Deposition of these thick, in-situ coal beds requires a discrete balance between subsidence of the earth's crust and in-filling by trememdous volumes of organic debris. These conditions in concert with a favorable ground water table, non-oxidizing clear water, and a climate amenable to the luxuriant growth of vegetation produce a stabilized swamp critical to the deposition of coal beds.

Deposition of the unusually thick coal beds of the Powder River Basin may be partially attributable to short distance water transportation of organic detritus into areas of crustal subsidence. Variations in coal bed thickness throughout the basin relate to changes in the depositional environment. Drill hole data that indicate either the complete absence or extreme attenuation of a thick coal bed probably relate to location of the drill holes within the ancient stream channel system draining this low land area in Early Cenozoic time. Where thick coal beds thin rapidly from the depocenter of a favorable depositional environment, it is not unusual to encounter a synclinal structure over the maximum coal thickness due to the differential compaction between organic debris in the coal depocenter and fine-grained clastics in the adjacent areas.

The Wasatch Formation of Eocene age crops out over most of the central part of the Powder River Basin and exhibits a disconformable contact with the underlying Fort Union Formation. The contact has been placed at various horizons by different workers; however, for the purpose of this report, the contact is positioned near the top of the Roland coal bed as mapped by Olive (1957) in northwestern Campbell County, Wyoming, and is considered to disconformably descend in the stratigraphic column to the top of the Wyodak-Anderson coal bed (Roland

coal bed of Taff, 1909) along the eastern boundary of the coal measures. No attempt is made to differentiate the Wasatch and Fort Union Formations on geophysical logs or in the subsurface mapping program that is a part of this CRO-CDP project.

Although Wasatch and Fort Union lithologies are too similar to allow differentiation in some areas, most of the thicker coal beds occur in the Fort Union section on the east flank of the Powder River Basin. Furthermore, orogenic movements peripheral to the basin apparently increased in magnitude during Wasatch time causing the deposition of friable, coarse-grained to gritty arkosic sandstones, fine- to very fine-grained sandstones, siltstones, mudstones, claystones, brown-to-black carbonaceous shales and coal beds. These sediments are noticeably to imperceptibly coarser than the underlying Fort Union clastics.

The Walker Creek School Quadrangle is located in an area where the surface rocks are classified into the Wasatch and Fort Union Formations (Denson and Horn, 1975). The thin coals that crop out in T. 34 N., R. 68 W. (Winchester, 1912) appear to occur in the lower part of the Lebo Shale Member of the Fort Union Formation as mapped by Denson and Horn (1975). The Fort Union Formation crops out over approximately eighty percent of the quadrangle and the Wasatch age sediments are restricted to the high terrain and the western part of the area. A section of the Wasatch and Fort Union Formations, approximately 500 feet (152 m), is exposed within the quadrangle.

III. Data Sources

Areal geology of the coal outcrops and associated clinker is derived from the Lost Spring coal field report (Winchester, 1912). Five coal bed outcrops less than 5 feet (1.5 m) thick that are present in the southeastern portion of the quadrangle cannot be correlated with the local

coal beds identified in the subsurface.

The major source of subsurface control, particularly on deep coal beds, is the geophysical logs from oil and gas test bores and producing wells. Some geophysical logs are not applicable to this study, for the logs relate only to the deep potentially productive oil and gas zones. More than eighty percent of the logs include resistivity, conductivity, and self-potential curves. Occasionally the logs include gamma, density, and sonic curves. These logs are available from several commercial sources.

All geophysical logs available in the quadrangle are scanned to select those with data applicable to Coal Resource Occurrence mapping. Paper copies of the logs are obtained, interpreted, and coal intervals identified where they exist.

The topographic map of the Walker Creek School Quadrangle is published by the U. S. Geological Survey, compilation date, 1970. Land network and mineral ownership data are compiled from land plats available from the U. S. Bureau of Land Management in Cheyenne, Wyoming. This information is current to October 13, 1977.

IV. Coal Bed Occurrence

The Walker Creek School Quadrangle is located south of the principal coal deposits of the Powder River Basin. Five coal bed outcrops less than 5 feet (1.5 m) thick are present in this area; however, their thinness and limited lateral extent exclude them from being mapped in the CRO/CDP program.

The Coal Data Sheet, Plate 3, shows by columnar sections the interpretations of geophysical well logs. The coal beds identified in the subsurface are thin and have limited lateral extent. Because of these characteristics, coal bed resource estimates are not made for this quad-

rangle. Inasmuch as the second youngest local coal bed identified in the subsurface underlies most of the quadrangle, it is designated as datum for the correlation diagram (Plate 3).

No coal beds were identified on numerous geophysical logs from test bores drilled within the Walker Creek School Quadrangle. These geophysical logs are not shown on the Coal Data Sheet (Plate 3); however, their location and identification is as follows:

In Township 34 North, Range 69 West, the following logs are not shown:

Section 2-Inexco Oil Company, Federal XR #1-2
Section 13-Phillips Petroleum Company, #1 Somers A
Section 22-Davis Oil Company, Grover Lamme #1
Section 33-Diamond Shamrock Corporation, #1-33 Schiek Federal

These logs from Township 35 North, Range 68 West were examined but not drawn on the Coal Data Map and Coal Data Sheet:

Section 19-Diamond Shamrock, #1-19 Ackerman Federal
Section 20-Diamond Shamrock, #1-20 Anderman Federal
Section 30-Haynie and Mayer, #2-30 Lebar

In Township 35 North, Range 69 West, the following logs were scanned but do not appear on plates 1 and 3:

Section 22-Haynie and Mayer, Ampet Federal #5
Section 24-Diamond Shamrock, Well Draw Federal #1-24 and Shenandoah Oil Corporation, Baughn #1-24
Section 26-Haynie and Mayer, Ampet Federal #3 and Ampet Federal #4
Section 27-Haynie and Mayer, Lebar #1
Section 34-Haynie and Mayer, Lebar #2-34

Inexco Oil Company's Federal Andy #1-33 log from Township 36, North, Range 69 West, does not indicate the occurrence of coal in the subsurface.

V. Coal Development Potential

The current data base indicates that, within the parameters of this CRO/CDP program, there are no coal resources within the Walker Creek School Quadrangle of importance to surface and underground mining or in-situ gasification. The entire quadrangle is considered to have no coal development potential. Therefore, a coal development potential map was not prepared.

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