Text to Accompany:

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FEDERAL COAL RESOURCE OCCURRENCE AND FEDERAL COAL DEVELOPMENT POTENTIAL MAPS OF THE McCURTAIN QUADRANGLE, HASKELL AND LE FLORE COUNTIES, OKLAHOMA

(Report includes 15 plates)

Prepared for

UNITED STATES DEPARTMENT OF THE INTERIOR

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Purpose

This text is to be used in conjunction with the Federal Coal Resource Occurrence (FCRO) and Federal Coal Development Potential (FCDP) maps of the McCurtain 7.5-minute quadrangle, Haskell and LeFlore Counties, Oklahoma.

This report was compiled to support the land-planning work of the Bureau of Land Management (BLM). The work was undertaken by Geological Services of Tulsa, Tulsa, Oklahoma, at the request of the United States Geological Survey under contrct number 14-08-0001-17989. The resource information gathered for this report is in response to the Federal Coal Leasing Amendments Act of 1976 (Public Law 94-377). Published and unpublished publicly available information was used as the data base for this study. No new drilling or field mapping was done to supplement this study, nor was any confidential or proprietary data used.

Location

The McCurtain 7.5-minute quadrangle is located in the southeast portion of the Oklahoma coal field (Trumbull, 1957), within the eastern Arkoma Basin (McAlester basin or McAlester coal basin of earlier publications). The southeastern part of Haskell County and northwestern corner of LeFlore county are included in the study area. This area is roughly 60 miles south of Muskogee, Oklahoma, and approximately halfway between McAlester, Oklahoma and Fort Smith, Arkansas.

Accessibility

The town of McCurtain is located in the southwest corner of the quadrangle; it is on Oklahoma State Highway 31, approximately 55 miles northeast of McAlester, Oklahoma, and 45 miles southwest of Fort Smith, Arkansas. Oklahoma State Highway 26 runs north out of McCurtain across the north half of the quadrangle; it connects McCurtain with the town of Keota and Oklahoma State Highway 9 in the adjoining quadrangle. Light-duty (commonly known as "section-line") roads occur every half-mile to two miles apart in the northeast quarter; elsewhere, these secondary roads are more sparsely located within lowland valleys or along relatively level uplands, connecting through watergaps. A few unimproved roads lead to strip mines or relatively isolated homesites and gas well locations.

From the east, the Fort Smith and Van Buren Railroad spur line crosses the southern half of the quadrangle and curves north and east outside the town of McCurtain. An old railroad grade leads out of this railroad line, going westward from McCurtain. The Texas and Pacific Railroad crosses the northeast corner of the quadrangle, approximately 9 miles from McCurtain. A pipeline route runs generally northeast across the northern half of the area.

Physiography

The McCurtain quadrangle is situated in the eastern part of the Arkansas Valley physiographic province. This valley occupies the Arkoma structural basin north of the Ouachita Mountians, south of the Ozark Mountains, east of the central Oklahoma platform, and northeast of the Arbuckle Mountains; it is drained by the Arkansas and Canadian rivers. The general drainage for this portion of the province is northeast, toward the Arkansas River. Portions of

Robert S. Kerr Reservoir occupy the lower valleys of major tributaries. One of these larger tributaries is Sansbois Creek in the northeast corner of the McCurtain quadrangle.

The topography is that of a subdued mountain type (Oakes and Knechtel, 1948); mountains and ridges range between steeply-dipping hogbacks and nearly-level mesas, the height frequently indicating the approximate thickness of the shale section underlying the sandstone caprock. Structural influence on the major topographic features can be noted on Plate 1. Seven Devils Mountain occupies the Cowlington Syncline. Hogback ridges, with a relief of 100 to 150 feet (30 to 45 m) outline the Milton Anticline. Mesa-like hills are formed along the crest of this anticline; they reach elevations of 800 feet (244 m) to slightly more than 900 feet (274 m) above sea level, exhibiting a relief of 200 to 250 feet (61 to 76 m) above the local stream channels).

The maximum amount of relief for the McCurtain area is approximately 350 feet (106 m); this occurs in the northwest quarter of the quadrangle. Here, the channel of Sansbois Creek is generally at 450 feet (137 m) above sea level. Where Robert S. Kerr Reservoirs occupies the channel and lower valley, the normal pool elevation is 460 feet (140 m) (U.S.G.S. Topographic Quadrangle, 7.5 minute series, McCurtain, Oklahoma, 1968). Adjacent to this valley, Seven Devils Mountain reaches a maximum elevation of 813 feet (248 m), measured in section 3, T. 8 N., R. 22 E.

Owl Creek flows eastward near the southern edge of the quadrangle; Mule Creek carries intermittent drainage northwestward from McCurtain, across the west center of the map. Intermittent tributaries to these creeks form an annular drainage pattern within the Milton Anticline and join Owl Creek or Mud Creek by means of steep, narrow watergaps through the ridges.

Long, nearly-parallel intermittent streams dissect the northeastern third of the McCurtain Quadrangle. They unite and join Otter Creek, a permanent stream that flows into Robert S. Kerr Reservoir immediately north of the study area.

Climate and Vegetation

The climate in the southern part of the Oklahoma coal field is fairly moderate. Winters are short and not extremely cold; summers are generally long and hot. The mean annual temperature is 62.6°F (17° C) (Hendricks, 1937). Maximum temperatures range from an average of 47° (8.3° C) in January to 92°F (33.3° C) in August; average minimum temperatures range between 28°F (-2.2° C) in January and 70°F (21.1° C) in August. Temperatures above 100°F (37.7° C) frequently occur in July and August. The average relative humidity is 66%; average annual precipitation in the area varies between 38 inches (96.5 cm) in the west to 42 inches (106.7 cm) in the east (Trumbull, 1957). Rains are general and abundant in spring and early summer, localized in July and August, and again become widespread but less frequent in fall and winter (Hendricks, 1939). (The above temperature and precipitation figures were confirmed with the Tulsa office, U.S. Department of Commerce, N.O.A.A., on 11/25/80).

The area support a wide variety of vegetation; red, white, and blackjack oaks, hickories, elms, and hackberries are common upland trees. Pines may be found on the higher ridges and mountains. Where valleys have not been cleared for farming, thick stands of water and willow oaks, hickories, wild plums, willows and cottonwoods are present (Hendricks, 1939).

Land Status

The Federal government owns coal mineral rights to approximately 12,800 acres of land in the McCurtain quadrangle (Plate 2). Approximately 5,200 acres were leased as of October 19, 1979. The McCurtain Known Recoverable Coal Resources Area (KRCRA) lies in section 14 and 15, T. 8 N., R. 22 E., within an area of unleased Federal coal lands.

GENERAL GEOLOGY

Previous Work

Much work has been done on the southeastern Oklahoma coal field. The first geologic study, of the Choctaw coal field, was published by Chance (1890) and included a map showing the outcrops of the most important coal beds in the area. In 1897, Drake published the results of his study on the coal fields of the Indian Territory, which consisted of a map and text of the principal coal beds, general stratigraphy and structural features.

From 1899 to 1910, Taff and his associates published several reports on the Oklahoma coal lands. These included a number of investigations carried out for the United States Geological Survey on the extent and general character of local stratigraphy, including coal beds. Much of his work was a part of Senate Document 390 (1910), which represented a compilation of material collected for the purpose of determining the value and extent of coal deposits in and under the segregated coal lands of the Choctaw and Chickasaw Nations in Oklahoma.

The Oklahoma Geological Survey published a bulletin by Snider in 1914 on the geology of east-central Oklahoma, emphasizing the geologic structure and oil and gas possibilities of the area. Further studies on the southern Oklahoma coal lands were carried out by Shannon and others (1926), Moose and Searle (1929), and Hendricks (1939). These, along with later works by Knechtel and Oakes in the 1940's added greatly to the body of knowledge on Oklahoma coals, particularly in terms of their quality, chemical composition and extent.

Several of estimates as to original and remaining coal reserves have been published, among them are the figures published in papers by Trumbull 1957 and Friedman (1974). Non-proprietary information from coal test holes drilled in various years in the Wilburton quadrangle were obtained from USGS files. In recent years a number of masters theses have been done on various section of the southeastern Oklahoma coal field. Catalano (1976) carried out a study of the Hartshorne coal in an area including the McCurtain quadrangle, and some of his work has been incorporated in this report.

Stratigraphy

The Arkoma Basin, once part of the larger Ouachita geosyncline, formed as a result of subsidence beginning in Mississippian time and continuing through Early and Middle Pennsylvanian. Strata in the basin are thought to have been deposited in a deltaic environment with sediment coming primarily from eroding highlands to the northeast, north, and northwest (Branan, 1968). Evidence that the basin was becoming full is provided by coal seams in the upper Atoka and lower Desmoinesian section. Sedimentation continued until late Pennsylvanian time, when the Arbuckle Orogeny of southern Oklahoma took place (Branan, 1968). In early Permian time, Ouachita mountain building to the south of the basin compressed Arkoma Basin strata into a series of long, narrow, east-west anticlinal and synclinal folds (see section on Structure below).

Much of the rock units cropping out in the McCurtain quadrangle are of Pennsylvanian age, and include the Atoka Formation, as well as the Hartshorne, McAlester, Savanna and Boggy formations of the Lower-Desmoinesian Krebs Group. All of these formations contain coal beds ranging from less than 1 inch (2.54 cm) to more than 6 feet (1.8m) thick. The rocks exposed in this study area were mapped and described in detail for Haskell County by Oakes and Knechtel (1948) and for LeFlore County by Knechtel (1949).

The Atoka Formation was named by Taff and Adams in 1900. It is exposed in the McCurtain quadrangle along the axis of the Milton Anticline (Plate 1). Less than 300 feet (91 m) of the upper part of the Atoka is exposed; these beds consist mostly of gray argillaceous to silty shale containing a minor amount of hard, fine grained, gray to black sandstone beds (Oakes & Knechtel, 1948). Beds and lenses of clay-ironstone concretions may occur in the shales (Knechtel, 1949).

The Hartshorne Formation is the basal unit of the Desmoinesian Series. It is probably conformable with the underlying Atoka Formation (Hendricks, 1937; Oakes and Knechtel, 1948), although areas the sharp and irregular contact between the Hartshorne and Atoka Formations has lead some observers to conclude that a minor unconformity spearates them, at least locally (Hendricks, 1939, and Branson, 1962). The contact between the Hartshorne Formation and the overlying McAlester Formation is conformable (Hendricks, 1939, Oakes and Knechtel, 1948).

The boundaries of the Hartshorne Formation have been modified several times since the unit was first mapped by H. M. Chance in 1890. Then called the "Tobucksy" sandstone, the formation was renamed the Hartshorne sandstone by Taff in 1899. Early workers defined the formation such that the Upper Hartshorne coal was considered to be part of the overlying McAlester Formation.

However, Oakes and Knechtel (1948) recognized a convergence of the Upper and Lower Hartshorne coals in northern LeFlore and eastern Haskell counties, and redefined the formation to include both coals. The Hartshorne coal, undivided to the north, splits into Upper and Lower Hartshorne coals along a northeast-southwest trending line (Plate 8). The presently-used definition of the Hartshorne Formation is one proposed by McDaniel (1961), which supports the boundaries suggested by Oakes and Knechtel (1948), but formally divides the formation into upper and lower members where applicable (based on the above mentioned coal "split line").

The Hartshorne Formation is exposed on the limbs of the Milton Anticline (Plate 1). It consists predominantly of sandstone and hard siltsone with a smaller amount of shale (Knechtel, 1949). The sandstones are fine-grained, brown to light gray or white, silty or micaceous; the shales are gray and sandy. Plant fossils are locally abundant, particularly in the shales. The lower sandstone is massive and persistent; thickness averages around 50 feet (15 m) but may be greater locally. This is overlain by approximately 40 feet (12 m) of silty or sandy shale or siltstone; above this shale the upper Hartshorne sandstone may achieve a maximum thickness of 50 feet (15 m). The upper sandstone is variable in thickness and character, frequently occurring as thin beds which intergrade with the underlying siltstone (Oakes and Knechtel, 1948; Knechtel, 1949). The Hartshorne coal occurs above this upper sandstone.

Exposures of the Hartshorne coal in the mining area along the Milton Anticline of LeFlore and Haskell counties revealed only a few inches to about 1 fcot (0.3 m) of separation between the upper and lower seams. This interburden was described as mostly bony coal or coaly shale; at exposures in southern LeFlore, Latimer, and Pittsburg counties, this interval becomes a thicker wedge that is predominantly sandstone (Oakes and Knechtel, 1948). Well logs in the southern part of the McCurtain quadrangle indicate a shale interval between these two coal seams (Plates 1, 3); the interburden thickness becomes greater than 40 feet (12 m) in this area (Plate 10).

The McAlester Formation is approximatley 2000 feet thick (610 m) in southern Haskell County, thinning northward to around 700 feet (213 m) along the Canadian and Arkansas rivers (Oakes and Knechtel, 1948). Contact with the underlying Hartshorne Formation is considered to be gradational and conformable. There is minor local channeling and unconformity at the upper contact with the Savanna Formation in Haskell County. The McAlester Formation consists basically of shale units alternating with several persistent sandstone members. In the McCurtain quadrangle, these units may be grouped into three parts: upper and lower divisions consisting primarily of shale and a middle division containing three relatively prominent sandstones. These alternating shale and sandstone units are exposed over most of the study area, outside of the Milton Anticline (Plate 1).

The lowermost unit of the McAlester Formation is the McCurtain Shale Member, named for type exposures in the vicinity of the town of McCurtain. Average thickness of this member is 500 feet (152 m) in the study area; it is primarily a buff to greenish gray argillaceous shale that locally contains zones of siderite concretions and thin sandstones. One persistent sandstone with an associated local coal occurs approximately 200 feet (61 m) above the base of the shale; it is frequently noted in well logs of the area (Plate 3). A sandstone zone exposed in section 11 and 15, T. 8 N., R. 23 E., northeast of McCurtain, comprises approximately 10 feet (3 m) of thin, flaggy ripple-marked beds and contains a calcareous, fossiliferous layer. Twelve to fifteen miles to the northwest, this zone contains fossiliferous limestone; six or seven miles to the northeast, in the Bokoshe quadrangle, this horizon forms prominent cliffs of massive sandstone beds.

The middle subdivision of the McAlester Formation includes, in ascending order, the Warner Sandstone Member, an unnamed shale, the Lequire Sandstone Member, an unnamed shale, and the Cameron Sandstone Member. The shale units range from light gray and sandy to dark gray and carbonaceous; these shales are generally lighter and more sandy than those of the upper and lower portions of the McAlester Formation. The three sandstone members are buff, fine-grained, massive to thinly and regularly bedded, and ripple-marked.

The Warner Sandstone Member is a massive unit that forms the first prominent areally-persistent escarpment stratigraphically above the Hartshorne Formation in Haskell and LeFlore counties. It overlies the McCurtain Shale Member conformably and is made up of irregular beds of fine-grained sandstone with some layers of slabby to platy sandstone, siltstone, and shale (Oakes and Knechtel, 1948). A thin local coal bed occurs in the upper part of the Warner (Plate 3); it is sometimes associated with a shale bed that is locally as much as 5 feet thick (1.5 m) and is generally overlain by about 10 feet (3.0 m) of softer, thin beds of sandstone.

The unnamed shale unit is poorly exposed on the flanks of the Milton anticline. It overlies the Warner Sandstone conformably and is characteristically buff and silty to argillaceous. The average thickness is the McCurtain area is approximately 200 feet (61 m). The shale is noted for its variations in thickness; it thins rapidly to the northeast and is no longer present in the Stigler area where the Warner and Lequire sandstones are combined (Oakes and Knechtel, 1948).

The Lequire Sandstone Member conformably overlies the shale unit (above) and crops out widely in the eastern portion of the McCurtain quadrangle. The sandstone is generally slabby to thin-bedded, buff, fine-grained, commonly ripple-marked, and forms low, relatively inconspicuous ridges (Knechtel, 1949). A thin local coal may be found in the upper part or in the sandy shales above the sandstone (Plate 3). The Lequire is generally 8 to 10 feet thick (2.4 to 3.0 m) and thins toward the northeast where it is apparently coalesces with the Warner Sandstone.

The shale unit between the Warner and Lequire sandstones is poorly exposed in northern LeFlore County (Knechtel, 1949). It ranges from 180 to 750 feet thick (55 to 228 m), is light to dark gray in color and contains some zones of clay-ironstone nodules and lenses.

The Cameron sandstone member ranges from 10 to 20 feet (3.0 to 6.1 m) thick in northern LeFlore County; where present in eastern Haskell County, it is made up of thin, ripple-marked, fine-grained beds with interbedded shale. Surface exposures are not easily distinguished south of the Milton Anticline. The sandstone is not indicated on some wireline well logs, and appears as very thin sandstones or shaly sands on other logs.

The upper portion of the McAlester Formation, in ascending order, consists of the following units: an unnamed shale (containing the Stigler [Lower McAlester] coal, Upper McAlester [Stigler rider] coal,and a local coal), the Tamaha Sandstone Member, unnamed shale unit, the Keota Sandstone Member, and the Upper McAlester unnamed shale unit. These units grade into each other vertically and laterally. The shales are light to dark gray, and contain beds or lenses of clay-ironstone nodules, and thin sandstones (Knechtel, 1948). From outcrops in the McAlester district, the shales associated with the McAlester (Stigler) coals and those above the Keota Sandstone are described as dark, carbonaceous, and containing plant fragments or marine and brackish invertebrate fossils. Occasionally, one or more thin fossiliferous limestones are described from these intervals (Hendricks and Parks, 1937). The Tamaha and Keota sandstone members are discontinous or lenticular units; each is made up of one to three thin sandstone beds that may thicken and unite or intergrade with sandy shale.

The Savanna Formation is present in the Cowlington Syncline (Plate 1) and exposures may be found in a small strip at the center of the southern edge of the McCurtain quadrangle. It is poorly exposed in the area, and consists of a succession of sandstones and shales in which shale predominates but sandstone is most conspicuous in outcrops (Oaks and Knechtel, 1948). The nature of the contact between the Savanna and McAlester formations is not well exposed in the McCurtain quadrangle. It is believed to be irregular and to represent an unconformity which is more clearly demonstrated in other areas (Hendricks and Parks, 1937).

Quaternary deposits of recent alluvium occupy some stream valleys and flood plains in the McCurtain area. The alluvium is mainly composed of silt and sand, ranging in thickness from a few inches at the edges of flood plains up to 100 feet (30 m) (Oakes and Knechtel, 1948).

Structure

The McCurtain quadrangle is located near the center of the Arkoma Basin; this basin occupies the shallow-water, subsiding portion of the large Ouachita Geosyncline (Oakes and Knechtel, 1948). It is characterized by a thick sequence of lower Pennsylvanian strata folded into broad, relatively shallow synclines and narrow anticlines (Dane, et al, 1938; Russell, 1960). The axes of these structures are commonly en echelon, trend northeast-southwest, and are generally parallel to the frontal margin of the adjacent Ouachita salient, which is defined by the Choctaw Fault.

The principal surface structures in the McCurtain area are shown on Plate 1. The most pronounced structural feature is the Milton Anticline which extends generally northeast across the southern half of the quadrangle. A number of normal faults modify the trace of the anticlinal axis; they occur along either side and generally parallel to it, but cross the axis in three places. Where this occurs near the southwest corner of the quadrangle, the Hartshorne and lower McAlester strata appear to outline an anticline nose. The amount of dip ranges between 12° and 20° along the axis of the Milton Anticline, but the direction and intensity change frequently as a result of faulting. Dips along the southern flanks are steeper, between 20° and 25°, and moderate southward toward the Sansbois Syncline (south of the study area).

Structures in the north half of the McCurtain area trend more toward the north than the northeast. The axis of the Cowlington Syncline crosses the northwest quarter of the quadrangle. The strata dip northwest approximately 3° to 5° throughout most of this portion of the area.

COAL GEOLOGY

Several major coal beds have been identified in the McCurtain quadrangle. They include in ascending order the Hartshorne coal bed and its lower and upper splits, three unnamed coals, the Lower McAlester (Stigler) coal bed, and the Upper McAlester (Stigler Rider) coal bed. In addition, local coals in the upper part of the McAlester Formation and in the Savanna Formation have been tentatively identified from well logs. The Hartshorne coals and the Lower McAlester coal have been mapped for this report.

In the McCurtain quadrangle there are measurements of five local coals which exceed Reserve Base thickness of 1 foot (0.3 m). They include two local coals measured in data point 156, two measured in data point 193, and one measured in data point 198. In addition, there is one measurement of the Upper McAlester coal which exceeds 1 foot (0.3 m), in data point 193 (see Plate 1 for location and Plate 3 for correlations). All of the above mentioned data points have been treated as isolated data points (see below) for the purposes of this report.

Hartshorne Coal Bed and Upper and Lower Splits

The Hartshorne coals occur at or near the top of the Hartshorne Formation. The split line for the Hartshorne coal runs roughly east-west across the southern half of the McCurtain quadrangle (Plate 10). North of this line, only one coal seam is present; south of it, the Hartshorne seam is split into Upper and Lower Hartshorne coals. The interburden increases from 1 foot (0.3 m) at the split line to greater than 40 feet (12 m) at the southern edge of the quadrangle.

The Hartshorne coals have been mined along the outcrop on the flanks of the Milton Anticline. The location and extent of the mines (Plate 1) reflect the structural control and intensity of dip of strata.

Isopach measurements of the Upper and Lower Hartshorne coal beds are presented on Plate 8. The Lower Hartshorne coal is usually over 3 feet (0.9 m) thick and the upper coal averages over 2.5 feet (0.76 m) in thickness where mined. Well log data indicate an area where both of the coals may be greater than 10 feet (3m) thick. Net thickness for the Hartshorne coal bed is greater than 5 feet (1.5 m) in the mining area in the southwest quarter of the quadrangle.

Unnamed Local Coal Beds in the Lower McAlester Formation

Three local coal beds occur in the McAlester Formation below the Stigler coal (Plate 3). These coals are indicated on well logs; two are estimated to be as much as 2 feet (0.61 m) thick. The lower coal occurs in a thin sandy zone or above a thin intermittent sandstone near the center of the McCurtain shale member. The middle coal occurs in the thin sandstones or sandy shale overlying the Warner sandstone. The upper coal is found at the base of the shale overlying the Lequire sandstone, or within the upper sandy shale portion of the Lequire.

Stigler (Lower McAlester) Coal Bed

Where the Cameron sandstone is present in Haskell County, the Stigler coal bed occurs a few feet above it (Plate 3) within the shale sequence of the upper part of the McAlester Formation (Oakes and Knechtel, 1948). Strip mining has been carried out along the outcrops in the northwest quarter of the McCurtain quadrangle (Plate 1); the coal dips generally toward the axis of the Cowlington Syncline (Plate 5).

In the southern portion of the McCurtain quadrangle, the inferred outcrop of the Stigler coal crosses east-west, and the dip of coal is to the south (Plate 1, 5). These outcrops are covered by alluvium (Oakes and Knechtel, 1948). Thickness of the Stigler coal is estimated as 2 feet or more (0.6 m) where the indicated on gas well logs; it may thicken to more than 4 feet

(1.2 m) near the center of the south edge of the area (Plate 4).

Upper McAlester (Stigler Rider) Coal

The Upper McAlester coal (known as Stigler rider or "rider vein" to miners) is usually present approximately 25 feet (7 m) above the Stigler coal in the mining area (Plates 1 and 3). With only one exception (data point 193), this seam is less than 1 foot (0.3 m) thick in the McCurtain area. It is accompanied by a foot or more of under clay (Oakes and Knechtel, 1948).

Unnamed Local Coal Beds (Upper Part of the McAlester Formation)

A persistent local coal occurs 100 to 130 feet (30.5 to 39.6 m) above the Stigler coal (Plate 3). It was identified from a well log and estimated to be 2 feet (0.6 m) thick. Another coal has been tentatively identified from well log data at the approximate horizon of the Keota sand; thickness was estimated to be 2 feet (0.6 m)

Unnamed Local Coal Beds Savanna Formation

Limited exposures of thin local coals within the sandstone sequences of the Savanna Formation have been noted in Haskell and LeFlore counties (Oakes and Knechtel, 1948; Knechtel, 1949). These thin coals have been included in the composite section (Plate 3) based upon inferred identification on well logs in the McCurtain and adjoining areas.

Chemical Analyses of Coal

Chemical analyses were available for the Hartshorne coal and upper and lower splits in the McCurtain quadrangle. A summary of the analyses available is presented in Table 1. Average analyses are shown here, as is the range for all samples used to calculated each average value.

The coals were classified according to fixed carbon (FC), as determined on a dry, mineral-matter-free (mmf) basis. The "as received" FC shown on Table 1 were converted to dry mmf FC according to the following formula:

$$\text{Dry mmf Btu/lb} = \frac{\text{As rec'd FC} - 0.15\ S}{[1.00 - (M + 1.08\ A + 0.55\ S]} \times 100$$

where M = moisture, A = Ash, S = Sulfur

Based on the average fixed carbon shown on Table 1, the Hartshorne and Upper Hartshorne coals are classified as medium volatile bituminous coals, the Upper Hartshorne having an average 78% dry mmf fixed carbon and the Hartshorne having an average 77% dry mmf fixed carbon. The Lower Hartshorne coal is classified as low volitile A bituminous, with an average 79% dry mmf fixed carbon.

Isolated Data Points

In instances where single or isolated measurement of coal beds thicker than 1.0 foot (0.3 m) are encountered, the standard criteria for construction of isopach, structure contour, mining ratio, and overburden isopach maps are not available. The lack of data concerning these beds limits the extent to which they can be reasonably projected in any direction, and usually precludes their correlation with other, better known beds. For this reason, isolated data ponts have been mapped on separate figures for non-isopached coal beds. These figures are not included in this report, but are kept on file at the BLM office in Tulsa . However, coal reserves from these isolated data points are included in tables 2 and 3, and in the Reserve Base tonages shown on Plate 2.

Five of the six isolated data points in the McCurtain quadrangle are measurement of unnamed local coals, and one is of the Upper McAlester coal.

Table 1 Average chemical composition of coal beds in the McCurtain quadrangle, Haskell and LeFlore counties, Oklahoma

		Upper Hartshorne Coal Bed			Lower Hartshorne Coal Bed			Hartshorne Coal Bed		
Analysis	Form of analysis	# of samples	Average	Range	# of samples	Average	Range	# of samples	Average	Range
<u>Proximate</u>										
Moisture	A	3	0.37	0.22-0.47	3	0.35	0.32-0.40	25	3.1	24-4.4
Volatile matter	A	3	21.2	21.1-21.4	3	20.5	19.9-21.1	25	21.8	17.7-23.6
	C	-	-	-	-	-	-	3	19.3	18.5-20.0
Fixed Carbon	A	3	74.6	73.1-75.5	3	76.6	76.0-77.2	25	68.5	66.0-72.6
	C	-	-	-	-	-	-	3	71.9	68.6-74.9
Ash	A	3	3.8	3.1-5.3	3	2.5	2.46-2.58	25	6.6	4.4-8.8
	C	7	6.8	3.7-10.3	7	4.9	3.6-6.1	4	9.6	5.6-12.9
<u>Ultimate</u>										
Sulfur	A	3	0.87	0.83-0.91	3	0.72	0.62-0.92	25	0.9	0.6 -1.5
	C	6	0.77	0.65.0.90	6	0.88	0.58-1.42	4	1.7	0.7-3.7
Hydrogen	A	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Carbon	A	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Nitrogen	A	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Oxygen	A	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Heating Value										
Catories	A	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Btu/lb	A	-	14978	13989-15740	3	14,442	13113-15119	20	13985-14141	13610-14360
	C	-	-	-	-	-	-	3	14,141	13388-14673

Form of analysis: A = as received C = moisture free
Note: To convert Btu /lb to kj/kg multiply by 2.324
Source of data used in this table: Oakes and Knechtel (1948), Catalano (1976), USGS bore hole files

COAL RESOURCES

Data from drill holes, mine measured sections, outcrops, well logs and mine maps were used to construct outcrop, isopach, and structure contour maps of the various coal beds in the McCurtain quadrangle (see below). The source of each indexed data point shown on Plate 1 is listed in Appendix I at the end of this report.

A system for classifying coal resources has been published by the U. S. Bureau of Mines and the U. S. Geological Survey, and published in U. S. Geological Survey Bulletin 1450-B (1976). Under this system, resources are classified as either Identified or Undiscovered. Identified Resources are specific bodies of coal whose location, rank, quality and quantity are known from geologic evidence supported by specific measurements, while Undiscoverred Resources are bodies of coal which are thought to exist, based on broad geologic knowledge and theory.

Identified Resources may be subdivided into three categories of reliability of occurrence, according to their distance from a known point of coal-bed measurement. In order of decreasing reliability, these categories are: measured, indicated and inferred. Measured coal is that which is located within 0.25 miles (0.4 km) from a measurement point, indicated coal extends 0.5 mile (0.8 km) beyond measured coal to a distance of 0.75 miles (1.2 km) from the measurement point, and inferred coal extends 2.25 miles (3.6 km) beyond indicated coal, or a maximum distance of 3 miles (4.8 km) from the measurement point.

Undiscovered Resources may be either hypothetical or speculative. Hypothetical resources are those undiscovered coal resources that may be expected to exist in known coal fields under known geologic conditions. They are located beyond the outer boundary of inferred resources (see above) in areas where the coal-bed continuity is assumed based on geologic evidence. Hypothetical resources are those more than 3 miles (4.8 km) from the nearest measurement point. There are no hypothetical reserves in the McCurtain quadrangle.

Speculative resources are Undiscovered Resources that may occur in favorable areas where no discovereies have yet been made. Speculative resources have not been estimated in this report.

Coal resources for the Stigler (Lower McAlester) coal and the Hartshorne coal and its upper and lower splits were calculated using data obtained from their coal isopach maps (Plates 4 and 8 respectively). The coal-bed acreage (measured by planimeter and calculated using the trapezoidal method [modified from Hollo and Fifadara, 1980] multiplied by the average thickness of the coal bed, and by a conversion factor of 1800 short tons of coal per acre-foot (13,238 metric tons per hectare-meter) for bituminous coal yields the coal resources in short tons. Coal resource tonnages were calculated for Identified Resources in the measured, indicated, and inferred categories, and Undiscovered Resources in the hypothetical category, for unleased Federal coal lands. All coal beds thicker than 1 foot (0.305 m) that lie less than 3000 feet (914 m) below the ground surface are included in these calculations. These criteria differ from those stated in U.S. Geological Survey Bulletin 1450-B, which calls for a minimum thickness of 28 inches (70 cm) and a maximum depth of 1000 feet (305 m) for bituminous coal.

Reserve Base and Reserve tonnages for the above mentioned coal beds are shown on Plates 7, 12, and 13, and have been rounded to the nearest 10,000 short tons (9,072 metric tons). In this report, Reserve Base coal is the gross amount of Identified Resources that occurs in beds 1 foot (0.3 m) or more thick and under less than 3,000 feet (914 m) of overburden. Reserves are the recoverable part of the Reserve Base coal. In the southeastern Oklahoma coal field, a recovery factor of 80 percent is applied toward surface-minable Reserve Base coal, and a recovery factor of 50 percent is applied toward subsurface-minable coal. No recovery factor is applicable for in-situ coal gasification methods.

The total tonnage per section for both Reserve Base and hypothetical coal, including both surface and subsurface minable coal is shown in the northwest corner of the Federal coal lands in each seciton on Plate 2. All values shown on Plate 2 are rounded to the nearest 10,000 short tons (9,072 metric tons), and total approximately 85.94 million short tons (77.96 million metric tons) for the entire quadrangle, including tonnages in the isolated data points. Reserve Base tonnages from the various development potential categories for surface and subsurface mining and in-situ coal gasification methods are shown in tables 2 and 3.

The authors have not made any determination of economic recoverability for any of the coal beds described in this report.

COAL DEVELOPMENT POTENTIAL

Coal development potential areas are drawn to coincide with the boundaries of the smallest legal land subdivisions shown on Plate 2. In sections or parts of sections where no land subdivisions have been surveyed by the BLM, approximate 40-acre (16-hectare) parcels have been used to show to limits of the high, moderate, or low development potentials. A constraint imposed by the BLM specifies that the highest development potential affecting any part of a 40acre (16 hectares) lot, tract, or parcel be applied to that entire lot, tract, or parcel. For example, if 5 acres (2 hectares) within a parcel meet the criteria for a high development potential, 25 acres (10 hectares), a moderate development potential, and 10 acres (4 hectares), a low development potential, then the entire 40 acres (16 hectares) are assigned a high development potential. For purposes of this report, any lot or tract assigned a coal development potential contains coal in beds with a nominal minimum areal extent of 1 acre (0.4 hectare).

Development Potential for Surface Mining Methods

Areas where the coal beds of Reserve Base thickness are overlain by 150 feet (46 m) or less of overburden are considered to have potential for surface mining and are assigned a high, moderate, or low development potential based on their mining ratios (cubic yards of overburden per ton of recoverable coal). The formula used to calculate mining ratios for surface mining of coal is as follows:

$$MR = \frac{t_o\,(cf)}{t_c\,(rf)}$$

where MR = mining ratio

t_o = thickness of overburden in feet

t_c = thickness of coal in feet

rf = recovery factor (80 percent for this quadrangle)

cf = conversion factor to yield MR value in terms of cubic yards of overburden per short tons of recoverable coal:

0.896 for bituminous coal

Note: To convert mining ratio to cubic meters of overburden per metric ton of recoverable coal, multiply MR by 0.8428.

Areas of high, moderate, and low development potential for surface mining methods are defined as areas underlain by coal beds having respective mining ratio values of 0 to 10, to 15, and greater than 15. These mining ratio values for each development potential category are based on economic and technological criteria and were provided by the U.S. Geological Survey.

Areas where to coal data are absent or extremely limited between the 150-foot (46 m) overburden line and the coal outcrop are assigned unknown development potential for surface mining methods. This applies to areas where coal beds 1.0 foot (0.304 m) or more thick are not known but may occur, and to those areas influenced by isolated data points. Limited knowledge pertaining to the areal distribution, thickness, depth and attitude of the coals in these areas prevents accurate evaluation of development potential in the high, moderate, or low categories. The areas influenced by isolsated data points in the quadrangle contain, approximately 0.25 million short tons (0.23 million metric tons) of coal available for surface mining.

The coal development potential for surface mining methods is shown on Plate 14. All tonnage values are summarized presented in Table 2. Of Federal coal land not subject to currently outstanding coal lease, permit, license or preference right lease application having a known development potential for surface mining, 25 percent is rated high, 2 percent is rated moderate, and 9 percent is rated low. The remaining Federal land (64 percent) is classified as having unknown or no development potential for surface mining methods.

Development Potential for

Subsurface Mining and In-Situ Coal Gasification Methods

Areas considered to have a development potential for conventional sub-

Table 2. Coal Reserve Base data for surface mining methods for Federal coal land (in short tons) in the McCurtain quadrangle, Haskell and LeFlore counties, Oklahoma.

Coal Bed	High Development Potential	Moderate Development Potential	Low Development Potential	Unknown Development Potential	Total
Stigler Lower McAlester	410,000	210,000	1,720,000	-	2,340,000
Upper Hartshorne	10,000	-	40,000	-	50,000
Hartshore	190,000	100,000	960,000	-	1,250,000
Lower Hartshorne	30,000	10,000	170,000	-	210,000
Isolated Data Points	-	-	-	250,000	250,000
Total	640,00	320,000	2,890,000	250,000	4,100,000

surface mining methods are those areas where the coal beds of Reserve Base thickness are between 150 and 3,000 feet (46 and 914 m) below the ground surface and have dips of 15° or less. Coal beds lying between 150 and 3,000 feet (46 and 914 m) below the ground surface, dipping greater than 15°, are considered to have a development potential for in-situ coal gasification methods.

Areas of high, moderate, and low development potential for conventional subsurface mining methods are defined as areas underlain by coal beds at depths ranging from 150 to 1,000 feet (46 to 305m), 1,000 to 2,000 feet (305 to 610 m), and 3,000 to 3,000 feet (610 to 914 m), respectively.

Areas where the coal data are absent or extremely limited between 150 and 3,000 feet (46 to 914 m) below the ground surface are assigned unknown development potentials. This applies to areas where coal beds of Reserve Base thickness are not known, but may occur and to those areas influenced by isolated data points. The areas influenced by isolated data points in this quadrangle contain 1.76 million short tons (1.60 million metric tons) available for subsurface mining.

The coal development potential for conventional subsurface mining and in-situ gasification methods is shown on Plate 15. A summary of all tonnange values is presented in Table 3. Of the Federal land areas having a known development potential for conventional subsurface mining or in-situ gasification methods, 46 percent is rated high, 16 percent is rated moderate, and none is rated low. Five percent of the remaining Federal land in the quadrangle is classified as having no development potential for either subsurface mining method.

Based on criteria provided by the U.S. Geologicial Survey, coal beds of

Reserve Base thickness dipping between 15^{o} and 35^{o} (regardless of tonnage) have a low development potential for in-situ coal gasification methods. Beds dipping from 35^{o} to 90^{o}, with a minimum of 50 million tons of coal in a single unfaulted bed or multiple, closely spaced, approximately parallel beds have a moderate development potential for in-situ coal gasification methods. Coal lying between the 150-foot (46 m) overburden isopach and the outcrop is not included in total coal tonnages available because it is needed for cover and containment in the in-situ process.

In the McCurtain quadrangle, 55 percent of Federal coal land has a low development potential for in-situ gasification. However, 41 percent of this land also has a potenital for conventional subsurface mining methods. No land in the quadrangle has a moderate development for in-situ gasification.

Table 3. Coal Reserve Base data for subsurface mining and in-situ gasification methods for Federal coal land (in short tons) in the McCurtain quadrangle, Haskell and LeFlore counties, Oklahoma

Coal Bed	High Subsurface Development Potential	Moderate Subsurface Development Potential	Low Subsurface Development Potential	Low In-site Development Potential	Unknown Development Potential	Total
Stigler Lower McAlester	3,960,000	-	-	4,260,000	-	8,220,000
Upper Hartshorne	2,070,000	7,960,000	2,960,000	14,970,000	-	27,960,000
Hartshore	6,200,000	-	-	470,000	-	6,670,000
Lower Hartshorne	2,680,000	9,690,000	5,070,000	19,790,000	-	37,230,000
Isolated Data Points	-	-	-	-	1,760,000	1,760,000
Total	14,910,000	17,650,000	8,030,000	39,490,000	1,760,000	81,840,000

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APPENDIX I. SOURCE AND RELIABILITY OF DATA USED ON PLATE 1.

Listed below is a point by point accounting as to the source and reliability of all information shown on Plate 1. Also presented are any notes or comments pertaining to individual data points.

DATA POINT #	LOCATION	INCREASING RELIABILITY →	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	CSE	Location					x	Cheyenne Petroleum Company,	KB is 11' above GL. I-GR
	Section 13	Overburden				x		#1-13, Arnold, 1976	log (CFD starts below
1	T 9 N | R 22 E	Coal Thickness			x				Hartshorne).
	SW NE	Location					x	Texas Oil and Gas, #1	KB is 14' above GL. DIF
	Section 21	Overburden				x		Ross "B", 1978	log (Den - Neut too deep).
2	T 9 N | R 22 E	Coal Thickness			x				
	NW NE	Location			x			Catalano, 1978, plate 2, 10	Upper and lower Hartshorne
	Section 23	Overburden	x					p. 53, Bore Hole #8	benches. Plate shows wrong
3	T 9 N | R 22 E	Coal Thickness	x						scale - should be 100'/in.
	NE NE	Location			x			Oakes & Knechtel, 1948,	Prospect pit on west edge
	Section 24	Overburden			x			plate 2, table 3, Bore Hole	of strip pit.
4	T 9 N | R 22 E	Coal Thickness			x			#6	
	SE SW	Location				x		Oakes & Knechtel, 1948,	On west edge of strip pit.
	Section 24	Overburden			x			plate 2, table 3, Bore Hole	
5	T 9 N | R 22 E	Coal Thickness			x			#7	
	SW SW	Location				x		Oakes & Knechtel, 1948,	
	Section 24	Overburden			x			plate 2, table 3, Bore Hole	
6	T 9 N | R 22 E	Coal Thickness			x			#8	
	NE NW	Location			x			Catalano, L.E., 1978, plate	
	Section 26	Overburden	-	-	-	-	-	2, 10, p. 53, Bore Hole #10	
7	T 9 N | R 22 E	Coal Thickness			x				
	SW NW	Location			x			Catalano, L.E., 1978, plate	Scale est. at 100'/inch,
	Section 27	Overburden	x					2, 10, p. 53, Bore Hole #11	not 1000'/inch as shown.
8	T 9 N | R 22 E	Coal Thickness	x						U & L Hartshorne benches.
	S/2 SE	Location					x	Texas Oil and Gas, Wilson	KB is 11' above GL. I-GR
	Section 28	Overburden				x		"H", #1, 1977	log (CFD too deep).
9	T 9 N | R 22 E	Coal Thickness			x				
	NE SW	Location					x	Monsanto Company #1 Queen,	KB is 17' above GL. D-log
	Section 27	Overburden				x		1970	too deep.
10	T 9 N | R 22 E	Coal Thickness			x				
	NW SE	Location				x		Oakes & Knechtel, 1948,	
	Section 26	Overburden			x			plate 2, table 3, Bore Hole	
11	T 9 N | R 22 E	Coal Thickness			x			#9	

DATE POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	SE SW	Location				x		Oakes & Knechtel, 1948,	
	Section 26	Overburden			x			plate 2, table 3, Bore Hole	
12	T 9 N R 22 E	Coal Thickness			x			#10	
	NW NW	Location				x		Oakes & Knechtel, 1948,	Apparently not removed by
	Section 35	Overburden				x		plate 2, table 3, Bore Hole	stripping.
13	T 9 N R 22 E	Coal Thickness			x			#13	
	SW NW	Location				x		Oakes & Knechtel, 1948,	Strip pit location (symbol
	Section 35	Overburden				x		plate 2, table 3, Bore Hole	for drill hole on plate 2).
14	T 9 N R 22 E	Coal Thickness			x			#14	
	N/2 SW	Location			x			Oakes & Knechtel, 1948,	Prospect pit location.
	Section 35	Overburden		x				plate 2, table 3, Prospect	
15	T 9 N R 22 E	Coal Thickness				x		Pit #15	
	NE NW	Location			x			Catalano, Lee, 1978, plate	No split implied.
	Section 31	Overburden	-	-	-	-	-	10, p. 53, Bore Hole #4	
16	T 9 N R 23 E	Coal Thickness			x				
	NE SW	Location					x	Stephens Prod. Company, #1	IEL used, FDL starts too
	Section 35	Overburden		x				Warren Foundation, 1965	deep. KB is 12' above GL.
17	T 9 N R 22 E	Coal Thickness		x					
	NE SE	Location				x		Oakes & Knechtel, 1948,	Apparently not removed by
	Section 34	Overburden				x		plate 2, table 3, Bore Hole	stripping.
18	T 9 N R 22 E	Coal Thickness			x			#11	
	NE SW	Location					x	Gose Petroleum #1-A	I-E log, FDL log starts too
	Section 33	Overburden				x		Frederick, 1967	deep. KB is 15' above GL.
19	T 9 N R 22 E	Coal Thickness			x				
	W/2 SE	Location					x	Hanover Management Company	I-GR log (DIF), density log
	Section 33	Overburden		x				#2-A Frederick, 1978	starts too deep. KB is
20	T 9 N R 22 E	Coal Thickness		x					16.3' above GL.
	SE SE	Location				x		Oakes, M.C. & Knechtel,	
	Section 34	Overburden				x		1948, plate 2, table 3,	
21	T 9 N R 22 E	Coal Thickness			x			Bore Hole #12	
	NW NW	Location				x		Oakes, M.C. & Knechtel,	
	Section 2	Overburden				x		1948, plate 2, table 3,	
22	T 8 N R 22 E	Coal Thickness			x			Bore Hole #1	
	SW NW	Location				x		Oakes, M.C. & Knechtel,	
	Section 2	Overburden				x		1948, plate 2, table 3,	
23	T 8 N R 22 E	Coal Thickness			x			Bore Hole #2	
	NW SW	Location				x		Oakes, M.C. & Knechtel,	
	Section 2	Overburden				x		1948, plate 2, table 3,	
24	T 8 N R 22 E	Coal Thickness			x			Bore Hole #3	

DATE POINT #	LOCATION		INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	SE SE		Location				x		Oakes, M.C. & Knechtel,	
	Section 3		Overburden				x		1948, plate 2, table 3,	
25	T 8 N	R 22 E	Coal Thickness			x			Bore Hole #4	
	CS line		Location				x		Oakes, M.C. & Knechtel,	
	Section 3		Overburden				x		1948, plate 2, table 3,	
26	T 8 N	R 22 E	Coal Thickness				x		Bore Hole #5	
	NE NW		Location				x		Oakes, M.C. & Knechtel,	
	Section 10		Overburden				x		1948, plate 2, table 3,	
27	T 8 N	R 22 E	Coal Thickness				x		Bore Hole #10	
	SE NE		Location				x		Oakes, M.C. & Knechtel,	Disturbed by stripping.
	Section 9		Overburden				x		1948, plate 2, table 3,	
28	T 8 N	R 22 E	Coal Thickness				x		Bore Hole #9	
	NE SW		Location				x		Oakes, M.C. & Knechtel,	Disturbed by stripping.
	Section 9		Overburden				x		1948, plate 2, table 3,	
29	T 8 N	R 22 E	Coal Thickness				x		Bore Hole #8	
	SW SW		Location				x		Oakes, M.C. & Knechtel,	
	Section 9		Overburden				x		1948, plate 2, table 3,	
30	T 8 N	R 22 E	Coal Thickness				x		Bore Hole #7	
	SE SE		Location				x		USGS files, 1958, Evans	Chemical analysis, both
	Section 4		Overburden				x		Coal Company Mine Map,	coals.
31	T 8 N	R 23 E	Coal Thickness				x		Bore Hole #11-AA	
	SE SE		Location				x		Knechtel, M.M., 1949,	Coal prospect; upper and
	Section 4		Overburden	-	-	-	-	-	table 3, plates 1 & 2,	lower Hartshorne benches.
32	T 8 N	R 23 E	Coal Thickness					x	Prospect Pit #8	
	SE SE		Location				x		USGS files, 1958, Evans	
	Section 4		Overburden				x		Coal Company Mine Map,	
33	T 8 N	R 23 E	Coal Thickness	x					Bore Hole #8-B	
	NW NE		Location				x		USGS files, 1958, Evans	
	Section 9		Overburden				x		Coal Company Mine Map,	
34	T 8 N	R 23 E	Coal Thickness				x		Bore Hole #9-BB	
	NW NE		Location				x		Knechtel, M.M., 1949,	
	Section 9		Overburden	-	-	-	-	-	table 3, plates 1 & 2,	
35	T 8 N	R 23 E	Coal Thickness					x	Bore Hole #22	
	N/2 N/2		Location				x		Knechtel, 1949, table 3,	
	Section 9		Overburden	-	-	-	-	-	plates 1 & 2, Bore Hole #21	
36	T 8 N	R 23 E	Coal Thickness			x				
	NE NW		Location				x		USGS files, 1958, Evans	
	Section 9		Overburden				x		Coal Company Mine Map,	
37	T 8 N	R 23 E	Coal Thickness				x		Bore Hole #14-B	

DATA POINT #	LOCATION	INCREASING RELIABILITY →	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	S/2 NW	Location				x		Knechtel, 1949, table 3,	Coal prospect, U & L Hart-
	Section 9	Overburden	-	-	-	-	-	plates 1 & 2, Prospect Pit	shorne benches.
38	T 8 N R 23 E	Coal Thickness			x			#20	
	SW NW	Location				x		Knechtel, 1949, table 3,	U & L Hartshorne benches.
	Section 9	Overburden	-	-	-	-	-	plates 1 & 2, Bore Hole	
39	T 8 N R 23 E	Coal Thickness					x	#19	
	SE NE	Location				x		USGS files, 1958, Evans	
	Section 8	Overburden				x		Coal Company Mine Map,	
40	T 8 N R 23 E	Coal Thickness				x		Bore Hole #12 AA	
	SE NE	Location				x		USGS files, 1958, Evans	
	Section 8	Overburden				x		Coal Company Mine Map,	
41	T 8 N R 23 E	Coal Thickness				x		Bore Hole #19	
	NE SE	Location				x		Knechtel, M.M., 1949,	U & L Hartshorne benches
	Section 8	Overburden	-	-	-	-	-	OGS Bulletin 68, table 3,	with location in strip mine
42	T 8 N R 23 E	Coal Thickness					x	plates 1 & 2, Bore Hole #18	area.
	NW SE	Location				x		Knechtel, M.M., 1949,	U & L Hartshorne benches
	Section 8	Overburden	-	-	-	-	-	OGS Bulletin 68, table 3,	with location in strip mine
43	T 8 N R 23 E	Coal Thickness					x	plates 1 & 2, Bore Hole #17	area.
	NE SW	Location				x		Knechtel, M.M., 1949, OGS	U & L Hartshorne benches
	Section 8	Overburden	-	-	-	-	-	Bulletin 68, table 3,plates	with location in strip mine
44	T 8 N R 23 E	Coal Thickness			x			1 & 2, Prospect Pit #16	area.
	NE SW	Location				x		USGS files, 1958, Evans	U & L Hartshorne benches
	Section 8	Overburden				x		Coal Company Mine Map,	with location in strip mine
45	T 8 N R 23 E	Coal Thickness				x		Bore Hole #13	area.
	NE SW	Location				x		Knechtel, M.M., 1949,	U & L Hartshorne benches
	Section 8	Overburden	-	-	-	-	-	table 3, plates 1 & 2,	with location in strip mine
46	T 8 N R 23 E	Coal Thickness					x	Bore Hole #15	area.
	SW SW	Location				x		Knechtel, M.M., 1949,	U & L Hartshorne benches
	Section 8	Overburden	-	-	-	-	-	table 3, plates 1 & 2,	with location in strip mine
47	T 8 N R 23 E	Coal Thickness					x	Bore Hole #14	area.
	SE SE	Location				x		Knechtel, M.M., 1949,	U & L Hartshorne benches
	Section 7	Overburden	-	-	-	-	-	table 3, plates 1 & 2,	with location in strip mine
48	T 8 N R 23 E	Coal Thickness					x	Bore Hole #13	area.
	SW SE	Location				x		Knechtel, M.M., 1949,	U & L Hartshorne benches
	Section 7	Overburden	-	-	-	-	-	table 3, plates 1 & 2,	with location in strip mine
49	T 8 N R 23 E	Coal Thickness					x	Bore Hole #12	area.
	S/2 S/2	Location				x		Knechtel, M.M, 1949,	U & L Hartshorne benches
	Section 7	Overburden	-	-	-	-	-	table 3, plates 1 & 2,	with location in strip mine
50	T 8 N R 23 E	Coal Thickness					x	Bore Hole #11	area.

DATA POINT #	LOCATION	INCREASING RELIABILITY →	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	SE SW	Location				x		Knechtel, M.M., 1949,	U & L Hartshorne benches
	Section 7	Overburden	-	-	-	-	-	table 3, plates 1 & 2,	with location in strip mine
51	T 8 N R 23 E	Coal Thickness			x			Prospect Pit #10	area.
	SW SW	Location				x		Knechtel, M.M., 1949,	U & L Hartshorne benches
	Section 7	Overburden	-	-	-	-	-	table 3, plates 1 & 2,	with location in strip mine
52	T 8 N R 23 E	Coal Thickness					x	Bore Hole #9	area.
	SE SE	Location				x		Oakes, M.C. & Knechtel,	U & L Hartshorne benches
	Section 12	Overburden				x		M.M., 1948, plate 2, table	with location in strip mine
53	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #13	area.
	SE SW	Location				x		Oakes, M.C. & Knechtel,	U & L Hartshorne benches
	Section 12	Overburden				x		M.M., 1948, plate 2, table	with location in strip mine
54	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #12	area.
	N/2 NW	Location				x		Oakes, M.C. & Knechtel,	U & L Hartshorne benches
	Section 13	Overburden				x		M.M., 1948, plate 2, table	with location in strip mine
55	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #14	area.
	NW NW	Location				x		Oakes, M.C. & Knechtel,	Drill hole located near
	Section 13	Overburden				x		M.M., 1948, plate 2, table	edge of more recent strip-
56	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #15	ping.
	NW NW	Location			x			Catalano, Lee, 1978, plate	
	Section 13	Overburden	-	-	-	-	-	10, p. 53, Bore Hole #93	
57	T 8 N R 22 E	Coal Thickness			x				
	NW SW	Location					x	Oklahoma Department of	
	Section 13	Overburden					x	Mines files, 1978-79,	
58	T 8 N R 22 E	Coal Thickness					x	Bore Hole #D-7	
	NW NE	Location				x		Oakes, M.C. & Knechtel,	Drill hole now located near
	Section 14	Overburden				x		M.M., 1948, plate 2, table	edge of strip land.
59	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #16	
	SW NE	Location			x			Catalano, Lee 1978, plate	
	Section 14	Overburden	-	-	-	-	-	10, p. 54, Bore Hole #101	
60	T 8 N R 22 E	Coal Thickness			x				
	SE NW	Location				x		Oakes, M.C. & Knechtel,	Located on edge of strip
	Section 14	Overburden				x		M.M., 1948, plate 2, table	pit. U & L Hartshorne
61	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #17	benches.
	SE NW	Location			x			Catalano, Lee 1978, plate	
	Section 14	Overburden	-	-	-	-	-	10, p. 54, Bore Hole #104	
62	T 8 N R 22 E	Coal Thickness			x				
	SE NW	Location			x			Catalano, Lee 1978, plate	
	Section 14	Overburden	-	-	-	-	-	10, p. 54, Bore Hole #106	
63	T 8 N R 22 E	Coal Thickness			x				

DATE POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	SE NW	Location				x		Oakes, M.C. & Knechtel,	Location on edge of strip
	Section 14	Overburden				x		M.M., 1948, plate 2, table	pit. U & L Hartshorne
64	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #18	benches.
	S/2 NW	Location				x		Oakes, M.C. & Knechtel,	U & L Hartshorne benches.
	Section 14	Overburden				x		M.M., 1948, plate 2, table	
65	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #19	
	SE NW	Location			x			Catalano, Lee 1978, plate	
	Section 14	Overburden	-	-	-	-	-	10, p. 54, Bore Hole #107	
66	T 8 N R 22 E	Coal Thickness			x				
	SW NW	Location				x		Oakes & Knechtel, 1948, OGS	Location in more recent
	Section 14	Overburden			x			Bulletin #67, plate 2,	strip pit.
67	T 8 N R 22 E	Coal Thickness				x		table 3, Bore Hole #20	
	SW NW	Location				x		Oakes & Knechtel, 1948, OGS	Location on edge of strip
	Section 14	Overburden			x			Bulletin #67, plate 2,	pit.
68	T 8 N R 22 E	Coal Thickness			x			table 3, Bore Hole #22	
	W/2 NW	Location				x		Oakes & Knechtel, 1948, OGS	
	Section L4	Overburden				x		Bulletin #67, plate 2,	
69	T 8 N R 22 E	Coal Thickness			x			table 3, Bore Hole #21	
	SW SW	Location				x		Oakes & Knechtel, 1948, OGS	On old mine Lease Map #0337
	Section 11	Overburden				x		Bulletin #67, plate 2,	
70	T 8 N R 22 E	Coal Thickness				x		table 3, Bore Hole #11	
	N edge NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 15	Overburden				x		M.M., 1948, plate 2, table	
71	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #23	
	NW NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 15	Overburden				x		M.M., 1948, plate 2, table	
72	T 8 N R 22 E	Coal Thickness				x		3, Bore Hole #24	
	SE NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 15	Overburden			x			M.M., 1948, plate 2, table	
73	T 8 N R 22 E	Coal Thickness			x			3, Bore Hole #27	
	NE SE	Location			x			Catalano, Lee 1978, plate	Location in mined area
	Section 15	Overburden	-	-	-	-	-	10, p. 54, Bore Hole #128	(strip).
74	T 8 N R 22 E	Coal Thickness			x				
	SW NE	Location				x		USGS files, 1942, Sans Bois	Location in mined area.
	Section 15	Overburden	-	-	-	-	-	Coal Company Mine Map, Bore	
75	T 8 N R 22 E	Coal Thickness				x		Hole #11-3	
	SE NW	Location				x		Oakes, M.C. & Knechtel,	Location in mined area.
	Section 15	Overburden			x			M.M., 1948, plate 2, table	
76	T 8 N R 22 E	Coal Thickness			x			3, Bore Hole #28	

DATE POINT #	LOCATION	INCREASING RELIABILITY →	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	NE NW	Location			x			Oakes, M.C. & Knechtel,	
	Section 15	Overburden			x			M.M., 1948, plate 2, table	
77	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #25	
	NE SW	Location					x	Texas Pacific Federal	IEL used; FDL starts too
	Section 15	Overburden				x		College Unit #1 (10/14/64)	deep (not obtained)
78	T 8 N | R 22 E	Coal Thickness			x				KB: 15.6' above GL
	NE SW	Location				x		Oakes, M.C. & Knechtel,	
	Section 15	Overburden			x			M.M., 1948, plate 2, table	
79	T 8 N | R 22 E	Coal Thickness			x			3, Bore Hole #29	
	NE SW	Location			x			Oakes, M.C. & Knechtel,	Exact location questionable
	Section 15	Overburden			x			M.M., 1948, plate 2, table	
80	T 8 N | R 22 E	Coal Thickness				x		3, Data Control #31	
	NW SW	Location				x		Oakes, M.C. & Knechtel,	
	Section 15	Overburden			x			M.M., 1948, plate 2, table	
81	T 8 N | R 22 E	Coal Thickness			x			3, Bore Hole #30	
	SW NW	Location				x		Oakes, M.C. & Knechtel,	
	Section 15	Overburden				x		M.M., 1948, plate 2, table	
82	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #26	
	E/2 E/2	Location				x		Oakes, M.C. & Knechtel,	
	Section 16	Overburden				x		M.M., 1948, plate 2, table	
83	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #35	
	NE NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 16	Overburden				x		M.M., 1948, plate 2, table	
84	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #36	
	SW NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 16	Overburden				x		M.M., 1948, plate 2, table	
85	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #37	
	SW NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 16	Overburden				x		M.M., 1948, plate 2, table	
86	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #38	
	NW SE	Location				x		Oakes, M.C. & Knechtel,	
	Section 16	Overburden			x			M.M., 1948, plate 2, table	
87	T 8 N | R 22 E	Coal Thickness			x			3, Bore Hole #33	
	NW SE	Location			x			Fieldner, et al, 1922,	Taken from face of 7 west
	Section 16	Overburden		-	-	-	-	P. 214 Measured Section.	entry, main slope. Blue
88	T 8 N | R 22 E	Coal Thickness					x		Ridge mine #3.
	SE SW	Location				x		Oakes, M.C. & Knechtel,	
	Section 16	Overburden				x		M.M., 1948, plate 2, table	
89	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #34	

DATA POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	NW NW	Location				x		Oakes, M.C. & Knechtel,	
	Section 21	Overburden				x		M.M., 1948, plate 2, table	
90	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #52	
	NW NW	Location				x		Oakes, M.C. & Knechtel,	
	Section 21	Overburden			x			M.M., 1948, plate 2, table	
91	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #53	
	NE NW	Location				x		Oakes, M.C. & Knechtel,	Located in stripped area.
	Section 21	Overburden				x		M.M., 1948, plate 2, table	
92	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #59	
	SW NW	Location				x		Oakes, M.C. & Knechtel,	
	Section 21	Overburden				x		M.M., 1948, plate 2, table	
93	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #60	
	SE NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 20	Overburden				x		M.M., 1948, plate 2, table	
94	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #46	
	SE NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 20	Overburden				x		M.M., 1948, plate 2, table	
95	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #47	
	SE NW	Location				x		Oakes, M.C. & Knechtel,	Located in stripped area.
	Section 21	Overburden				x		M.M., 1948, plate 2, table	
96	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #58	
	SW NE	Location				x		Oakes, M.C. & Knechtel,	Located in strip area.
	Section 21	Overburden				x		M.M., 1948, plate 2, table	No. 5 Slope Mine.
97	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #57	
	SW NE	Location				x		Oakes, M.C. & Knechtel,	
	Section 21	Overburden				x		M.M., 1948, plate 2, table	
98	T 8 N | R 22 E	Coal Thickness				x		3, Bore Hole #61	
	SE NE	Location				x		USGS files, 1902, Sans Bois	
	Section 21	Overburden			x			Coal Company Mine Map	
99	T 8 N | R 22 E	Coal Thickness				x			
	SE NE	Location				x		USGS files, 1912, Sans Bois	
	Section 21	Overburden			x			Coal Company Mine Map,	
100	T 8 N | R 22 E	Coal Thickness				x		Bore Hole #2	
	SE NE	Location				x		USGS files, 1912, Sans Bois	Coal not reported.
	Section 21	Overburden		x				Coal Company Mine Map #2,	
101	T 8 N | R 22 E	Coal Thickness				x		Bore Hole #25	
	SE NE	Location			x			USGS files, 1912, Sans Bois	Coal not reported.
	Section 21	Overburden			x			Coal Company Mine Map #2,	
102	T 8 N | R 22 E	Coal Thickness	-	-	-	-	-	Bore Hole #23	

DATA POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	SE NE	Location				x		USGS files, 1912, Sans Bois	Reported depth to coal may
	Section 21	Overburden		x				Coal Company Mine Map #2,	be to base, not top of coal
103	T 8 N | R 22 E	Coal Thickness					x	Bore Hole #21	
	NE NE	Location			?			USGS files, 1902, Sans Bois	Elevation of top of coal
	Section 21	Overburden				x		Coal Company Mine Map,	given as 24.5'.
104	T 8 N | R 22 E	Coal Thickness				x		Bore Hole #1	
	NE NE	Location				x		Oakes and Knechtel, 1948,	Coal, questionably Hart-
	Section 21	Overburden				x		plate 2, table 3, Bore Hole	shorne.
105	T 8 N | R 22 E	Coal Thickness				x		#55	
	NE NE	Location				x		Oakes and Knechtel, 1948,	
	Section 21	Overburden			x			plate 2, table 3, Bore Hole	
106	T 8 N | R 22 E	Coal Thickness	-	-	-	-	-	#54	
	SE SE	Location				x		Oakes, and Knechtel, 1948,	
	Section 16	Overburden		x				plate 2, table 3, Bore Hole	
107	T 8 N | R 22 E	Coal Thickness			x			#32	
	SW NW	Location				x		USGS files, 1912, Sans Bois	
	Section 22	Overburden		x				Coal Company Mine Map #2,	
108	T 8 N | R 22 E	Coal Thickness	-	-	-	-	-	Bore Hole #19	
	SW NW	Location				x		USGS files, 1902, Sans Bois	
	Section 22	Overburden	-	-	-	-	-	Coal Company Mine Map,	
109	T 8 N | R 22 E	Coal Thickness	-	-	-	-	-	Bore Hole #12	
	SE SW	Location				x		Oakes and Knechtel, 1948,	
	Section 21	Overburden				x		plate 2, table 3, Bore Hole	
110	T 8 N | R 22 E	Coal Thickness				x		#63	
	NW SE	Location			x			USGS files, 1912, Sans Bois	Note discrepancies b/w
	Section 21	Overburden			x			Coal Company Mine Map #2	original data and Mine Map
111	T 8 N | R 22 E	Coal Thickness			x			Bore Hole #2	#2.
	SE SW	Location				x		Fieldner et al, 1914,	
	Section 21	Overburden	-	-	-	-	-	p. 251, Section E, sample	
112	T 8 N | R 22 E	Coal Thickness					x	#13692	
	SW SE	Location				x		Fieldner et al, 1914,	
	Section 21	Overburden	-	-	-	-	-	p. 251-252, Section A,	
113	T 8 N | R 22 E	Coal Thickness					x	sample #13688	
	SW SE	Location				x		USGS files, 1912, Sans Bois	Composite of a mine section
	Section 21	Overburden				x		Coal Company Mine Map #2	and Bore Hole 50' apart.
114	T 8 N | R 22 E	Coal Thickness					x		
	SW SE	Location				x		Lord, N.W. et al, 1913,	Sampled from Sans Bois #2
	Section 21	Overburden	-	-	-	-	-	p. 676	Mines, face of S entry.
115	T 8 N | R 22 E	Coal Thickness					x		10,2700' SE of opening.

DATE POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	NW SE	Location				x		Oakes and Knechtel, 1948,	Upper and lower Hartshorne
	Section 21	Overburden				x		plate 2, table 3, Bore Hole	benches.
116	T 8 N | R 22 E	Coal Thickness				x		#62	
	SW SE	Location				x		USGS files, 1912, Sans Bois	* Average of 2 values;
	Section 21	Overburden	-	-	-	-	-	Coal Company Mine Map #2	middle band = 2.0'.
117	T 8 N | R 22 E	Coal Thickness					x		
	NW NE	Location				x		Oakes and Knechtel, 1948,	
	Section 28	Overburden				x		plate 2, table 3, Bore Hole	
118	T 8 N | R 22 E	Coal Thickness				x		#80	
	SE SE	Location				x		Oakes and Knechtel, 1948,	
	Section 21	Overburden				x		plate 2, table 3, Bore Hole	
119	T 8 N | R 22 E	Coal Thickness				x		#64	
	SE SE	Location				x		Oakes and Knechtel, 1948,	
	Section 21	Overburden				x		plate 2, table 3, Bore Hole	
120	T 8 N | R 22 E	Coal Thickness				x		#65	
	SW SW	Location				x		USGS files, 1912, Sans Bois	
	Section 22	Overburden			x			Coal Company Mine Map #2,	
121	T 8 N | R 22 E	Coal Thickness				x		Bore Hole #59	
	SW SW	Location				x		USGS files, 1912, Sans Bois	
	Section 22	Overburden			x			Coal Company Mine Map #2	
122	T 8 N | R 22 E	Coal Thickness					x	Bore Hole #57	
	NW SW	Location				x		Oakes and Knechtel, 1948,	
	Section 22	Overburden				x		plate 2, table 3, Bore Hole	
123	T 8 N | R 22 E	Coal Thickness				x		#66	
	SE SW	Location				x		Oakes and Knechtel, 1948,	
	Section 22	Overburden				x		plate 2, table 3, Bore Hole	
124	T 8 N | R 22 E	Coal Thickness				x		#67	
	NW NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.35-
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #166	0.4 ft.
125	T 8 N | R 22 E	Coal Thickness			x				
	NW NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.35-
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #169	0.4 ft.
126	T 8 N | R 22 E	Coal Thickness			x				
	NW NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.35-
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #170	0.4 ft.
127	T 8 N | R 22 E	Coal Thickness			x				
	SW NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.3'.
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #175	
128	T 8 N | R 22 E	Coal Thickness			x				

DATE POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	W/2 NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.3'.
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #176	
129	T 8 N | R 22 E	Coal Thickness			x				
	NW NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.37'.
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #172	
130	T 8 N | R 22 E	Coal Thickness			x				
	NW NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.37'.
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #174	
131	T 8 N | R 22 E	Coal Thickness			x				
	NE NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.5^{+}ft
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #167	
132	T 8 N | R 22 E	Coal Thickness			x				
	NE NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.5^{+}ft
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #168	
133	T 8 N | R 22 E	Coal Thickness			x				
	NE NE	Location			x			Catalano, Lee 1978, plate	Parting estimated at 0.5^{+}ft
	Section 22	Overburden	-	-	-	-	-	10, p. 55, Bore Hole #165	
134	T 8 N | R 22 E	Coal Thickness			x				
	SW SW	Location					x	USGS files, 1972, Bore Hole	
	Section 14	Overburden					x	#12	
135	T 8 N | R 22 E	Coal Thickness					x		
	SW SW	Location					x	USGS files, 1972, Bore Hole	
	Section 14	Overburden					x	#11	
136	T 8 N | R 22 E	Coal Thickness					x		
	SW SW	Location					x	USGS files, 1972, Bore Hole	
	Section 14	Overburden					x	#14	
137	T 8 N | R 22 E	Coal Thickness					x		
	SW SW	Location					x	USGS files, 1972, Bore Hole	
	Section 14	Overburden					x	#13	
138	T 8 N | R 22 E	Coal Thickness					x		
	SE SE	Location			x			Oakes and Knechtel, 1948,	
	Section 22	Overburden				x		plate 2, table 3, Bore Hole	
139	T 8 N | R 22 E	Coal Thickness				x		#69	
	S/2 SE	Location			x			Oakes and Knechtel, 1948,	
	Section 22	Overburden				x		plate 2, table 3, Bore Hole	
140	T 8 N | R 22 E	Coal Thickness				x		#68	
	SW SE	Location			x			USGS files, 1949, Panther	Located in an extension
	Section 22	Overburden	-	-	-	-	-	Coal Mine #1	from Sans Bois Coal Company
141	T 8 N | R 22 E	Coal Thickness					x		Mine #12 (2-19-30)

DATA POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	NE SE	Location				x		Oakes and Knechtel, 1948,	Slope mine loc: + at open-
	Section 22	Overburden	-	-	-	-	-	plate 2, table 3, Slope	ing of Panther #2 Mine.
142	T 8 N | R 22 E	Coal Thickness					x	Mine #70	
	SE SE	Location				x		Oakes and Knechtel, 1948,	
	Section 22	Overburden			x			plate 2, table 3, Bore Hole	
143	T 8 N | R 22 E	Coal Thickness				x		#71	
	NW SW	Location				x		USGS files, 1954, Prospect	Located 1580' FSL 130' FEL,
	Section 23	Overburden					x	Bore Hole log(c. 1954),Bore	SW corner (W of #12 Mine).
144	T 8 N | R 22 E	Coal Thickness					x	Hole #15	No date given.
	NE SW	Location					x	USGS files, 1954, Prospect	Located up dip from Hart-
	Section 23	Overburden					x	Bore Hole log, Bore Hole	shorne outcrop. 2020' FSL,
145	T 8 N | R 22 E	Coal Thickness					x	#14	2175' FWL.
	NE SW	Location			x			Oakes and Knechtel, 1948,	
	Section 23	Overburden			x			plate 2, table 3, Bore Hole	
146	T 8 N | R 22 E	Coal Thickness			x			#72	
	SE SW	Location				x		Oakes and Knechtel, 1948,	
	Section 23	Overburden				x		plate 2, table 3, Bore Hole	
147	T 8 N | R 22 E	Coal Thickness				x		#73	
	SE SW	Location					x	USGS files, 1964, Prospect	2100' FWL 750' FSL. Por-
	Section 23	Overburden					x	Bore Hole log, Core Hole #3	tions cored, dip of fms in-
148	T 8 N | R 22 E	Coal Thickness					x		dicated on log.
	NW SE	Location				x		Oakes and Knechtel, 1948,	
	Section 23	Overburden				x		plate 2, table 3, Bore Hole	
149	T 8 N | R 22 E	Coal Thickness			x			#74	
	NW SE	Location				x		USGS files, 1954, Prospect	Location in more recent
	Section 23	Overburden					x	Bore Hole log, #51-C	stripped area.
150	T 8 N | R 22 E	Coal Thickness					x		
	W/2 E/2	Location			x			USGS files, 1954, Prospect	Location estimated from map
	Section 23	Overburden					x	Bore Hole log #13	location on log.
151	T 8 N | R 22 E	Coal Thickness					x		
	NW SE	Location			x			Oakes and Knechtel, 1948,	Original data for overbur-
	Section 23	Overburden		x				plate 2, table 3, Bore Hole	den from Coal Lease Map
152	T 8 N | R 22 E	Coal Thickness			x			#75	#0337
	NE SE	Location				x		USGS files, 1954, Prospect	Located on edge of more re-
	Section 23	Overburden					x	Bore Hole log #53-C	cent stripping.
153	T 8 N | R 22 E	Coal Thickness					x		
	SE NE	Location					x	USGS files, 1954, Bore Hole	Located in stripped area.
	Section 23	Overburden					x	#12	
154	T 8 N | R 22 E	Coal Thickness					x		

DATA POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	SE NE	Location				x		USGS files, 1954, Prospect	Located on edge of more
	Section 23	Overburden					x	Bore Hole log #52-C	recent stripping.
155	T 8 N | R 22 E	Coal Thickness					x		
	SE SE	Location				x		Oakes and Knechtel, 1948,	Diamond Drill Hole #36 on
	Section 23	Overburden			x			plate 2, table 3, Bore Hole	Mine Map #0377 and BLM-C-
156	T 8 N | R 22 E	Coal Thickness				x		#76	033621 (original data).
	NW SW	Location				x		USGS files, 1953, McCurtain	Located on edge of stripped
	Section 24	Overburden					x	#3, Bore Hole	area.
157	T 8 N | R 22 E	Coal Thickness					x		
	SW NW	Location				x		Oakes and Knechtel, 1948,	Drill hole in more recent
	Section 24	Overburden			x			plate 2, table 3, Bore Hole	strip pit.
158	T 8 N | R 22 E	Coal Thickness			x			#77	
	SW NW	Location			x			USGS files, 1954, Prospect	Estimated location scaled
	Section 24	Overburden			x			Bore Hole log #1-D	from log - located in strip
159	T 8 N | R 22 E	Coal Thickness					x		pit pond.
	SW NW	Location			x			USGS files, 1954, Prospect	Estimated location scaled
	Section 24	Overburden			x			Bore Hole log #6-D	from log - located in
160	T 8 N | R 22 E	Coal Thickness					x		stripped area.
	SE NW	Location				x		USGS files, 1954, Prospect	Located 1390' FWL 2510' FNL
	Section 24	Overburden					x	Bore Hole log #1	in stripped area.
161	T 8 N | R 22 E	Coal Thickness					x		
	NE SW	Location	-	-	-	-	-	Oakes and Knechtel, 1948,	Edge of strip pit.
	Section 24	Overburden	-	-	-	-	-	plate 2, table 3, Bore Hole	
162	T 8 N | R 22 E	Coal Thickness	-	-	-	-	-	#78	
	SE NW	Location				x		USGS files, 1954, Prospect	Location scaled from log -
	Section 24	Overburden					x	Bore Hole log #19-D	edge of strip pit.
163	T 8 N | R 22 E	Coal Thickness					x		
	SE NW	Location				x		USGS file, 1953, Bore Hole	Located in strip area.
	Section 24	Overburden					x	McCurtain #4	
164	T 8 N | R 22 E	Coal Thickness					x		
	NE SW	Location				x		Oakes and Knechtel, 1948,	Drill Hole on edge of re-
	Section 24	Overburden			x			plate 2, table 3, Bore Hole	cent strip pit.
165	T 8 N | R 22 E	Coal Thickness			x			#79	
	NW SE	Location			x			USGS files, 1954, Prospect	Estimated location scaled
	Section 24	Overburden					x	Bore Hole log #22-D	from log in stripped area.
166	T 8 N | R 22 E	Coal Thickness					x		Core.
	NW SE	Location				x		USGS files, 1954, Prospect	Core.
	Section 24	Overburden					x	Bore Hole log #2	
167	T 8 N | R 22 E	Coal Thickness					x		

DATE POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	NE SE	Location			x			USGS files, 1954, Prospect	Estimated location scaled
	Section 24	Overburden					x	Bore Hole log #26-D	from log; BH #26-C on log,
168	T 8 N | R 22 E	Coal Thickness					x		#26-D on map. Core.
	N/2 SE/4	Location			x			USGS files, 1954, Prospect	Estimated location scaled
	Section 24	Overburden					x	Bore Hole log #27-D	from log; on edge of strip
169	T 8 N | R 22 E	Coal Thickness					x		area. Core.
	NE SE	Location			x			USGS files, 1954, Prospect	Upper and lower Hartshorne
	Section 24	Overburden					x	Bore Hole log #3	benches located in stripped
170	T 8 N | R 22 E	Coal Thickness					x		area. Core.
	NE SE	Location			x			USGS files, 1954, Prospect	Core. Estimated location
	Section 24	Overburden					x	Bore Hole log #25-D	scaled from log; located in
171	T 8 N | R 22 E	Coal Thickness					x		strip pit.
	SW SW	Location	x					USGS files, 1964, Bore Hole	Questionable location; or
	Section 19	Overburden					x	#1	depth to coals questionable
172	T 8 N | R 23 E	Coal Thickness					x		
	SE SW	Location				x		USGS files, 1954, "Lankford	Core. Area recently
	Section 19	Overburden				x		4-B" Bore Hole	stripped.
173	T 8 N | R 23 E	Coal Thickness				x			
	SE SW	Location			x			USGS files, 1954, Prospect	Location scaled from map
	Section 19	Overburden					x	Bore Hole log #45-D	located on log.
174	T 8 N | R 23 E	Coal Thickness					x		
	SE SW	Location			x			USGS files, 1954, Prospect	Location scaled from map
	Section 19	Overburden					x	Bore Hole #44-D	located on log.
175	T 8 N | R 23 E	Coal Thickness					x		
	SW SE	Location				x		USGS files, 1954, Prospect	Core. Located in strip
	Section 19	Overburden					x	Bore Hole log - Lankford #5	mined area.
176	T 8 N | R 23 E	Coal Thickness					x		
	SE SE	Location				x		USGS files, 1954, Prospect	Core. Located in strip
	Section 19	Overburden					x	Bore Hole log - Lankford #6	mined area.
177	T 8 N | R 23 E	Coal Thickness					x		
	SE SE	Location			x			USGS files, 1954, Prospect	
	Section 19	Overburden					x	Bore Hole log #49-C	
178	T 8 N | R 23 E	Coal Thickness					x		
	SE SE	Location			x			USGS files, 1954, Prospect	
	Section 19	Overburden					x	Bore Hole log #50-D	
179	T 8 N | R 23 E	Coal Thickness					x		
	SW SW	Location				x		USGS files, 1954, Prospect	
	Section 20	Overburden					x	Bore Hole log #48-D	
180	T 8 N | R 23 E	Coal Thickness					x		

DATE POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	SW SW	Location				x		USGS files, 1954, Prospect	
	Section 20	Overburden					x	Bore Hole log #47-C	
181	T 8 N | R 23 E	Coal Thickness					x		
	SW SW	Location				x		USGS files, 1954, Lankford	GL questionable. Core
	Section 20	Overburden					x	#7, Prospect Bore Hole log	located in pond in strip
182	T 8 N | R 23 E	Coal Thickness					x	L-7	pit.
	SW SW	Location				x		USGS files, 1954, Lankford	Core.
	Section 20	Overburden					x	#8, Prospect Bore Hole log	
183	T 8 N | R 23 E	Coal Thickness					x	L-8	
	SE SW	Location			x			USGS files, 1954, Prospect	
	Section 20	Overburden					x	Bore Hole log #28-C	
184	T 8 N | R 23 E	Coal Thickness					x		
	SE SW	Location			x			USGS files, 1954, Prospect	
	Section 20	Overburden					x	Bore Hole log #29-D	
185	T 8 N | R 23 E	Coal Thickness					x		
	SE SE	Location				x		Knechtel, M.M., 1949,	
	Section 20	Overburden	-	-	-	-	-	plates 1 & 2, table 3,	
186	T 8 N | R 23 E	Coal Thickness				x		Slope Mine #30	
	NE SE	Location				x		Knechtel, M.M., 1949,	#31 - Coal Prospect.
	Section 20	Overburden	-	-	-	-	-	plates 1 & 2, table 3,	
187	T 8 N | R 23 E	Coal Thickness					x	Slope Mine #31	
	NE SW	Location				x		Knechtel, M.M., 1949,	Located in Premier Coal Co.
	Section 21	Overburden	-	-	-	-	-	plates 1 & 2, table 3,	Mine #3
188	T 8 N | R 23 E	Coal Thickness				x		Slope Mine #32	
	SW NE	Location					x	American #1 Tackett Unit	IEL - used. BHO is 19.4'
	Section 28	Overburden				x		1963	above GL.
189	T 8 N | R 23 E	Coal Thickness		x					
	SW SE	Location				x		Knechtel, M.M., 1949,	
	Section 28	Overburden			x			plates 1 & 2, table 3,	
190	T 8 N | R 23 E	Coal Thickness			x			Prospect #35	
	SW NE	Location					x	Pan American #1, Brickel	IEL. GR C-FDL logs, both
	Section 29	Overburden				x		Unit	show Hartshorne KB 13.6'
191	T 8 N | R 23 E	Coal Thickness				x			above GL.
	SE NW	Location					x	Pan American #1, Heer Unit,	BS-GR - IEL logs, KB is
	Section 32	Overburden				x		1966	13.31' above GL.
192	T 8 N | R 23 E	Coal Thickness				x			
	NW SE	Location					x	Pan American #1, Miller "C"	IEL; FDL used, BS-GR too
	Section 30	Overburden				x		1965	deep.
193	T 8 N | R 23 E	Coal Thickness				x			

DATA POINT #	LOCATION	INCREASING RELIABILITY	1	2	3	4	5	REFERENCE	NOTES/COMMENTS
	SW NE	Location					x	Pan American #1 Arnwine,	IEL used. FDC - coal zones
	Section 31	Overburden				x		1965	not logged
194	T 8 N | R 23 E	Coal Thickness		x					
	NE NE	Location					x	Sampson Rscs. #1 Ramirez	DILL used (CNL & FDCL-GR:
	Section 36	Overburden				x		et al, 1976	coals not logged). KB is
195	T 8 N | R 22 E	Coal Thickness			x				14' above GL.
	NE NE	Location					x	Wessley Petroleum Ltd. #1	IEL used; KB 13' above GL.
	Section 36	Overburden				x		Craig Unit, 1969	
196	T 8 N | R 22 E	Coal Thickness			x				
	SE NW	Location					x	Pan American #1 Williams	(?BHO=Permanent; Datum=
	Section 36	Overburden				x		Unit, 1962	below GL), IEL logs.
197	T 8 N | R 22 E	Coal Thickness				x			KB 17' above GL.
	SE NW	Location					x	Pan American #1 Krisher	IEL used.
	Section 25	Overburden				x		Unit, 1965	
198	T 8 N | R 22 E	Coal Thickness			x				
	NE SW	Location				x		Pan American #1 McCafferty	I-GR log used. Log mea-
	Section 26	Overburden				x		Unit, 1965	sured from DF. KB=10.57'
199	T 8 N | R 22 E	Coal Thickness			x				above GL.
	SW NE	Location					x	Sinclair O & G #1 Wautland	IEL used, CAL/FDC not used.
	Section 27	Overburden				x		Unit, 1965	
200	T 8 N | R 22 E	Coal Thickness			x				
	CNE	Location					x	Mustang Prod. #1 Beene-	I-GR used, CDLC/GR too deep
	Section 34	Overburden				x		Blake, 1976	KB is 15' above GL.
201	T 8 N | R 22 E	Coal Thickness			x				
	1000' NW of C	Location			x	?		Pan American #1 White "C",	I-GR only. Location is in-
	Section 34	Overburden					x	1966	correct on Catalano's the-
202	T 8 N | R 22 E	Coal Thickness				x			sis Maps. KB 17' above GL.

APPENDIX II TABLES OF OIL AND GAS TEST HOLES

Note: "Top Log Int." refers to the measured depth to the top of the interval logged by the particular sonde. Driller log total depth, referenced to K.B. or D.F., has been abbreviated to T.D. (Note: This may vary from T.D. referenced to G.L.). The measured depth at which coal is reported on the scout card appears in the column titled "Scout Card Coal". The column titled "Harts./Drill./Scout" contains the measured depths drilled to the top of the Hartshorne Sandstone, as reported by the driller logs and the scout cards.

* Logged interval stratigraphically below Hartshorne Coals.

Sec-Tn-Rg	Operator/Farm Location	Driller Logs Coal Reported Thickness & Depth	Scout Card Coal	Harts. Drill. Scout	Top Log Int. Gamma Elec.	Top Log Int. Dens. Sonic	T.D. Year
1-8-22	Leflore/#1 Evans 2485 FSL			NR	910		6440
	2000 FWL	Trace @ 715'	NR	715	910		1963
2-8-22	Leflore/#1 O. Gross 3225 FSL			NR	-		6290
	2362 FWL	7' @ 783	NR	NR	922		1961
3-8-22	Potts Stevenson/#1-A Shaw 660 FSL			951	-		6500
	660 FWL	2' @ 949'	947	951	1100		1974
3-8-22	Condo-Roye/#2 E. Condo SW NE SW			NR			6975
		NR	NR	NR			1967
3-8-22	Oxley/#1 B.L. Shaw S/2 SE NW NW			NR			6736
		NR	NR	NR			1973
3-8-22	Condo/#1 D. Condola CNW			NR			6475
		NR	NR	NR			1927
3-8-22	Leflore/#1 E. Condola 139 FSL			NR			6465
	788 FWL of NE 1/4	Trace @ 905'	895	910			1963
4-8-22	Monsanto/#3 McCurtain			NR			6500
	CSE SE	NR	NR	NR	1204		1977
4-8-22	Monsanto/#2 McCurtain			NR			6650
	1320' FSL 1007 FWL of NE 1/4	NR	NR	NR			1969
4-8-22	Monsanto/#1 McCurtain			NR			6400
	2004 FSL 3276 FEL	NR	NR	NR			1965
9-8-22	Exxon/#2 Cummings			NR	50	50	6485
	1425 FNL 1607 FEL	NR	NR	NR			1977
9-8-22	Humble/#1 Cummings			NR			6250
	1933 FSL 1933 FWL	NR	NR	NR			1965

Sec-Tn-Rg	Operator/Farm Location	Driller Logs Coal Reported Thickness & Depth	Scout Card Coal	Harts. Drill. Scout	Top Log Int. Gamma Elec.	Dens. Sonic	T.D. Year
10-8-22	Exxon/#2 D. R. Condo			NR	0	3200	6440
	1220 FSL 660 FWL of NW/4	NR	NR	NR			1978
10-8-22	Leflore Co. G & E/#1 D. R. Condo			NR			6356
	SE SE NW	NR	NR	NR			1962
11-8-22	Headington/#1 Greenwood			NR			5871
	CSW	NR	NR	NR	812		1969
36-8-22	Wessley/#1 Craig			NR	1642	2090	6389
	SW NE NE	NR	NR	NR	2090		1969
36-8-22	Pan Am./#1 Williams			NR	1044		9812
	3300 FSL 2480 FWL	NR	NR	NR	90	1044	1963
4-8-23	Humble/#1 Wallen			NR			5430
	SE SW NE	NR	NR	NR			1965
5-8-23	LRF/Evans Coal #1			1075			6100
	CSW SW	NR	NR	1075			1979
5-8-23	Unit Drlg/#1 M. B. McBee			NR	667		5620
	1723 FSL 1980 FWL of NE/4	NR	NR	NR	667		1976
5-8-23	Stephens/#1 L. B. Burris			NR		5300	6103
	1940 FSL 2240 FWL	NR	NR	NR	585		1965
6-8-23	Leflore Gas/#2 Evans			NR		1550	6247
	2515 FSL 2570 FWL	NR	680	NR	812		1964
7-8-23	Humble/#1 M. R. McBee			NR		6580*	6848
	CSW NE	NR	NR	NR	618*	908*	1964
7-8-23	Dyco/#1 McBee			NR	651	1300*	5920
	1520 FSL 1220 FWL of SE/4	NR	NR	NR	651		1978
8-8-23	Snee & Eberly/#1 Bradford			NR	515	1500*	6383
	C SE SE	NR	NR	NR	515		1970
8-8-23	Dyco/#1 Bradford			NR	620	2400	5750
	CNE SW SW	NR	NR	NR	620		1978
8-8-23	Leflore G & E/#1 E. B. Hamm				508		6222
	SE SE NW		NR	NR	508		1960
9-8-23	Humble/#1 H. Bledsoe			NR	6100	1596	7116
	2084 FSL 2832 FWL	NR	NR	NR	1542		1964
16-8-23	Leflore Gas/#1 Bridgman			NR		1900	6110
	1039 FSL 882 FWL	3' @ 93'	NR	NR	175		1963
17-8-23	Leflore & Carter/#1 McBee-H			NR	5500		6182
	SE SE NW	NR	NR	NR			1958

Sec-Tn-Rg	Operator/Farm Location	Driller Logs Coal Reported Thickness & Depth	Scout Card Coal	Harts. Drill. Scout	Top Log Int. Gamma Elec.	Top Log Int. Dens. Sonic	T.D. Year
18-8-23	Leflore G & E/#1 L. E. Kennedy			NR	0		7275
	2012 FSL 2093 FWL	NR	NR	NR	312		1962
18-8-12	Mustang/#1-18 Kennedy						5975
	CSW		NR	NR			1973
19-8-12	Pan Am/#1 L. E. Kennedy			NR		2850	5772
	1270 SW of Center	NR	NR	NR	630	2850	1965
20-8-23	Humble/#1 C. Nixon			NR	522	4700	6160
	SW NE	NR	NR	NR	522		1965
21-8-23	Leflore Gas/#1 USA			NR	2678	5000	5889
	NW NW SE	5' @ 8'	NR	NR	2678		1964
11-8-22	Leflore Gas/#1 Nelson Heirs			NR			6752
	2856 FSL 2457 FWL	NR	NR	NR			1964
12-8-22	Leflore/#1 E. O. Fitzgerald			NR	700		6265
	SE SE NW	5 @ 485	NR	520	700		1963
13-8-22	Stephens/#1 P.C. Patterson			NR			6429
	870 FSL 75 FEL of NW/4	NR					1965
14-8-22	Humble/#1 Price Self			NR			5714
	1933 FSL 1933 FWL	NR	NR	NR			1965
15-8-22	Texas-Pacific/#1 Fed. College			NR			6494
	CNE SW	NR	NR	545			1965
16-8-22	Texas-Pacific/#1 Fed. Porter			NR			6209
	2180 FSL 660 FWL of SE/4	NR	NR	400	1143		1965
21-8-22	Humble/#1 U.S. Govt.			NR		850	6249
	460 FSL 460 FWL of NE/4	NR			574		1965
22-8-22	Humble/#1 McCurtain			NR		850	5976
	2565 FSL 1646 FWL	NR	NR	NR	620		1965
23-8-22	Humble/#1 L. Rees			NR			5762
	SW NE NW	NR	NR	NR	574		1965
24-8-22	Texas-Pacific/#1 Fed. Lankford			NR			5780
	689 FSL 1951 FWL of NW/4	NR	NR	NR	1101		1965
25-8-22	Pan Amer./#1 Krisher			NR	800		6050
	CSE NW	NR	NR	1699	678	800	1965
26-8-22	Pan Amer./#1 McCafferty			NR	1021		6125
	1947 FSL 1947 FWL	NR	NR	NR	1021		1965
27-8-22	Sinclair/#1 Wantland			NR			5900
	SW NE	5 @ 1155	NR	1124	198		1965

Sec-Tn-Rg	Operator/Farm Location	Driller Logs Coal Reported Thickness & Depth	Scout Card Coal	Harts. Drill. Scout	Top Log Int. Gamma Elec.	Dens. Sonic	T.D. Year
28-8-22	Texas-Pacific/#1 Fed. King			NR	1118		6473
	950 FSL 10 FWL of NE/4	NR	NR	NR	1118		1966
34-8-22	Mustang/#1-34 Beene-Blake			NR	90		6359
	CNE	NR	NR	NR	113		1976
34-8-22	Wessley Energy/#1 Hinz			NR			6537
	CNW	NR	NR	NR			1975
34-8-22	Pan Am./#1 White "C"			NR	2245		6200
	1000' NW of Center	NR	NR	NR	50		1967
35-8-22	Tenneco/#2-35 F. Lane						7010
	640 FSL 1195 FWL of NE/4		NR	2786			1979
35-8-22	Tenneco/#1 Lane			NR	2788*		6500
	SE NE NW	NR	NR	2550	2778*		1966
36-8-22	Samson/#1 Ramirez			NR			6461
	CNE NE	NR	NR	NR	2145		1976
28-8-23	Pan Am/#1 Tackett			NR	1682		9272
	CSW NE	NR	NR	NR	100	1682	1963
28-8-23	Amoco/#2 Tackett			NR	1400	1400	5500
	CNW	NR	NR	NR	1400		1978
29-8-23	Pan Am/#1 Brickel			NR	616	5200	5960
	CSW NE	NR	NR	NR	616		1965
30-8-23	Amoco/#2 Miller "C"			NR			6000
	N/2 N/2 SW	NR	NR	NR			1972
30-8-23	Pan Am/#1 Miller "C"			NR	5650	70*	5933
	300' SE of center	NR	NR	1570	70	5650	1965
31-8-23	Pan Am/#1 Arnwine			NR		1550	5896
	SW NE	NR	NR	NR	671		1965
32-8-23	Ferguson/#1 Heer "C"			NR			5700
	CNW NW	3' @ 2222/5'mix @ 2244	NR	NR			1969
32-8-23	Pan Am/#1 Heer			NR	558	1250	6457
	SE NW (980' NW of center)	NR	NR	2124	672	1250*	1966
32-8-33	Pan Am/#2 Heer			NR	588		6603
	50' SW/C	NR	NR	NR	3200		1966
21-9-22	Texas O & G/ Ross "B"						7400
	W/2 SW SE NE		NR	NR			1979
22-9-22	Arco O & G/Cookson-Owens Unit						6517
	SE NE SE SW		NR	NR			1979

Sec-Tn-Rg	Operator/Farm Location	Driller Logs Coal Reported Thickness & Depth	Scout Card Coal	Harts. Drill. Scout	Top Log Int. Gamma Elec.	Top Log Int. Dens. Sonic	T.D. Year
33-9-22	Hanover/#2-A. Frederick			NR		3500	6772
	1320 FSL 40 FWL of SE/4	NR	NR	NR	335		1978
33-9-22	Gose/#1-A. Frederick			NR		?	6705
	900'S of center, 100' W of center	NR	NR	NR	293		1967
34-9-22	Gose/#1 Frederick			NR		5000	6230
	707 FSL 707 FWL (Questionable location)	NR	NR	NR			1965
34-9-22	Oxley/#1 Frederick			NR	1198		6300
	C W/2 SW	NR	NR	NR	1198		1972
34-9-22	Dyco/#1-A Fredrick			NR	1308	2700	6375
	2540 FSL 1320 FWL of NW/4	NR	NR	NR	1308		1974
35-9-22	Stephens/#1 Warren Found.			NR		2550	6749
	SE NE SW	NR	NR	NR	500		1965
36-9-22	Humble/#1 Evans			NR	1000		6324
	CNE SW	NR	NR	795	1000		1964
36-9-22	Nelson/#1-36 Withrow			NR			5900
	500 FSL 1980 FWL of NW/4	NR	NR	NR			
18-9-23	Gulfstream/#1 O. G. Muncy						5930
	CSE		NR	NR			1979
18-9-23	Gulfstream Petro/Muncy #1						
19-9-23	Gulfstream Petro/#1 L.B. Burris						
	SW NE SW NE		NR	NR			
20-9-23	Unit Drlg/#1 Burris						6118
	2640 FSL 1420 FWL		NR	NR			1979
21-9-23	Dyco/#1 Aetna			NR			6042
	1450 FSL 1400 FWL	NR	NR	NR			1977
21-9-23	Leflore G & E/#1 A. C. Ziegler			NR		5500	6110
	716 FSL 530 FWL of NE/4	NR	NR	NR			1962
29-9-23	AFE Engr. #1-29 Mason			NR			6200
	C E/2 W/2 NW	NR	NR	NR			1980
29-9-23	Hudson/#1-29 Smith			NR			6250
	1120 FSL 1120 FWL of NE/4	NR	NR	NR			1979
29-9-23	Dyco/#1 Bryant			1128			6158
	CSE	NR	NR	1128			1978
30-9-23	Tenneco/#1-30 Solesbee			NR	945	2550	6050
	1190 FSL 2490 FWL of NW/4	NR	NR	NR	945		1971

Sec-Tn-Rg	Operator/Farm Location	Driller Logs Coal Reported Thickness & Depth	Scout Card Coal	Harts. Drill. Scout	Top Log Int. Gamma Elec.	Top Log Int. Dens. Sonic	T.D. Year
31-9-23	Shamrock/#12 Carson			NR	895	2350	6007
	2310 FSL 2410 FWL	NR	NR	NR	895		1965
32-9-23	Gose/#1 Lackey			NR	750	5250	5500
	1000' S of C SW NW SE	NR	NR	NR	750		1967
32-9-23	Gose/#1 Davis				1000		5600
	CSE NW	NR	NR	791			1966
33-9-23	Leflore Co. Gas/#1 N.C. Holt						5903
	2876 FSL 3217 FWL		NR	NR	1046		1961
33-9-23	Humble/Holt #1			NR			
	SW SW NE	NR	NR				