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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE CACTUS RESERVOIR QUADRANGLE, RIO BLANCO AND MOFFAT COUNTIES, COLORADO

By

AAA Engineering and Drafting, Inc.
Salt Lake City, Utah

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This report has not been edited for conformity with U.S. Geological Survey editorial standards or stratigraphic nomenclature.

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INTRODUCTION

Purpose

These maps were compiled to support the land-use planning work of the Bureau of Land Management and to provide a systematic coal resource inventory of Federal coal lands in the Lower White River Known Recoverable Coal Resource Area (KRCRA) in response to the land-use planning requirements of the Federal Coal Leasing Amendments Act of 1976.

Published and unpublished non-proprietary data sources were used for this study. No new drilling or field mapping was done to supplement this study. No confidential or proprietary data were used.

Location

The Cactus Reservoir quadrangle is located in northwestern Rio Blanco County and southwestern Moffat County in northwestern Colorado. The city of Craig, the county seat of Moffat County, is 61 miles (98 km) northeast of the quadrangle. The city of Meeker, the county seat of Rio Blanco County, is approximately 39 miles (63 km) east-southeast of the quadrangle. The town of Rangely is 4 miles (6 km) southwest of the quadrangle and the Colorado-Utah state line is 16 miles (26 km) to the west. The Colorado-Wyoming state line is 52 miles (84 km) north of the quadrangle. The city of Vernal, Utah is 43 miles (69 km) northwest of the quadrangle.

Accessibility

Colorado State Highway 64 crosses the south half of the quadrangle on the White River flood plain. This highway connects Meeker and Rangely. U.S. Highway 40 crosses the northeast and northwest corners of the quadrangle and provides access to Vernal, Utah and Craig, Colo. A gravel road crosses the west half of the quadrangle in a northwest-southeast direction and connects Colorado State Highway 64 to U.S. Highway 40. Several unimproved dirt roads and jeep trails provide access to the more rugged areas of the quadrangle.

The nearest railhead is at Craig. This is the western terminus of a branch line of the Denver and Rio Grande Western Railroad; from Craig rail connections can be made to Denver, Colo. An airport is maintained near the town of Rangely.

Physiography

The general topography in the Cactus Reservoir quadrangle is hilly but not extremely rugged. The relief in the quadrangles is approximately 1,140 ft (347 m). The high point is 6,410 ft (1,954 m) above sea level on top of one of the mountains in the southwest corner of the quadrangle. The elevation of the low point is about 5,270 ft (1,606 m) where the White River leaves the quadrangle. The most rugged parts of the quadrangle are in the southwest quarter and in the area south of the White River. Steep-sided canyons in these areas range from 400-700 ft (122-213 m) in depth.

The northern two-thirds of the quadrangle is characterized by low hills and shallow washes. A long sandstone hogback crosses the northern part of the quadrangle in an east-west direction. This feature consists of a single- or double-crested hogback ridge as high as 200 ft (61 m)

that is formed by outcrops of steeply inclined massive sandstone beds. The hogback is breached in only a few places where streams have cut gaps through the resistant strata.

Most of the quadrangle area north of White River drains into Red Wash, an intermittent tributary drainage of the White River. Several small stock-watering reservoirs are in the northern half of the quadrangle. The only perennial streams in the area are White River and Spring Creek. The White River forms the major drainage and meanders across a flood plain that is as much as 0.5 mile (0.8 km) wide in the quadrangle area. The river flows westward to its confluence with the Green River in Utah.

Climate

The Cactus Reservoir quadrangle has a mid-latitude steppe climate and semiarid conditions prevail in the area. The normal annual precipitation for the quadrangle ranges from 9 inches (23 cm) in the central area of the quadrangle to 11 inches (28 cm) in the southeast corner and the north part of the quadrangle (U.S. Department of Commerce, (1964)).

The nearest weather data recording station is at Rangely where a record high temperature of 104° F (40° C) and a record low temperature of -37° F (-38° C) were recorded (National Weather Service Forecast Office, personal communication). The mean annual temperature of Rangely is 45.6° F (7.6° C). The temperatures in the Cactus Reservoir quadrangle are probably a few degrees cooler than temperatures at Rangely (elevation, 5,240 ft (1,597 m)) because of the higher altitudes in the quadrangle area. A flood hazard exists along the flood plain of the White River.

Land Status

The Cactus Reservoir quadrangle lies in the north-central part of the Lower White River Known Recoverable Coal Resource Area (KRCRA). The

KRCRA covers approximately 26,660 acres (10,789 ha) of the quadrangle. Several coal leases and preference right lease application areas occur in the quadrangle; these are shown on plate 2 along with the areas of non-Federal land and the KRCRA boundary. A comparison of the leased and unleased Federal coal ownership and non-Federal land in the quadrangle area is shown in table 1.

Table 1.--Comparison of Federal and non-Federal land areas in the Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado

Category	Approximate area (acres)[1]	Percent of quadrangle area
Non-Federal land	2,950	8
Leased Federal coal ownership	5,990	16
Unleased Federal coal ownership	27,510[2]	76
Total	36,450	100

[1]To convert acres to hectares, multiply acres by 0.4047.
[2]Coal is known to be present in only part of this area.

Previous Work

Gale (1910) described the coal fields of northwestern Colorado and northeastern Utah including the Lower White River field. Gaskill and Horn (1961) mapped the surface exposures of coal beds and the principal coal zones in and around the Cactus Reservoir quadrangle. A series of coal test holes within the quadrangle was described by Barnum, Garrigues, and Dyer (1977) and Garrigues (1976). Barnum and Garrigues (1980) have published a geologic map with coal sections of the Cactus Reservoir quadrangle. Most of the information on plates 1 and 3 was derived from preliminary versions of this report. Several short unpublished reports (Covington, 1967 and 1970; and Haines, 1974) were made available to the authors-- AAA Engineering & Drafting, Inc.--of this report.

GENERAL GEOLOGY

Stratigraphy

Sedimentary rocks exposed in the Cactus Reservoir quadrangle are Late Cretaceous and Tertiary in age. The important coal beds in the quadrangle occur in rocks of the Mesaverde Group of Late Cretaceous age. The Mesaverde Group has been divided, in ascending order, into the Sego Sandstone, lower unit, coal unit, and upper unit (Barnum and Garrigues, 1980). The Wasatch Formation of Paleocene and Eocene ages overlies the Mesaverde Group.

The Upper Cretaceous Sego Sandstone consists primarily of light-brown to very light yellow, mostly massive, resistant, fine-grained sandstone. It is typically separated into two ledges by a medial unit of light-gray, mostly marine shale that is interbedded with thin sandstone and local brown carbonaceous shale having sparse coal streaks. The Sego Sandstone is approximately 200 ft (61 m) thick.

The lower unit of the Mesaverde Group (which may be equivalent to the Iles Formation of the Meeker area) is approximately 690 ft (210 m) thick and consists primarily of light-yellow to light-brown, mostly massive, lenticular, fine-grained sandstone interbedded with light-gray to brown mudstones and shales. The lower unit also contains some beds of carbonaceous shale and thin local beds of coal.

The coal unit of the Mesaverde Group is approximately 400 ft (122 m) thick and consists of interbedded brown carbonaceous shale; light-gray mudstone; light-yellow, thin-bedded, friable, fine-grained sandstone; and coal. Commercially valuable coal occurs in this unit and is concentrated in the main coal zone of Barnum and Garrigues (1980). At least one mine (Staley-Gordon) in this quadrangle operated in one of the coal beds of the main coal zone.

The upper unit of the Mesaverde Group (which may be partly equivalent to the Williams Fork Formation of the Meeker area) is composed of light-yellowish-gray, fine-grained, crossbedded sandstone that is interbedded with light-gray shale and mudstone beds both of which contain some brown carbonaceous shale and minor thin coal beds. The upper unit is approximately 1,740 ft (530 m) thick.

The Wasatch Formation consists of variegated shale and claystone interbedded with light-brown, fine-grained sandstone. Local lenses of brown clay-pebble conglomerate and thin persistent beds of ostracodal limestone and sandstone are also found in the formation. The Wasatch is approximately 1,475 ft (450 m) thick.

Structure

The Cactus Reservoir quadrangle lies in the synclinal area between the Rangely anticline to the south and the Blue Mountain Uplift to the north. The axial trace of the Red Wash syncline passes through the northern half of the quadrangle in a N. 70° W. direction (pl. 1).

The syncline is asymmetric and the beds on the north flank turn up sharply and dip as steeply as 64° to the south. The steeply-dipping resistant Mesaverde sandstone beds form the hogback, called Coal Ridge, across the north side of the quadrangle. The south flank of the Red Wash syncline is more gently inclined than the north flank. The beds in the south part of the quadrangle exhibit northeastward dips that range from 6° to 10°.

No faults are known to have been mapped in the quadrangle area. Gaskill and Horn (1961) observed several normal faults of small displacement approximately 1 mile (1.6 km) south of the quadrangle.

Extensive burned areas in the southwest quarter of the quadrangle and the settling of strata that overlie the burned coal beds may give the casual observer the impression that faulting has occured in those areas.

COAL GEOLOGY

The important coal beds in the Cactus Reservoir quadrangle occur in the coal unit of the Mesaverde Group (pl. 3). Most coal beds in this unit are highly lenticular and cannot be correlated for any great distance. Generally, the coal beds are concentrated in the main coal zone, the base of which ranges from 65-130 ft (20-40 m) above the base of the coal unit. The coal zone ranges in thickness from 100-180 ft (30-55 m) and contains one to four coal beds 5 ft (1.5 m) or more thick. Generally within the quadrangle, the base of the main coal zone coincides with the top of a persistant, white, ripple-marked, very fine-grained, well-sorted sandstone flecked by carbonaceous fragments. The upper surface of this widespread sandstone is called the "coal marker" and has been mapped by Barnum and Garrigues (1980). The thicker coal beds of the main coal zone are concentrated near the base of the zone which is generally at or near the base of a coal bed.

The datum shown on plate 3 is the base of the main coal zone of Barnum and Garrigues (1980). Because of the lenticular nature of the coal beds and the uncertainty of correlation, the correlation lines shown between the columns on plate 3 are dashed. The vertical positions of isolated coal beds shown on plate 3 are only relative. The spatial relationships of the coal beds (pl. 3) were plotted using the best information available, and may not be accurate.

For convenience the coal beds have been given numbers from 1 to 20 and the prefix MCZ (main coal zone). The numbered coal beds have been correlated over small areas, generally within the quadrangle, and the sequential numbering does not necessarily reflect the true stratigraphic position of one coal bed with respect to another. The thinner coal beds of very limited extent are called "local" coal beds. Local coal beds that occur within the main coal zone have been named MCZ L (main coal zone, local coal bed) on plates 1 and 3. The local coal beds that occur above or below the main coal zone have been labeled "L". In this quadrangle two local coal beds have been correlated over small areas and have been called the L1 and L2 beds.

The term "bony coal," as used in this report, may include material described in the data sources as "bony coal," "bone," "shaly coal," "dirty coal," "smutty coal," or other similar terms.

Coal beds 5 ft (1.5 m) or more thick that lie less than 3,000 ft (914 m) below the ground surface are herein called Reserve Base coals and are used in calculating Reserve Base and Reserve tonnages discussed below under Coal Resources.

Main Coal Zone

Coal Bed 14

Coal bed 14 of the main coal zone is referred to as the MCZ 14 coal bed on plates 1 and 3. It is locally called the "C" bed and is known to be 5 ft (1.5 m) or more thick only in an indeterminate area in the southwest quarter of the quadrangle. An insufficient-data line has been utilized for a large part of the coal-bed boundary on the derivative maps (figs. 1, 2, 3, 10, 11, and 12). The bed is over 7 ft (2.1 m) thick in the area of the White River

Fuel mine (Staley—Gordon mine), but the interval to the overlying coal bed is less than 20 ft (6.1 m), as shown in the measured sections (pl. 1 and 3). The coal bed apparently thickens northward and southward from the isopached area. The MCZ 14 bed dips from 5-10° to the northeast in the southwest quarter of the quadrangle.

Coal Bed 15 (Staley or "D" Bed)

Coal bed 15 of the main coal zone is referred to as the MCZ 15 coal bed on plates 1 and 3, and is known locally as the Staley or the "D" bed. In the area of the Staley-Gordon mine (sec. 10 and 11, T. 2 N., R. 101 W.) the MCZ 15 bed ranges from less than 3 ft to more than 10 ft (1.0-3.0 m) in thickness (fig. 2). The bed was 7-8 ft (21.-2.4 m) thick in the mine area. The coal isopach map (fig. 2) shows that the MCZ 15 bed apparently thins westward and southeastward; however, it may thicken slightly to the northeast.

Coal Bed 19

Coal bed 19 of the main coal zone is referred to as the MCZ 19 coal bed on plates 1 and 3. It occurs locally in the south-central part of the quadrangle and over 5 ft (1.5 m) thick only in a small area on the southeast side of White River (pl. 1). The maximum measured thickness for this bed is 6.4 ft (2.0 m) at index number 108 (pl. 1) and it thins northward and southward from that point but maintains a 5- to 6- ft (1.5- to 1.8-m) thickness eastward into Spring Creek Canyon (fig. 3).

Isolated Data Points

The standard criteria for construction of isopach, structure contour, mining ratio, and overburden isopach maps cannot be applied to some coal beds 5 ft (1.5 m) or more thick because measurements are few and isolated. The lack of data for these beds limits the extent to which they can be

reasonably projected in any direction and usually precludes correlations with other coal beds. For these reasons, isolated data point maps are not included in this report but are in U.S. Geological Survey files. Resource tonnages were calculated for these non-isopached coal beds and are shown in table 2.

CHEMICAL ANALYSES OF THE COAL

Several analyses of coal from the Cactus Reservoir quadrangle were reported by D. V. Haines (unpublished report, 1974). The proximate analyses of four samples from the MCZ 15 (Staley or "D") coal bed are listed in table 3.

Table 2.--Isolated data points, Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado

Index No. (pl. 1)	Location	Outcrop or drill hole	Coal bed Symbol	Coal thickness (ft)[2]	Measured area (acres)[3]	Resource tonnage[1] (s.t.)[4]
3	E½NE¼ sec. 20 T. 3 N., R. 100 W.	Outcrop	MCZ 2	5.1	38	300,000
9	SW¼NE¼ sec. 19 T. 3 N., R. 100 W.	Do.	MCZ 5	5.7 [5]	53	500,000
9	SW¼NE¼ sec. 19 T. 3 N., R. 100 W.	Do.	MCZ 2	5.2 [5]	19	200,000
16	NW¼NE¼ sec. 23 T. 3 N., R. 101 W.	Do.	MCZ 11	5.5 [5]	41	400,000
24	SE¼NE¼ sec. 34 T. 3 N., R. 101 W.	Drill hole	MCZ L	5.0	126	1,100,000
24	SE¼NE¼ sec. 34 T. 3 N., R. 101 W.	Do.	MCZ L	10.5	126	2,400,000
24	SE¼NE¼ sec. 34 T. 3 N., R. 101 W.	Do.	MCZ L	7.0	126	1,600,000
27	SW¼NE¼ & NW¼SE¼ sec. 5, T. 2 N., R. 101 W.	Outcrop	MCZ L	5.0	23	200,000
61	NE¼NE¼ sec. 16 T. 2 N., R. 101 W.	Do.	MCZ 16	5.4	10	100,000
62	NE¼NE¼ sec. 16 T. 2 N., R. 101 W.	Do.	MCZ L	6.7	11	100,000
63	NW¼NE¼ sec. 16 T. 2 N., R. 101 W.	Do.	MCZ L	6.2	5	100,000

Table 2.--Isolated data points, Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado (Continued)

Index No. (pl. 1)	Location	Outcrop or drill hole	Coal bed Symbol	Coal thickness (ft)[2]	Measured area (acres)[3]	Resource tonnage[1] (s.t.)[4]
118	SW¼NW¼ sec. 18 T. 2 N., R. 100 W.	Drill hole	MCZ L	5.0	126	1,100,000
118	SW¼NW¼ sec. 18 T. 2 N., 100 W.	Do.	MCZ L	6.0	126	1,400,000
				Total resource tonnage		9,500,000

[1] Rounded to the nearest 100,000 short tons
[2] To convert feet to meters, multiply feet by 0.3048
[3] To convert acres to hectares, multiply acres by 0.4047
[4] To convert short tons to metric tons, multiply short tons by 0.9072
[5] Because other nearby measurements of the coal bed are less than 5 ft (1.5 m) thick, the coal thickness shown here is the estimated average coal thickness for the area shown in the "Measured area" column and is somewhat less than the coal thickness shown in Appendix A.

Table 3.--Proximate analyses (as-received) of samples from the MCZ 15 (Staley or "D") coal bed in the Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado (From D. V. Haines, 1974, unpublished report.)

	Moisture (percent)	Volatile matter (percent)	Fixed carbon (percent)	Ash (percent)	Heating value (Btu/lb[1])	Sulphur (percent)
1.	11.09	36.97	46.65	5.29	11,361	0.34
2.	11.7	33.5	49.2	5.6	11,210	0.4
3.	10.8	34.5	50.5	4.2	11,450	0.5
4.	13.2	36.6	45.3	4.9	11,070	0.4

[1]To convert Btu/lb to Kj/kg multiply by 2.326

On the basis of analyses in table 3, the MCZ 15 (Staley or "D") coal is ranked as high-volatile C bituminous coal (American Society for Testing and Materials, 1977).

Gale (1910, p.192) sampled the 3.7-ft (1.1-m) thick local coal bed in the Red Wash mine which is in SW¼NE¼ sec. 11, T. 2 N., R. 101 W.. The sample was analyzed and the following results were reported.

Table 4.--Chemical analysis of coal sample from Red Wash mine, Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado (Gale, 1910, p. 250)

Laboratory No.	5516
Air drying loss of sample received	3.2 percent
Chemical analysis, air-dried basis	
Moisture	8.02 percent
Volatile matter	34.22 percent
Fixed carbon	48.61 percent
Ash	9.15 percent
Sulphur	0.75 percent
Heat value	11,040 Btu/lb[1]

[1]To convert Btu/lb to Kj/kg multiply by 2.326

On the basis of this analysis, the coal bed sampled in the Red Wash mine is ranked as high-volatile C bituminous coal (American Society for Testing and Materials, 1977).

MINING OPERATIONS

Gale (1910) visited the now-abandoned coal mine located in the SW¼NE¼ sec. 11, T. 2 N., R 101 W. which D. V. Haines (unpublished report, 1974) referred to as the Red Wash mine. Gale (1910, p. 192) briefly described the coal workings. "The main entry extends down at least 75 feet and has been worked out in a room of considerable size. The dip at the entry is 9°. The coal bed measured 3 feet 8 inches of apparently bright, hard coal at the face in the mine. . . . The coal contains much bone, in irregularly distributed layers, which are difficult to separate in mining. The roof is thin-bedded sandstone for a thickness of several feet above the coal bed. . . . The floor is bony coal to as great a depth as it had been exposed."

The coal bed mined in the Red Wash mine is apparently a local bed and has not been correlated with other coal occurrences in the quadrangle. The period of operation is unknown except that some coal was produced in the early 1900's. No production figures are available.

The Staley-Gordon mine, also known as the White River Fuel mine, operated from 1936 to 1970 when the mine was closed "because of inability to meet governmental requirements of the 1969 Coal Mine Health and Safety Act." (D. V. Haines, unpublished report, 1974.) The mine operated on the Staley or "D" bed (MCZ 15 bed of this report) where it was 7-8 ft (2.1-2.4 m) thick, and produced a total of 15,209 short tons (13,798 metric tons) of coal (U.S. Geol. Survey, personal communication, 1979). The mine is located in the NE¼ sec. 10 and NW¼ sec. 11, T. 2 N., R. 101 W. The approximate outline of the mined-out area is shown on plate 1.

COAL RESOURCES

The principal sources of data used in the construction of the coal isopach, structure contour, and coal-data maps were Barnum and Garrigues (1980), and Gaskill and Horn (1961).

Coal isopach maps were constructed by using a point-data net derived from coal-thickness measurements of an individual coal bed obtained from surface exposures and correlated well located logs within the quadrangle boundary and a 3-mile (4.8-km)-wide zone around the quadrangle. Measured coal thickness values were used directly in the point-data net where the rocks dip less than 25°. In the drill hole at index number 18 (pl. 1) the rocks dip greater than 25° and an adjusted coal-bed thickness was calculated by multiplying the apparent, vertically-measured coal-bed thickness by the cosine of the dip. The principle of uniform variation in thickness between data points was used to establish the position of the isopach lines.

Structure contour maps were constructed by using point-data nets derived from well logs and surface exposures. The elevation of the top of each contoured coal bed was based on surface altitude and measured depth to the top of the designated coal bed encountered in drill holes and referenced to mean sea level.

Each overburden isopach map was based on a point-data net derived from stratigraphic-interval thicknesses measured from the ground surface to the top of the isopached coal bed. A secondary set of data-net points was generated by laying a structure contour map over a topographic contour map and then calculating apparent overburden thickness values at the intersections of structure contour lines and surface topographic contour lines.

Coal thickness data was obtained from the coal isopach maps (fig. 1, 2, and 3) for resource calculations. The coal-bed acreage (measured by planimeter) multiplied by the average isopach thickness of the coal bed multiplied by a conversion factor of 1,800 short tons of coal per acre-foot (13,238 metric tons of coal per hectare-meter) for bituminous coal yields coal resources in short tons. Reserve Base and Reserve values for the MCZ 14, MCZ 15, and MCZ 19 coal beds are shown on figures 10, 11, and 12 and are rounded to the nearest tenth of a million short tons. The Reserve values are based on a subsurface mining recoverability factor of 50 percent and a surface mining recoverability factor of 85 percent.

The following criteria for coal resource determinations are given in U.S. Geological Survey Bulletin 1450-B: "Measured.--Resources are computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of coals are so well defined that the tonnage is judged to be accurate within 20 percent of true tonnage. Although the spacing of the points of observation necessary to demonstrate continuity of the coal differs from region to region according to the character of the coal beds, the points of observation are no greater than ½ mile (0.8 km) apart. Measured coal is projected to extend as a ¼ mile (0.4 km) wide belt from the outcrop or points of observation or measurement.

"Indicated.--Resources are computed partly from specified measurements and partly from projection of visible data for a reasonable distance on the basis of geologic evidence. The points of observation are ½ (0.8 km) to 1½ miles (2.4 km) apart. Indicated coal is projected to extend as a ½ mile (0.8 km) wide belt that lies more than ¼ mile (0.4 km) from the outcrop or points of observation or measurement.

"Inferred.--Quantitative estimates are based largely on broad knowledge of the geologic character of the bed or region and where few measurements of bed thickness are available. The estimates are based primarily on an assumed continuation from Demonstrated coal [a collective term for the sum of coal in both Measured and Indicated Resources and Reserves] for which there is geologic evidence. The points of observation are 1½ (2.4 km) to 6 miles (9.5 km) apart. Inferred coal is projected to extend as a 2¼-mile (3.6 km) wide belt that lies more than 3/4 mile (1.2 km) from the outcrop or points of observation or measurement." (U.S. Bureau of Mines and U.S. Geological Survey, 1976, p. B6 and B7).

Coal resource tonnages were calculated for measured, indicated, and inferred categories in the unleased areas of Federal coal land where the coal is 5 ft (1.5 m) or more thick and lies within 3,000 ft (914 m) of the surface. The criteria cited above were used in calculating Reserve Base and Reserve data in this report and differ from those stated in U.S. Geological Survey Bulletin 1450-B, which calls for a minimum thickness of 28 in (70 cm) for bituminous coal and a maximum depth of 1,000 ft (300 m).

In this study, coal 5 ft (1.5 m) or more thick lying between the ground surface and a depth of 200 ft (61 m) is considered amenable to surface mining methods; coal 5 ft (1.5 m) or more thick lying between 200 ft (61 m) and 3,000 ft (914 m) below ground level in beds having dips of less than 15^{o} is considered minable by conventional subsurface methods. Coal 5 ft (1.5 m) or more thick lying between 200 ft (61 m) and 3,000 ft (914 m) below ground level with dips greater than 15^{o} is assumed to be suitable for in situ coal gasification methods.

Reserve Base tonnages of Federal coal per section for all isopached coal beds are shown on plate 2 and total approximately 3.8 million short tons (3.4 million metric tons) for the unleased Federal coal lands within the quadrangle. Reserve Base (in short tons) in the various development potential categories for surface and subsurface mining methods are shown in tables 5 and 6.

Resource tonnages calculated for isolated data points (non-isopached coal beds) are classified as inferred coal and placed in the unknown development potential category. The coal resources for the isolated data points are shown in table 2 and total 9.5 million short tons (8.6 million metric tons). In this quadrangle, coal resources of unknown development potential are projected to extend as a ¼ mile (0.4 km) wide belt from the outcrop or points of measurement at the isolated data points.

AAA Engineering and Drafting, Inc. has not made any determination of economic recovery for any of the coal beds described in this report.

COAL DEVELOPMENT POTENTIAL

Coal development potential areas are drawn (pl. 4 and 5) so as to coincide with the boundaries of smallest legal land subdivisions shown on plate 2. In sections or parts of sections where no land subdivisions have been surveyed by the BLM (U.S. Bureau of Land Management), approximate 40-acre (16-ha) parcels have been used to show the limits of high-, moderate-, or low-development-potential areas.

The designation of a coal-development-potential classification is based on the occurence of the highest rated coal-bearing area that may occur within any fractional part of a 40-acre (16-ha) BLM land grid-area,

lot, or tract of unleased Federal coal land. For example, a certain 40-acre (16-ha) parcel is totally underlain by a coal bed of "moderate-" development-potential. If a small corner of the same 40-acre (16-ha) area is also underlain by another coal bed of "high-" development-potential, the entire 40-acre (16-ha) area is given a "high-" development-potential rating even though most of the area is rated "moderate".

Table 5.--Coal Reserve Base data for surface mining methods for Federal coal lands in the Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado. (in short tons)[1]

Coal Bed Name	High development potential (0-10 mining ratio)	Moderate development potential (10-15 mining ratio)	Low development potential (> 15 mining ratio)	Total
MCZ 14 coal bed	1,500,000	-0-	-0-	1,500,000
MCZ 15 (Staley or "D") coal bed	300,000	-0-	-0-	300,000
MCZ 19 coal bed	1,000,000	-0-	-0-	1,000,000
TOTALS	2,800,000	-0-	-0-	2,800,000

[1]To convert short tons to metric tons, multiply by 0.9072

Table 6.--Coal Reserve Base data for subsurface mining methods for Federal coal lands in the Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado.
(in short tons)[1]

Coal Bed Name	High development potential	Moderate development potential	Low development potential	Total
MCZ 14 coal bed	-0-	-0-	-0-	-0-
MCZ 15 (Staley or "D") coal bed	-0-	-0-	-0-	-0-
MCZ 19 coal bed	1,000,000	-0-	-0-	1,000,000
TOTALS	1,000,000	-0-	-0-	1,000,000

[1]To convert short tons to metric tons, multiply by 0.9072

Development Potential Using Surface Mining Methods

Areas where the coal beds 5 ft (1.5 m) or more in thickness are overlain by 200 ft (61 m) or less of overburden are considered to have a surface mining potential and were assigned a high-, moderate-, or low-development-potential on the basis of the mining ratio (cubic yards of overburden per ton of recoverable coal). The following formula is used to calculate mining ratios:

$$MR = \frac{t_o\ (0.896)}{t_c\ \ (rf)}$$

Where MR = mining ratio (cubic yards of overburden per ton of recoverable coal)

t_o = thickness of overburden (in feet)

t_c = thickness of coal (in feet)

rf = recovery factor

0.896 = factor for bituminous coal.

To covert 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 here defined as areas underlain by coal beds having respective mining-ratio values of 0 to 10, 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 (1979, unpublished data).

The coal development potential using surface mining methods is shown on plate 4. Approximately 2.7 percent of the unleased Federal land area in this quadrangle is classified as having a high-development-potential using surface mining methods. The remaining Federal land in the quadrangle

is classified as having an unknown surface mining development potential or no development potential. Areas of unknown surface mining development potential are those not known to contain coal beds 5 ft (1.5 m) or more thick that are within 200 ft (61.0 m) of the surface; however, coal beds 5 ft (1.5 m) or more thick could be present in the area. Lands where it is known that no coal beds occur within 200 ft (61.0 m) of the surface have no surface-mining development potential.

The tonnage of Reserves recoverable by surface mining methods are calculated on a recoverability factor of 85 percent (specified by the U.S. Geological Survey, unpublished data, 1979) of the Reserve Base tonnage.

Development Potential Using Subsurface Mining and In Situ Coal Gasification

The coal development potential for areas in which subsurface development of coal is assumed possible is shown on plate 5. In this quadrangle, areas where coal beds dip 15^{o} or less, are 5 ft (1.5 m) or more thick and are overlain by 200 to 1,000 ft (61 to 305 m) of overburden are considered to have a high-development-potential for conventional subsurface mining methods. Approximately 1.0 percent of the unleased Federal land in this quadrangle has a high classification. Areas where such beds are overlain by 1,000-2,000 ft (305-610 m) and 2,000-3,000 ft (610-914 m) of overburden are rated as having moderate- and low-development-potentials, respectively. In this quadrangle there are no areas classified with a moderate- or low-development-potential using subsurface mining methods. Areas that contain no known coal in beds 5 ft (1.5 m) or more thick but do contain coal-bearing units at depths between 200 to 3,000 ft (61-914 m) are classified as areas of unknown coal development potential. Areas where it is known that no coal beds occur or where coal beds are present at depths greater than 3,000 ft (914 m) have no coal-development potential.

Reserve Base tonnages have been calculated for all areas within the quadrangle where the coal beds are 5 ft (1.5 m) or more thick. Reserves are based on a recoverability factor of 50 percent (specified by the U.S. Geological Survey, unpublished data, 1979) and have been calculated for only that part of the Reserve Base considered to be suitable for conventional subsurface mining methods. An arbitrary dip limit of 15^{o} is assumed to be the maximum dip suitable for conventional subsurface mining methods.

The development potential using in situ coal gasification applies to areas that contain coal beds dipping in excess of 15^{o}. Inasmuch as no coal beds 5 ft (1.5 m) or more thick are known to occur in this quadrangle where the dip is more than 15^{o} except for isolated data points, no lands are rated for using in situ coal gasification methods.

Reserves have not been calculated for the nonisopached coal beds at isolated data points. The areas controlled by those points have been assigned an unknown development potential. Resource tonnages included in the unknown development potential category for areas within ¼ mile (0.4 km) of isolated data points total 9.5 million short tons (8.6 million metric tons) as shown in table 2. No distinction has been made between surface and subsurface mining resources in the areas controlled by isolated data points.

Table 7.--Sources of data used on plate 1

Source	Plate 1 Index No.	Drill hole or measured section in reference source
Barnum and Garrigues, 1980	1	63
Do.	2	62
Do.	3	61
Do.	4	60
Do.	5	59
Do.	6	(No number used)
Do.	7	58
Do.	8	57
Do.	9	56
Do.	10	55
Do.	11	54
Do.	12	53
Do.	13	52
Do.	14	51
Do.	15	50
Do.	16	49
Do.	17	48
Barnum and Others, 1977	18	LW-1-CR
Barnum and Garrigures, 1980	19	47
Do.	20	46
Do.	21	45
Do.	22	44
Do.	23	43
Barnum and Others, 1977	24	LW-4-CR
Do.	25	LW-3-CR
Gaskill and Horn, 1961	26	DH 4 (p.43)
Barnum and Garrigues, 1980	27	41
Do.	28	40
Do.	29	(No number used)
Do.	30	Do.
Do.	31	39
Do.	32	(No number used)
Do.	33	Do.
Do.	34	38
Gaskill and Horn, 1961	35	16 (pl. 2)
Barnum and Garrigues, 1980	36	(No number used)
Do.	37	Do.
Do.	38	Do.
Do.	39	Do.
Do.	40	Do.
Do.	41	Do.
Do.	42	Do.
Do.	43	Do.
Do.	44	Do.
Do.	45	32
Do.	46	31

Source	Plate 1 Index No.	Drill hole or measured section in reference source
Gaskill and Horn, 1961	47	23 (p. 39)
Barnum and Garrigues, 1979	48	(No number used)
Do.	49	20
Gaskill and Horn, 1961	50	DH 10 (p. 45)
Do.	51	DH 9 (p. 45)
Barnum and Garrigues, 1980	52	30
Do.	53	29
Do.	54	(No number used)
Do.	55	Do.
Do.	56	21
Do.	57	22
Do.	58	23
Do.	59	24
Do.	60	37
Do.	61	36
Do.	62	35
Do.	63	34
Do.	64	33
Do.	65	(No number used)
Do.	66	Do.
Do.	67	Do.
Do.	68	Do.
Do.	69	Do.
Do.	70	Do.
Do.	71	Do.
Gaskill and Horn, 1961	72	18 (pl. 2)
Barum and Garrigues, 1980	73	28
Gaskill and Horn, 1961	74	DH 14 (p.46)
Do.	75	17 (p. 48)
Barnum and Garrigues, 1980	76	(No number used)
Do.	77	Do.
Gaskill and Horn, 1961	78	DH 13 (p. 46)
Barnum and Garrigues, 1980	79	(No number used)
Do.	80	Do.
Do.	81	27
Do.	82	26
Do.	83	25
Gaskill and Horn, 1961	84	DH 15 (p. 47)
Do.	85	DH 1 (p. 42)
Barnum and Garrigues, 1980	86	12
Do.	87	19
Gaskill and Horn, 1961	88	(No number used) (p. 41)
Barnum and Garrigues, 1980	89	17
Gaskill and Horn, 1961	90	DH 7 (p. 44)
Barnum and Garrigues, 1980	91	16
Do.	92	15
Gaskill and Horn, 1961	93	DH 6 (p. 43)
Do.	94	DH 3 (p. 42)

Source	Plate 1 Index No.	Drill hole or measured section in reference source
Barnum and Garrigues, 1980	95	(No number used)
Do.	96	Do.
Barnum and Others, 1977	97	LW-24-CR
Barnum and Garrigues, 1980	98	11
Do.	99	(No number used)
Do.	100	Do.
Do.	101	Do.
Do.	102	Do.
Do.	103	Do.
Do.	104	Do.
Do.	105	10
Do.	106	(No number used)
Do.	107	Do.
Do.	108	9
Do.	109	8
Gaskill and Horn, 1961	110	19 (p. 37)
Barnum and Garrigues, 1980	111	7
Do.	112	6
Do.	113	5
Do.	114	4
Do.	115	2
Do.	116	1
Barnum and Others, 1977	117	LW-8-CR
	118	LW-7-CR

REFERENCES

American Society for Testing and Materials, 1977, Standard specifications for classification of coals by rank, in Gaseous fuels, coal, and coke; atmospheric analysis: ASTM Publication D 388-77.

Barnum, B. E., and Garrigues, R. S., 1980, Geologic map and coal sections of the Cactus Reservoir quadrangle, Rio Blanco and Moffat Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1179, scale 1:24,000, 2 sheets.

Barnum, B. E., Garrigues, R. S., and Dyer, L. E., 1977, Coal Sections of holes drilled in the lower White River coal field, Moffat and Rio Blanco Counties, Colorado: U.S. Geological Survey Open-File Report 77-378, 1 sheet.

Covington, R. E., 1967, Geologic Map East Rangely Area, Rio Blanco County Colorado: Unpublished maps filed in U.S. Geol. Survey terminated coal lease file # D-047201 and # C023703.

Covington, R. E., 1970, Geological and Engineering Data on the coal properties located in Section 11, T. 2 N., R. 101 W., Rio Blanco County Colorado: Unpublished report.

Gale, H. S., 1910, Coal fields of northwestern Colorado and northeastern Utah: U.S. Geological Survey Bulletin 415, 265 p.

Garrigues, R. S., 1976, Geophysical logs of holes drilled in 1976 in the Lower White River coal field, Moffat and Rio Blanco Counties, Colorado: U.S. Geological Survey Open-File Report 76-871, 11 p.

Gaskill, D. L., and Horn, G. H., 1961, Northeast Rangely coal area, Rio Blanco and Moffat Counties, Colorado: U.S. Geological Survey open-file report, 48 p.

Haines, D. V., 1974, Geologic evaluation of preference right coal lease application Colorado 0126669, Rio Blanco County, Colorado: U.S. Geol. Survey unpublished report.

U.S. Bureau of Mines and U.S. Geological Survey, 1976, Coal resource classification system of the U.S. Bureau of Mines and U.S. Geological Survey: U.S. Geol. Survey Bull. 1450-B.

U.S. Department of Commerce, (1964), Normal annual precipitation, 1931-1960, Colorado: Environmental Science Services Admin., Weather Bureau, 2 sheets.

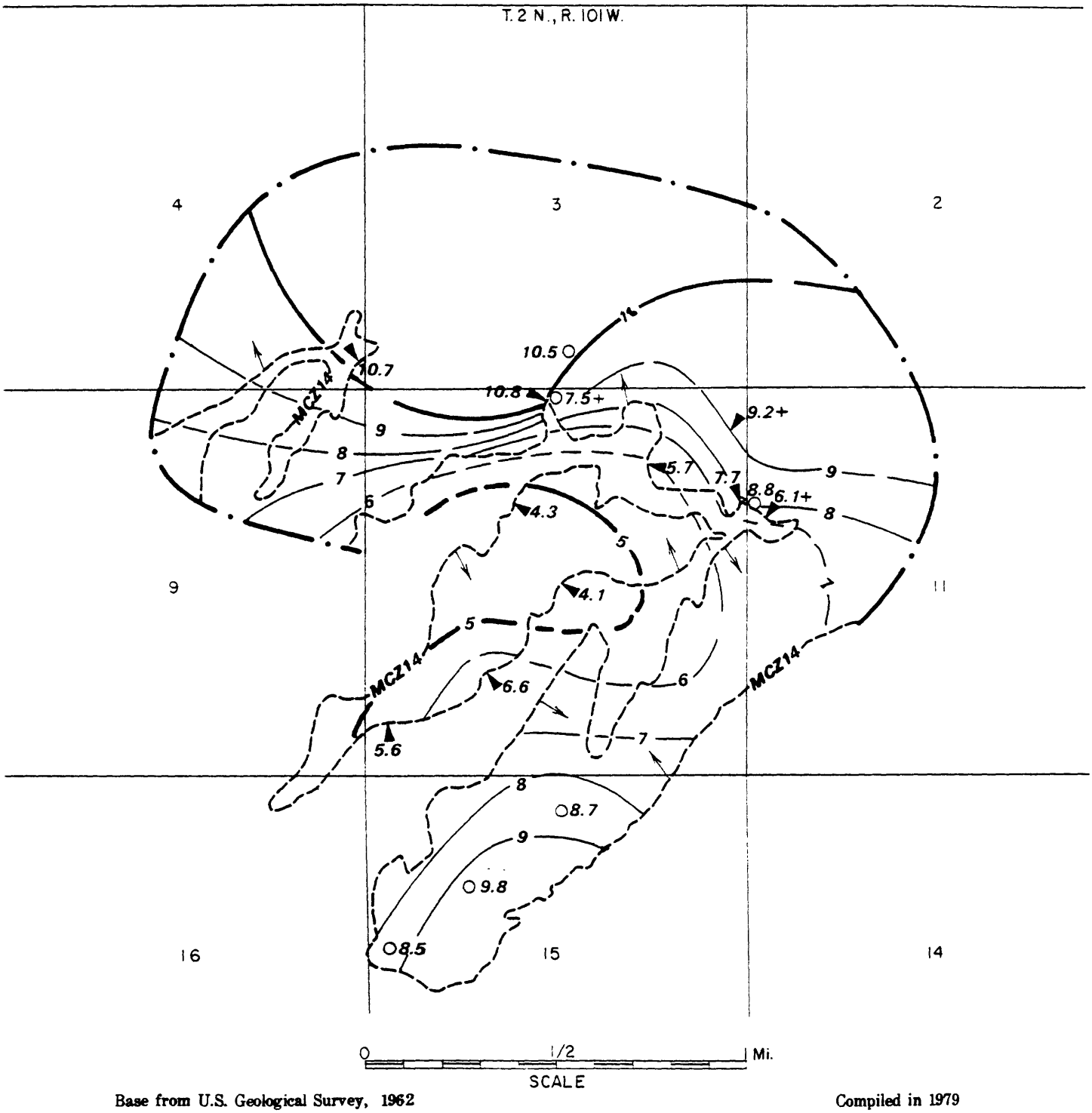


Figure 1. Isopach map of coal bed 14, main coal zone.

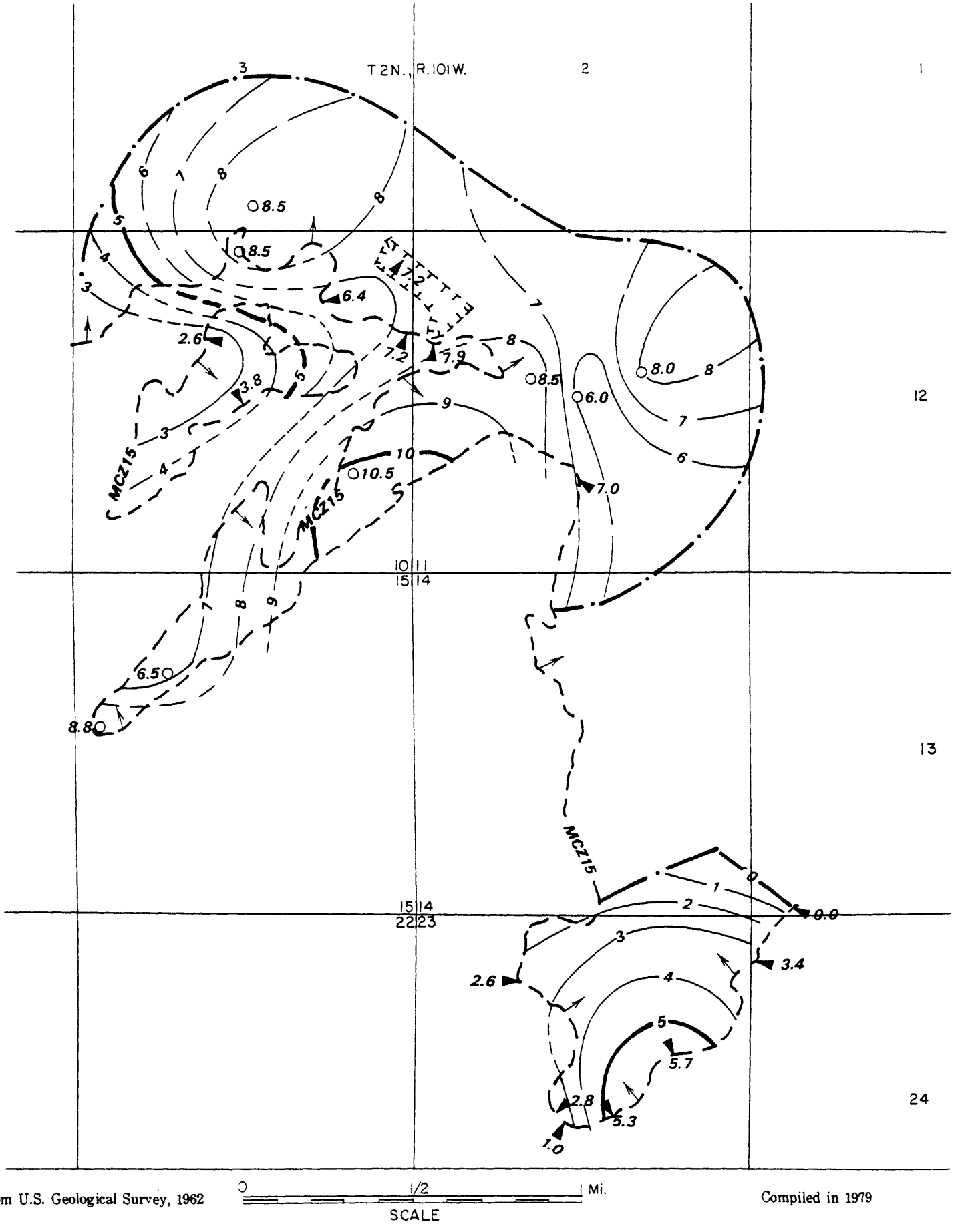


Figure 2. Isopach map of coal bed 15, main coal zone.

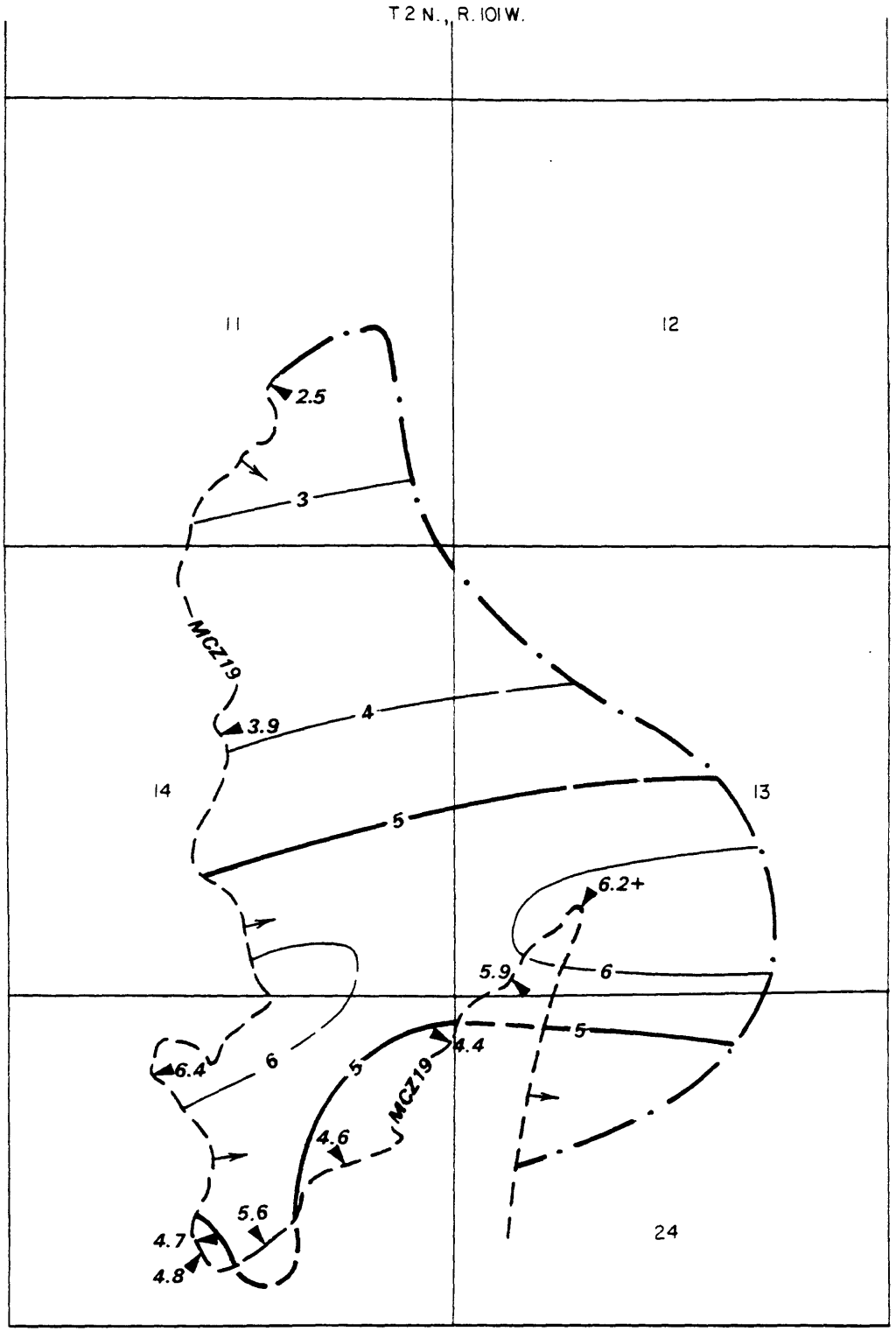
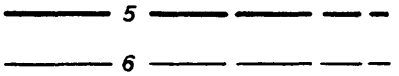
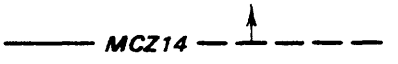


Figure 3. Isopach map of coal bed 19, main coal zone.



ISOPACHS–Showing thickness of coal, in feet. Long dashed where inferred, short dashed where projected above land surface. Isopach interval 1 foot.

POINT OF MEASUREMENT–Showing thickness of coal, in feet. Includes all points of measurement other than drill holes.



TRACE OF COAL BED OUTCROP–Showing symbol of name of coal bed. Arrow points toward coal-bearing area. Dashed where inferred by present authors.

DRILL HOLE–Showing thickness of coal, in feet. Drill holes which do not intersect the coal or from which a coal thickness could not be determined are not shown.

INSUFFICIENT DATA LINE–Coal thickness cannot be determined beyond line shown because of insufficient data.

To convert feet to meters, multiply feet by 0.3048.

Explanation for coal isopach maps (figs. 1-3)

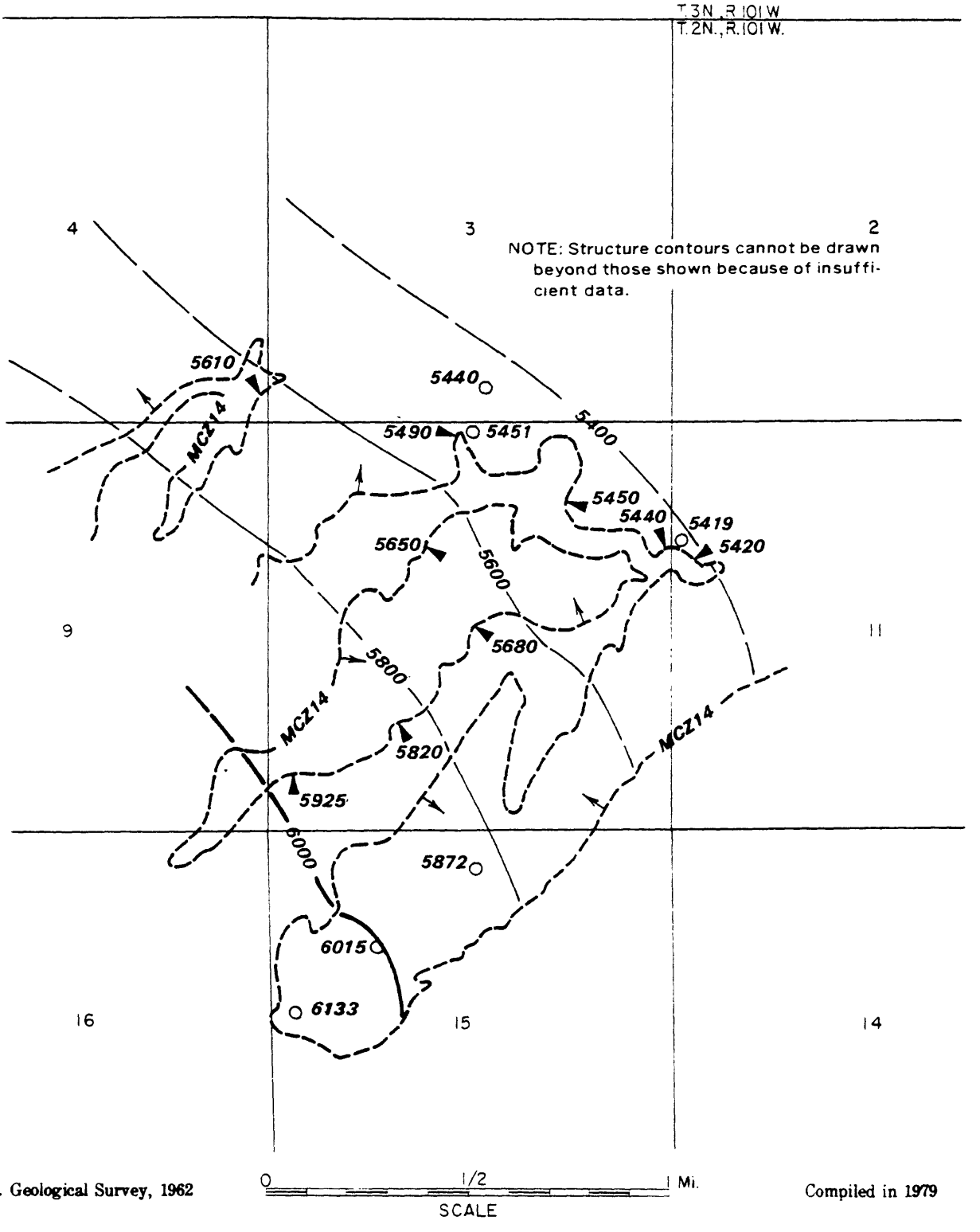
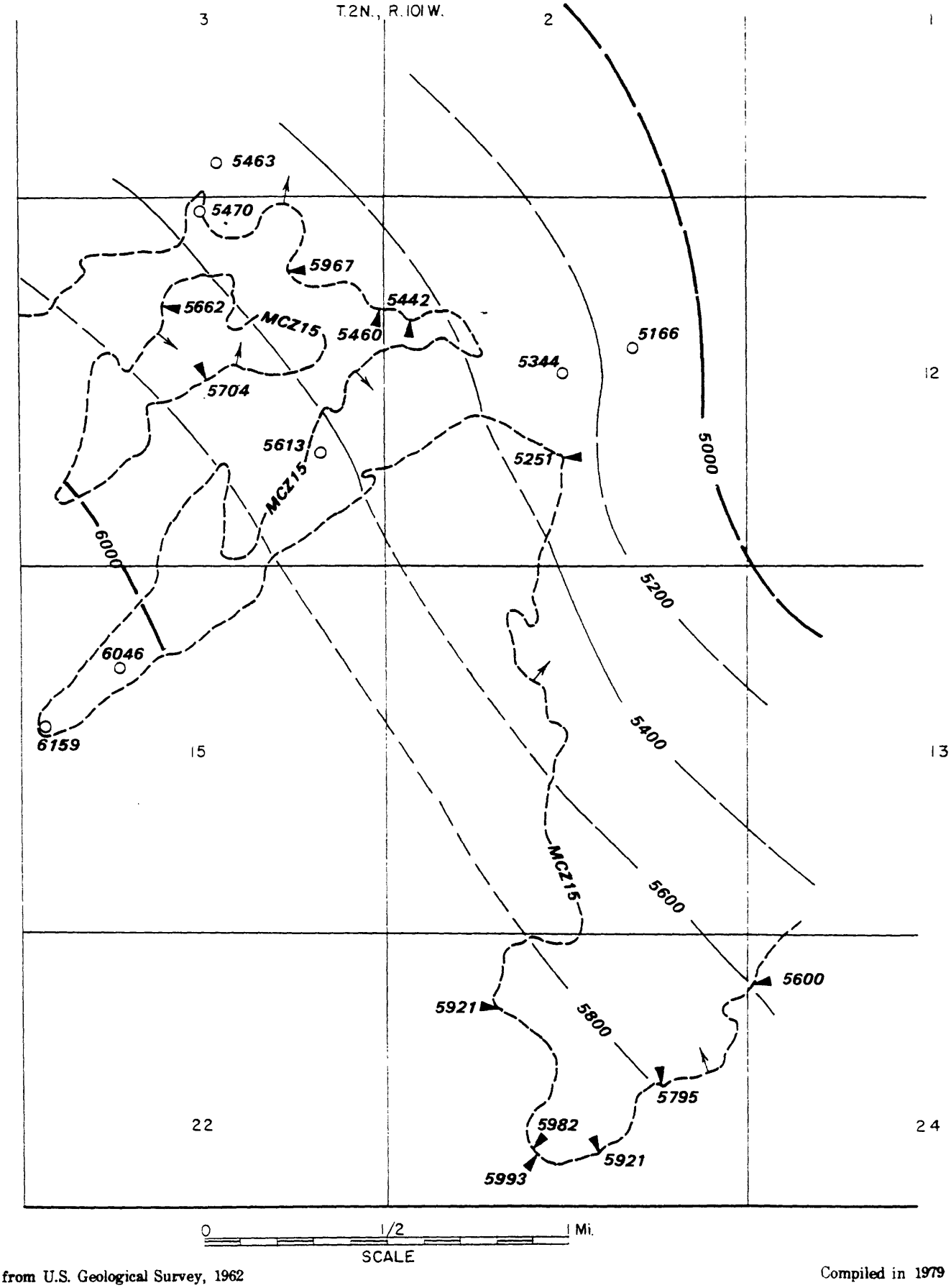


Figure 4. Structure contour map of coal bed 14, main coal zone.



Base from U.S. Geological Survey, 1962

Compiled in 1979

Figure 5. Structure contour map of coal bed 15, main coal zone.

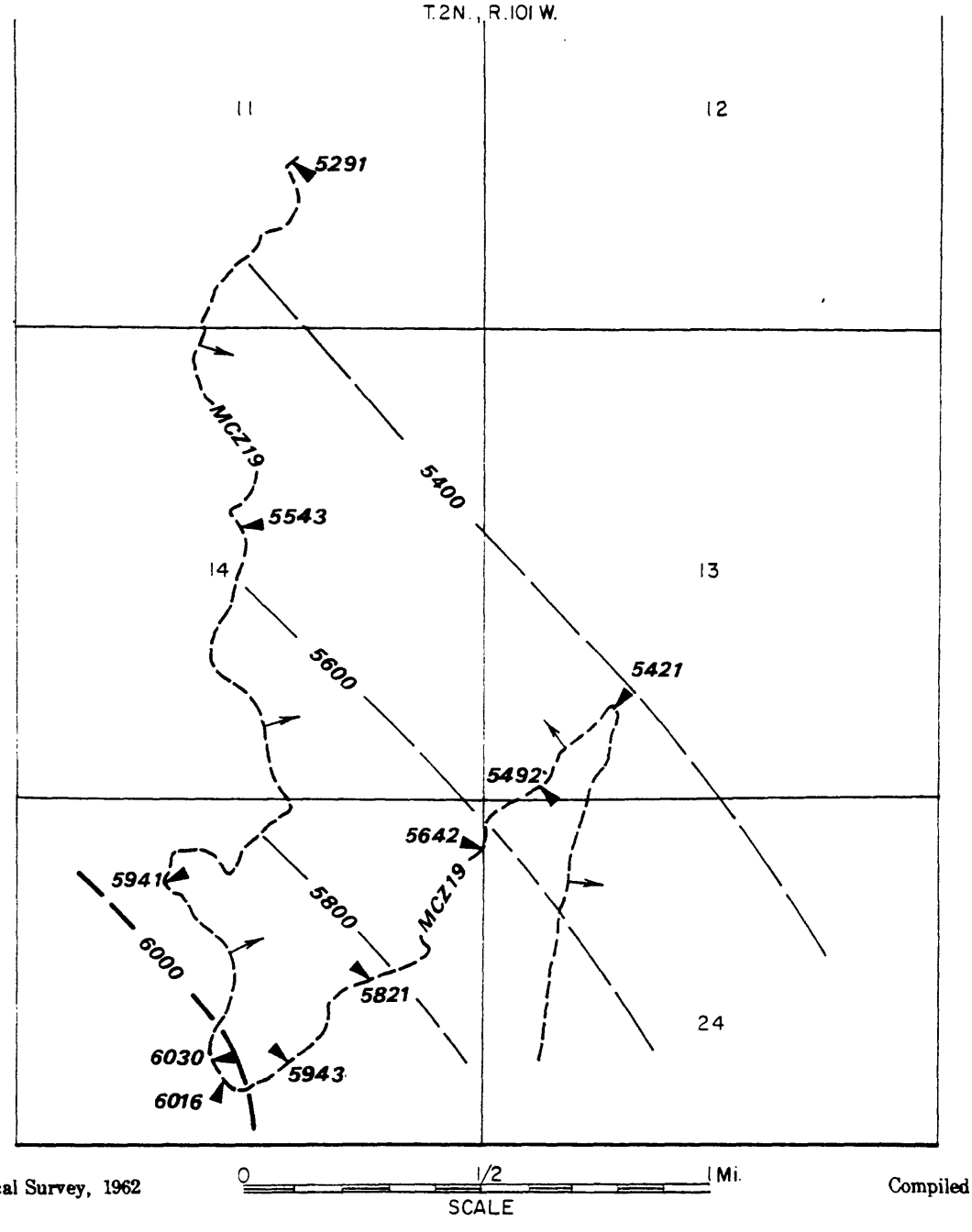
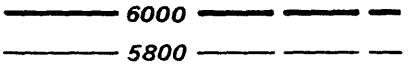


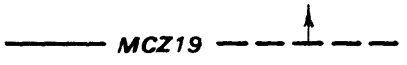
Figure 6. Structure contour map of coal bed 19, main coal zone.



STRUCTURE CONTOURS–Drawn on top of coal bed. Solid where vertical accuracy within 100 feet; long dashed where vertical accuracy possibly not within 100 feet; short dashed where projected above land surface. Hachures indicate closed contours of basin. Contour interval is 200 feet (61.0m). Datum is mean sea level.

DRILL HOLE–Showing altitude of top of coal bed, in feet. Drill holes which did not intersect top of coal bed or from which bed altitude could not be determined, are not shown.

POINT OF MEASUREMENT– Showing altitude of top of coal bed, in feet.



TRACE OF COAL BED OUTCROP–Showing symbol of name of coal bed. Arrow points toward coal-bearing area. Dashed where inferred by present authors.

To convert feet to meters, multiply feet by 0.3048.

Explanation for structure contour maps (figs. 4-6).

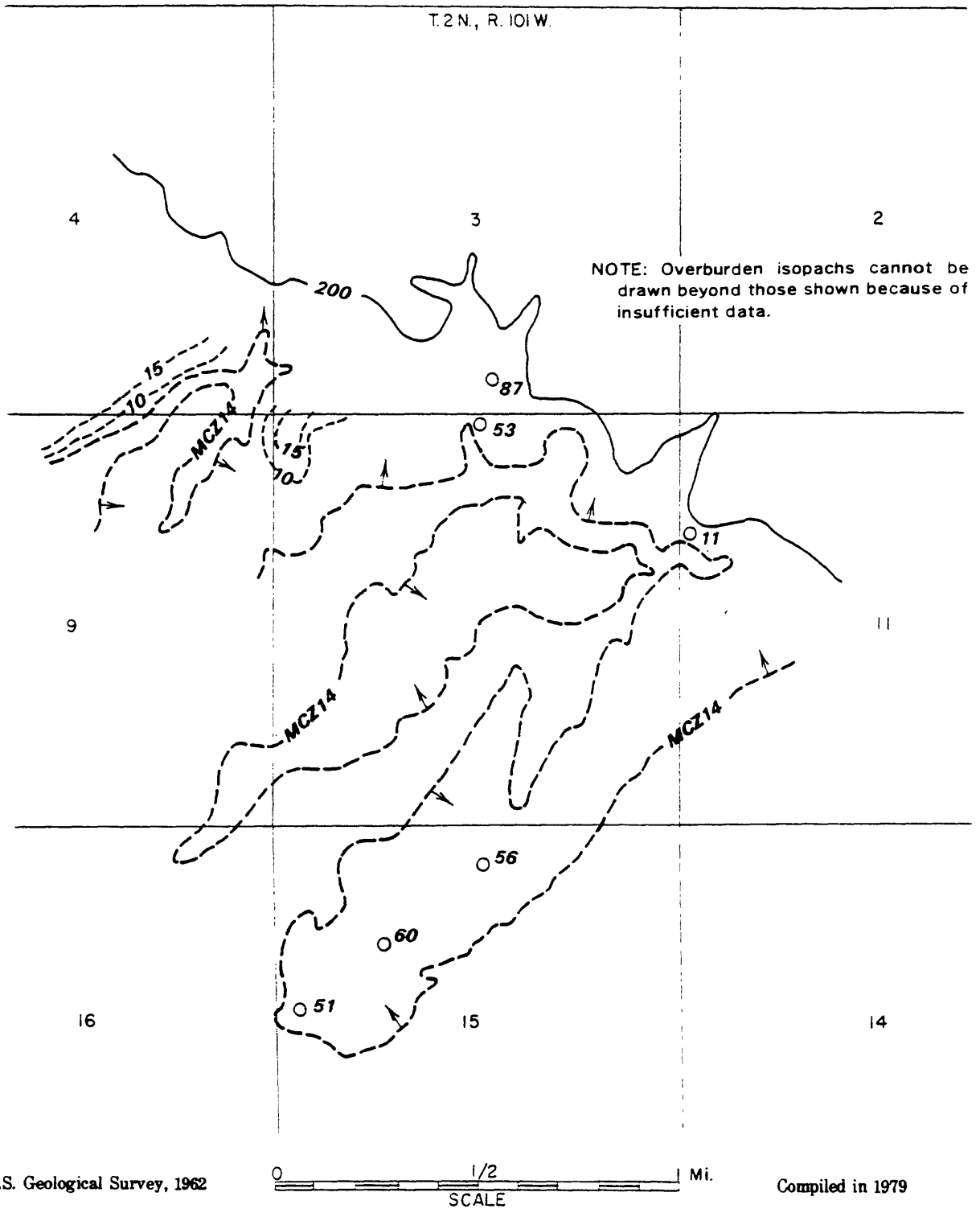
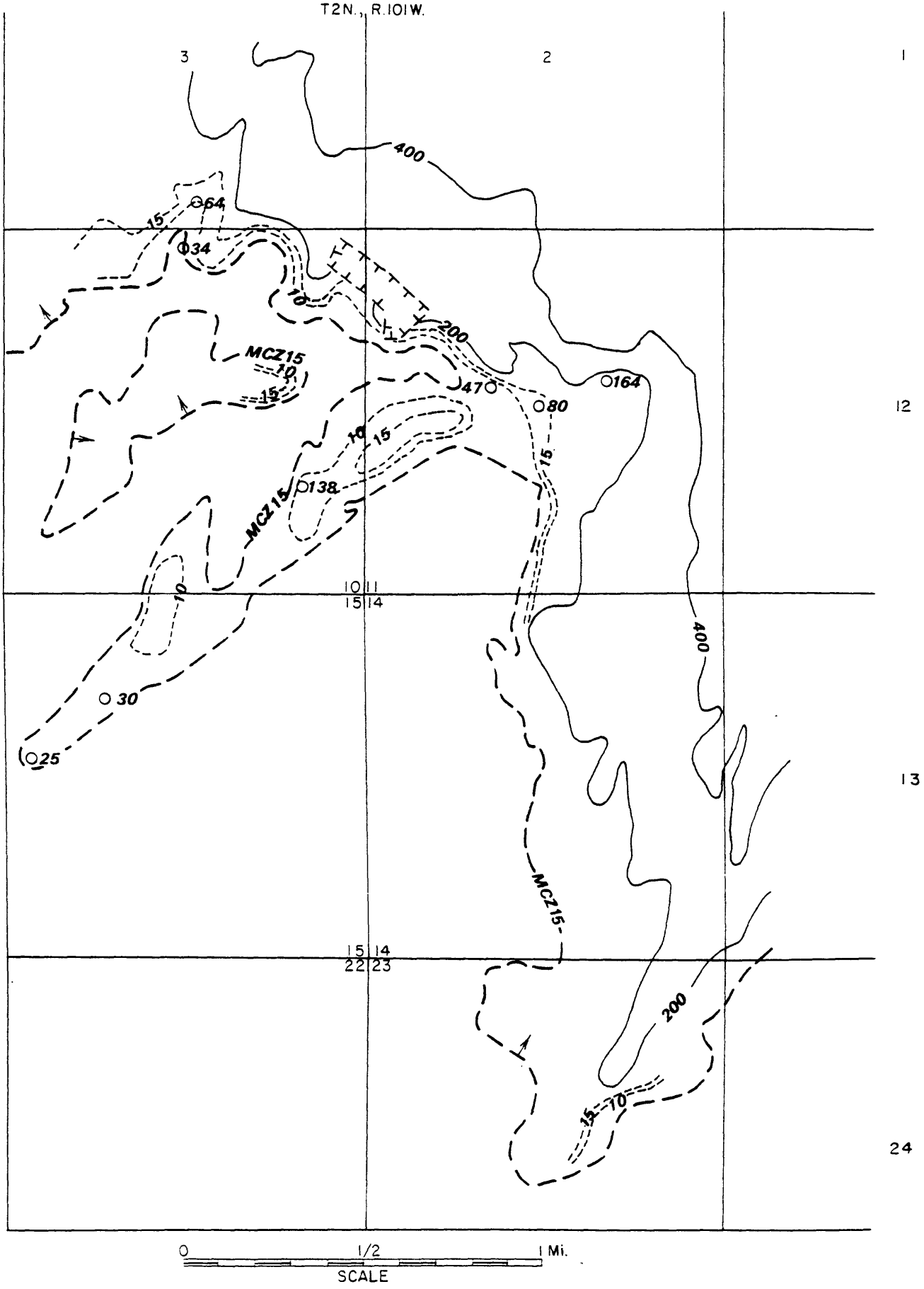


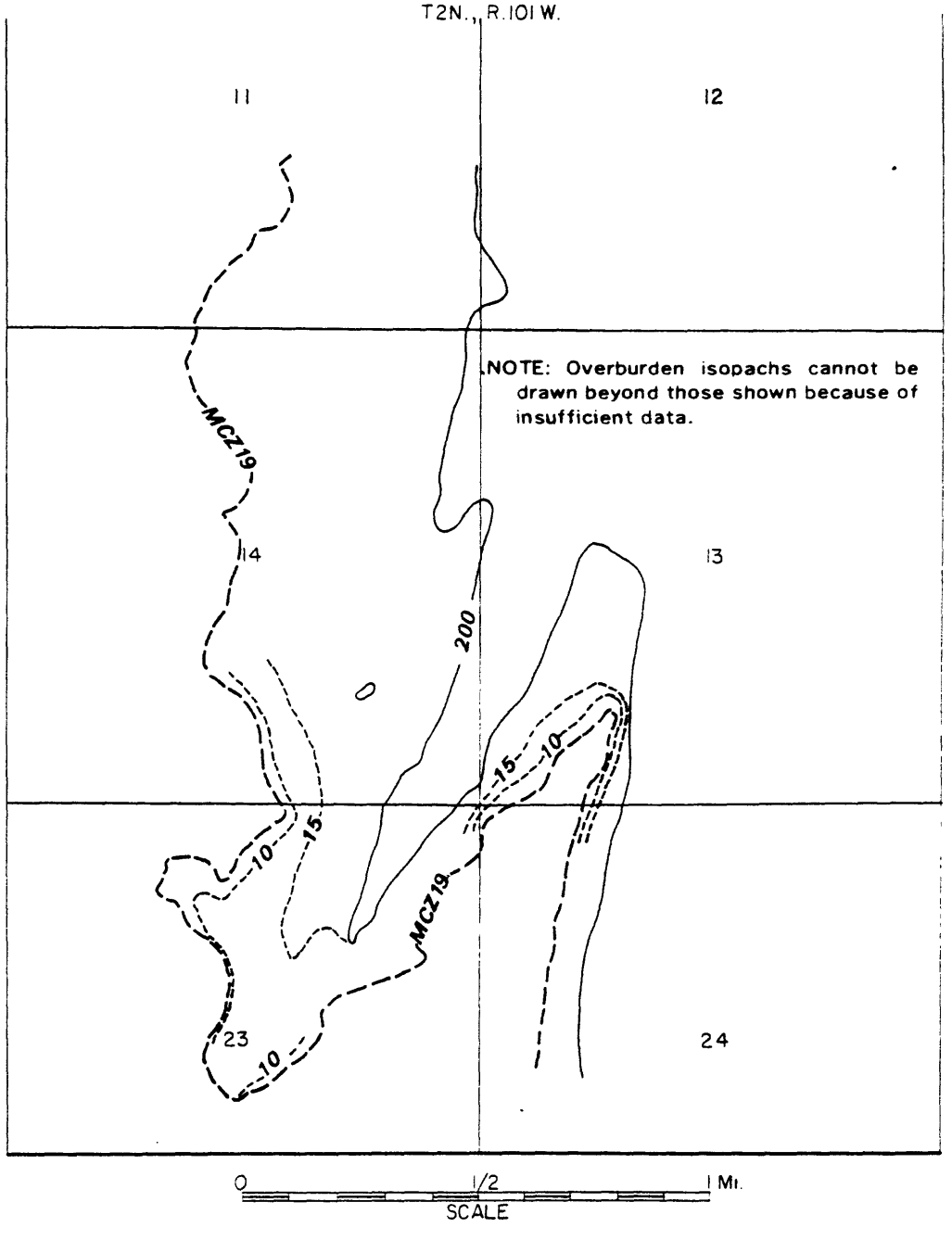
Figure 7. Overburden isopach map of coal bed 14, main coal zone.



Base from U.S. Geological Survey, 1962

Compiled in 1979

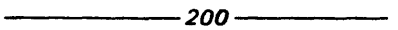
Figure 8. Overburden isopach map of coal bed 15, main coal zone.



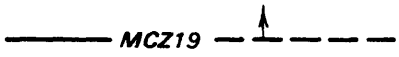
Base from U.S. Geological Survey, 1962

Compiled in 1979

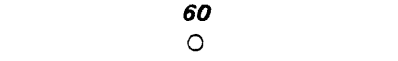
Figure 9. Overburden isopach map of coal bed 19, main coal zone.



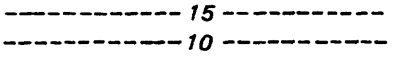
OVERBURDEN ISOPACHS – Showing thickness of overburden, in feet, from the surface to top of the coal bed or Isopach interval 200 feet (61.0 m).



TRACE OF COAL BED OUTCROP–Showing symbol of name of coal bed. Arrow points toward coal-bearing area. Dashed where inferred by present authors.



DRILL HOLE–Showing thickness of coal, in feet. Drill holes which do not intersect the coal or from which a coal thickness could not be determined are not shown.



MINING-RATIO CONTOURS–Number indicates cubic yards of overburden per ton of recoverable coal by surface mining methods. Contours shown only in areas suitable for surface mining within the stripping limit.

To convert feet to meters, multiply feet by 0.3048.

Explanation for overburden isopach maps (figs. 7-9).

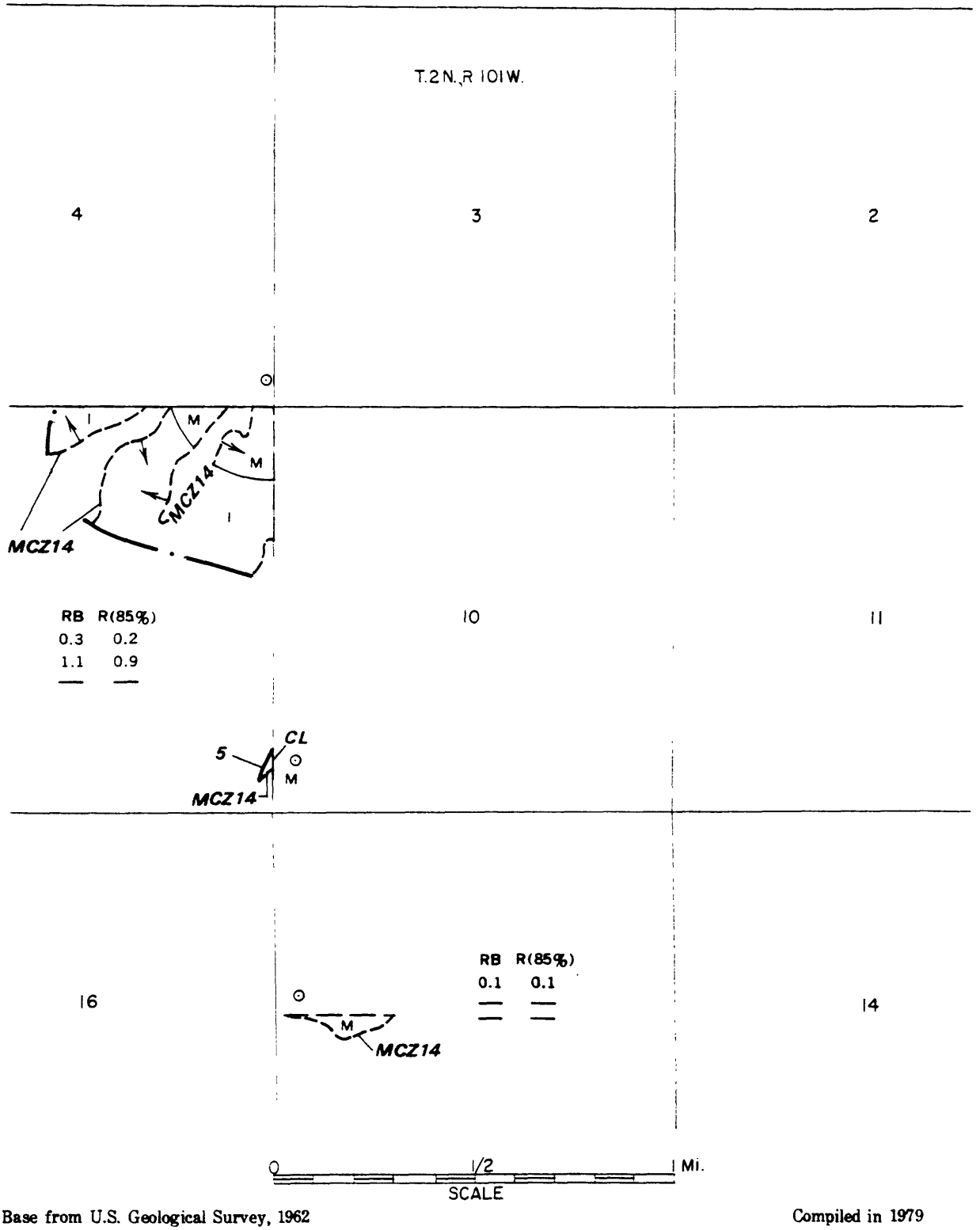


Figure 10. Areal distribution and identified resources map of coal bed 14, main coal zone.

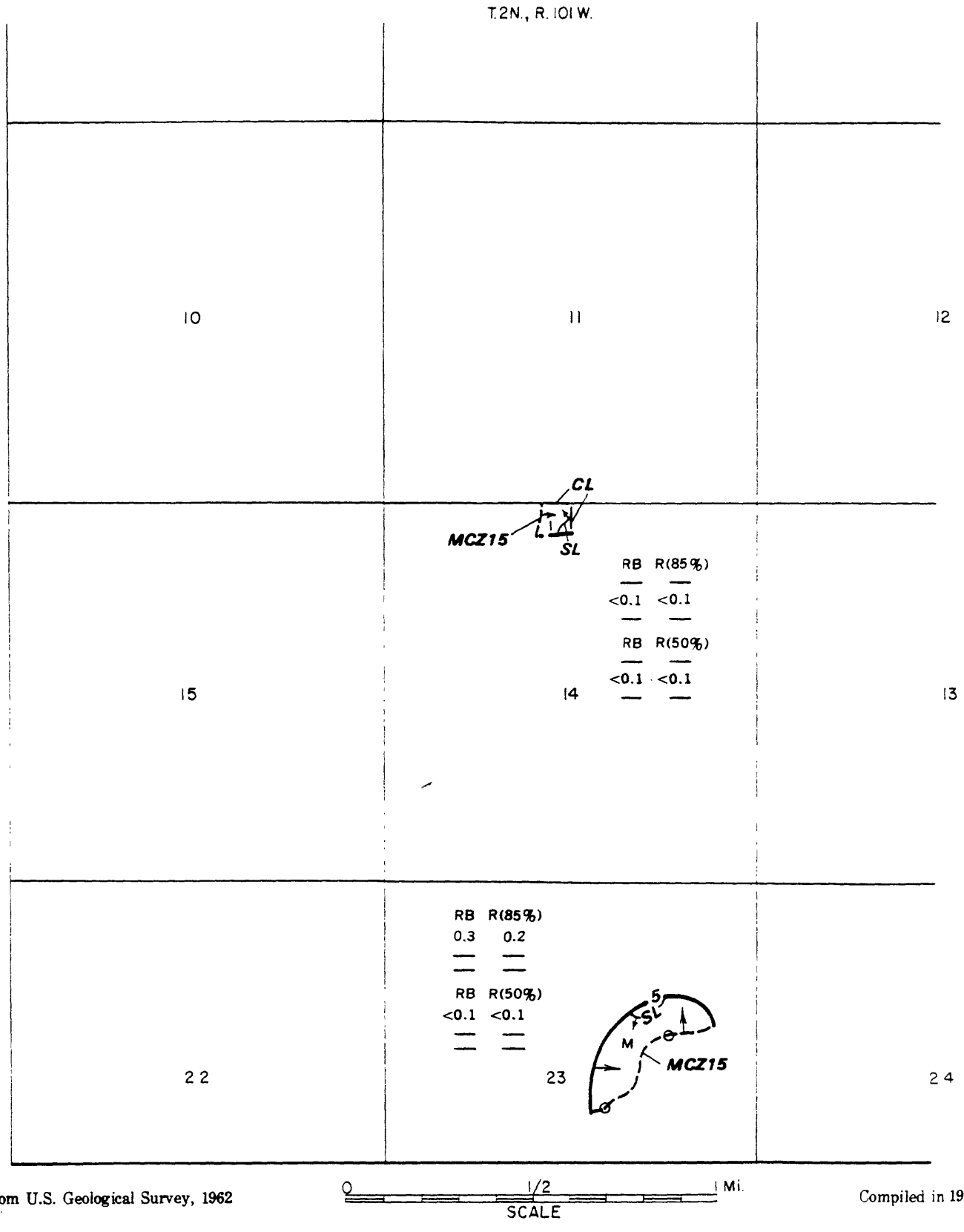


Figure 11. Areal distribution and identified resources map of coal bed 15, main coal zone.

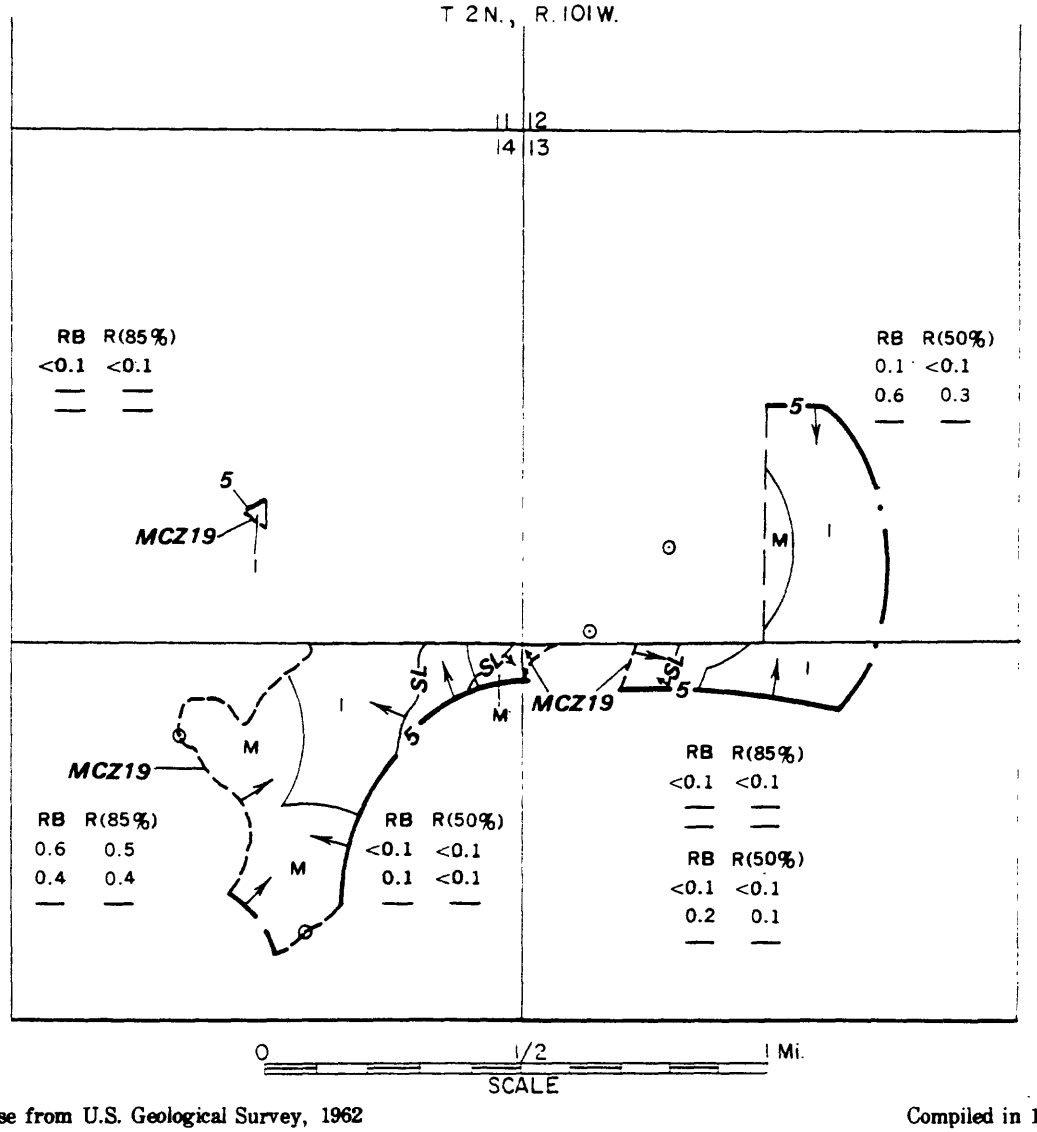
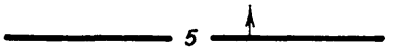
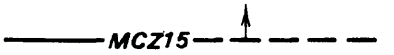


Figure 12. Areal distribution and identified resources map of coal bed 19, main coal zone.

FEDERAL COAL LEASE BOUNDARY (CL)



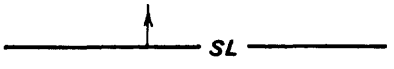
ISOPACH–Showing thickness of coal, in feet. Arrow points toward area where coal bed is 5 feet or more thick.



TRACE OF COAL BED OUTCROP–Showing symbol of name of coal bed. Arrow points toward coal-bearing area. Dashed where inferred by present authors.

POINT OF MEASUREMENT –Point from which boundary lines for measured, indicated, and inferred coal resources were drawn.

INSUFFICIENT DATA LINE–Coal resources were not calculated for areas beyond line shown because of insufficient data.

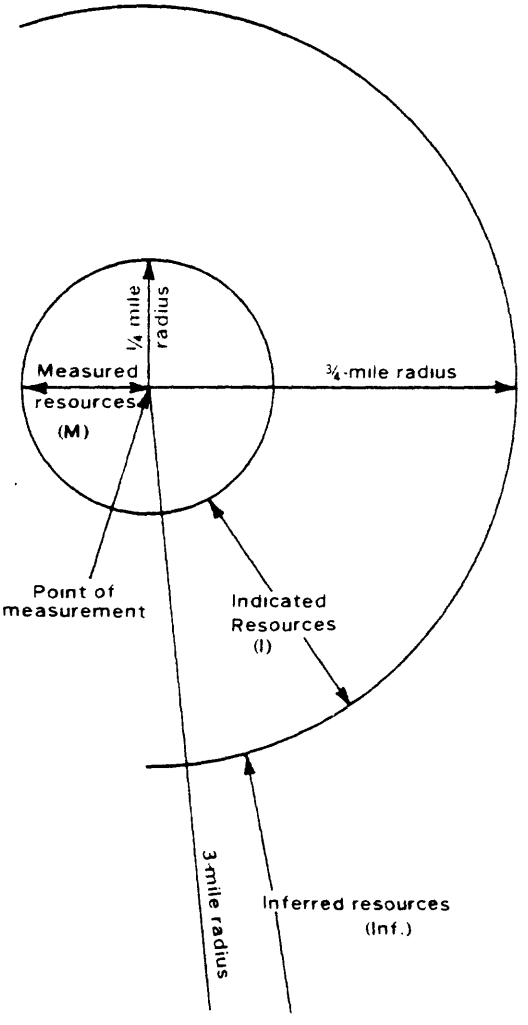


STRIPPING-LIMIT LINE–Boundary for surface mining (in this quadrangle, the 200-foot-overburden isopach). Arrow points toward the area suitable for surface mining where the recovery factor is 85 percent, and away from the area suitable for subsurface mining (down dip to the 3,000-foot-overburden isopach) where the recovery factor is 50 percent.

Explanation for areal distribution and identified resources maps (figs. 10-12).

Surface		Subsurface		
RB	R(85%)	RB	R(50%)	
0.3	0.2	<0.1	<0.1	(Measured)
—	—	—	—	(Indicated)
—	—	—	—	(Inferred)

IDENTIFIED COAL RESOURCES–Showing totals for Reserve Base (RB) and Reserves (R), in millions of short tons, for each section or part of section of non-leased Federal coal land, both within and beyond the stripping-limit line. Reserve (R) tonnage is calculated by multiplying the Reserve Base (RB) tonnage by the appropriate recovery factor. Dash indicates no resource in that category.



BOUNDARY LINES–Enclosed areas of measured, indicated, and inferred coal resources of the coal bed.

To convert short tons to metric tons, multiply short tons by 0.9072.

To convert feet to meters, multiply feet by 0.3048

Explanation for areal distribution and identified resources maps (figs. 10-12)--(Continued).

APPENDIX A

Coal and rock thicknesses for the measured sections and drill holes shown on CRO Coal Data Map, plate 1, Cactus Reservoir Quadrangle, Rio Blanco and Moffat Counties, Colorado.

1

R 86.3
C 1.0 (MCZ 6)
R 24.6
NR 19.4
C 0.8 (MCZ L)
R <0.5
C 0.7 (MCZ L)
R 6.2
C 3.4 (MCZ 2)
R <0.5
C 1.2 (MCZ 2)
R 6.9
C 4.3 (MCZ 1)
R 43.3

2

R 32.5+
NR 50.8
R 12.5
C 0.7 (L)
R 24.9
NR 10.2
R 24.4
C 2.1 (MCZ 7)
R 43.0
C 1.0 (MCZ 6)
R 34.8
C 4.8 (MCZ 4)
R 3.0
C 3.6 (MCZ 3)
R 3.3
NR 3.9
R 1.9

2 (cont.)

C 1.0 (MCZ 2)
R 1.0
C 3.3 (MCZ 2)
R 9.4
C 4.1 (MCZ 1)
R 17.4
NR 19.4
R 3.3+

3

R 83.3+
NR 38.9
R 24.0
NR 9.2
R 4.9
C 1.1 (L)
R 10.5
NR 8.5
R 4.3
C 1.8 (MCZ 9)
R 1.0
C 2.6 (MCZ 9)
R 36.3
C 0.8 (MCZ 7)
R 36.7
C 1.6 (MCZ 6)
R 40.4

3 (cont.)

C 4.6 (MCZ 4)
R 4.8
C 4.1 (MCZ 3)
R 10.8
C 1.5 (MCZ 2)
R 1.3
C 3.6 (MCZ 2)
R 10.3
C 4.4 (MCZ 1)
R 60.7

4

R 12.6
C 1.0 (MCZ 9)
R 11.6
C 1.0 (MCZ L)
R 5.2
NR 10.5
R 5.6
C 1.3 (MCZ 7)
R <0.5
C 3.1 (MCZ 7)
R 4.3
NR 12.0
R 24.3
C 2.3 (MCZ 6)
R 5.9
NR 7.9

4 (cont.)

R 13.1
C 1.1 (MCZ L)
R 4.3
C 0.3 (MCZ L)
R 1.5
NR 4.4
R 8.5
C 3.6 (MCZ 3)
R 4.6
C 3.6 (MCZ 2)
R 17.2
C 4.6 (MCZ 1)
R 14.4
C 1.0 (L)
R 36.4
C 1.0 (L 1)

4 (cont.)

R 18.2
C 1.0 (L)
R 40.8
C 1.0 (L)
R 6.6
NR 13.1
R 30.2
C 1.3 (L)
R 11.5+

5

NR 3.3+
R 4.3
NR 4.6
R 0.7
C 4.3 (MCZ 4)
R 6.2
NR 13.6
R 6.1
C 3.3 (MCZ 2)
R 0.8
NR 7.9
R 0.8
C 2.6 (MCZ 1)
R 23.0
C 1.0 (L)

5 (cont.)

R 4.3
NR 36.1
C 1.1 (L 1)
NR 44.6
R 6.6+

7

R 91.5
C 0.2 (L)
R 16.7
C 0.8 (L)
R 37.9
C 0.7 (MCZ 9)
R 1.1
C 1.0 (MCZ 9)
R <0.5
C 1.1 (MCZ 9)
R 11.2
C 0.5 (MCZ L)
R 28.9
C 0.7 (MCZ L)
R <0.5

7 (cont.)

C 1.6 (MCZ L)
R 26.7
C 3.3 (MCZ 6)
R 21.6
C 4.6 (MCZ 5)
R 27.1
C 2.3 (MCZ 3)
R 11.5
C 2.3 (MCZ L)
R 2.1
C 2.1 (MCZ 2)
R 8.7
C 3.0 (MCZ 1)
R 61.7
C 0.5 (L 1)

7 (cont.)

R 12.8
C 1.0 (L)
R 50.8+

8

R 7.9+
NR 6.6
R 3.3
C 1.8 (MCZ 9)
R 2.0
NR 22.0
R 12.5
C 0.7 (MCZ L)
R 32.5
C 3.3 (MCZ 6)
R 22.6
C 4.3 (MCZ 5)
R 1.3
NR 5.6
R 17.7

8 (cont.)

C 2.0 (MCZ 3)
R 13.4
C 1.2 (MCZ 2)
R <0.5
C 1.2 (MCZ 2)
R 10.7
C 4.3 (MCZ 1)
R 8.2
C 1.0 (L)
R 11.8
NR 9.7
R 17.0
NR 8.8
R 1.8
BC 3.3 (L 1)

8 (cont.)

R 9.0
NR 29.2
R 8.5

9

R 34.0
BC 1.6 (L)
R 94.0
C 2.3 (MCZ 8)
R 23.6
C 0.5 (MCZ L)
R 2.3
C 1.3 (MCZ L)
R 28.2
C 2.5 (MCZ 6)
R 0.7
C 0.5 (MCZ 6)
R 19.7
C 6.4 (MCZ 5)
R 37.7

9 (cont.)

C 5.4 (MCZ 2)
R 5.6
C 2.6 (MCZ 1)
R 12.5
BC 1.2 (L)
R 45.2
C 1.5 (L 1)
R 5.9
C 1.6 (L)
R 179.8
C 0.5 (L)
R 26.2+

10

R 6.2+
C 0.3 (L)
R 81.9
C 0.3 (MCZ L)
R 9.0
C 1.5 (MCZ 8)
R 29.7
C 1.8 (MCZ L)
R 32.0
C 1.0 (MCZ 6)
R 2.3
C 0.8 (MCZ 6)
R 20.0
C 1.0 (MCZ 5)
R 1.0

10 (cont.)

C 3.0 (MCZ 5)
R 10.5
C 0.2 (MCZ L)
R 26.9
C 3.1 (MCZ 2)
R 6.7
C 1.5 (MCZ 1)
BC 1.5 (MCZ 1)
R 38.9
NR 11.8
R 3.8
NR 5.6
R 1.0
C 1.1 (L 1)
R 70.2

10 (cont.)

NR 7.2
R 5.2
NR 6.6
R 16.2
C 1.5 (L)
R 70.5+

11

R 69.5+
NR 12.5
R 8.2
NR 3.6
R 18.4
NR 71.8
R 20.0
NR 10.8
R 6.9
C 1.6 (MCZ 8)
R 24.3
C 1.3 (MCZ L)
R 1.0
NR 4.1
R 30.0

11 (cont.)

C 1.6 (MCZ 6)
R 46.9
C 3.0 (MCZ L)
R 11.8
C 3.4 (MCZ L)
R 3.0
C 1.3 (MCZ 2)
R <0.5
C 0.5 (MCZ 2)
R <0.5
C 2.9 (MCZ 2)
R 8.5
C 4.3 (MCZ 1)
R 60.7
C 2.3 (L 1)

11 (cont.)

R 12.5
C 3.1 (L)
R 12.1
C 0.3 (L)
R 17.7
NR 5.4
R 21.6
C 1.0 (L)
R 45.8
C 1.6 (L)
R 68.9+

12

NR 6.6
R 59.4
NR 24.3
R 41.0
NR 12.1
R 4.8
C 2.0 (MCZ L)
R 17.4
C 0.5 (MCZ L)
R 4.6
NR 6.1
R 2.0
C 2.0 (MCZ L)
R 27.6
NR 5.6

12 (cont.)

R 4.1
C 0.8 (MCZ L)
R 11.2
C 2.0 (MCZ 5)
R 12.8
C 2.6 (MCZ L)
R 29.8
C 4.3 (MCZ 1)
R 9.4
C 1.0 (MCZ L)
R 6.9
NR 7.4
R 25.6
C 2.6 (L)
R 10.5

12 (cont.)

C 1.5 (L 1)
R 11.8
NR 12.0
R 15.1
NR 6.6
R 17.7
NR 16.6
R 30.2+

14 (cont.)

R 142.7+
C 0.7 (MCZ L)
R 3.6
C 0.7 (MCZ L)
R 40.7
C 2.3 (MCZ L)
R 8.2
NR 5.6
R 0.8
C 0.7 (MCZ L)
R 3.0
C 0.9 (MCZ 6)
R < 0.5
C 0.9 (MCZ 6)
R 5.7

14 (cont.)

NR 11.2
R 11.2
C 2.6 (MCZ 5)
R <0.5
C 1.0 (MCZ 5)
R 6.2
C 1.0 (MCZ L)
R 1.6
C 1.8 (MCZ L)
R 2.5
C 1.0 (MCZ L)
R 3.3
C 1.3 (MCZ L)
R 2.3

14 (cont.)

NR 3.9
R 3.3
C 0.5 (MCZ 10)
R <0.5
C 1.3 (MCZ 10)
R 7.5
C 2.3 (MCZ 2)
R <0.5
C 2.3 (MCZ 2)
R 8.5
C 3.9 (MCZ 1)
R 10.8
C 0.8 (MCZ L)
R 41.7

14 (cont.)

C 0.7 (L)
R 1.0
C 0.3 (L)
R 15.7
C 1.5 (L 1)
R 68.9
NR 16.1
R 24.3+

15 (cont.)

R 17.1
NR 66.6
R 22.0
NR 6.6
R 2.3
C 1.3 (MCZ L)
R 9.5
NR 40.7
R 9.0
C 4.1 (MCZ 5)
R 6.2
C 0.7 (MCZ L)
R <0.5
C 4.2 (MCZ L)

15 (cont.)

R 17.1
C 1.3 (MCZ 10)
R 10.2
C 2.1 (MCZ 2)
R 0.8
C 2.0 (MCZ 2)
R 6.4
C 3.9 (MCZ 1)
R 2.6
NR 6.2
R 11.5
NR 14.1
R 47.7
C 1.3 (L)
R 89.9

15 (cont.)

NR 4.9
R 5.2
C 0.8 (L)
R 6.6+

16 (cont.)

R 13.1
NR 52.5
R 8.5
C 4.5 (MCZ 11)
R <0.5
C 1.4 (MCZ 11)
R 3.1
C 1.5 (MCZ 10)
R <0.5
C 1.6 (MCZ 10)
R 8.2
C 2.0 (MCZ 2)
R 3.6
NR 2.6
R 0.8

16 (cont.)

C 3.6 (MCZ 1)
R 1.3
NR 6.2
R 1.5
C 1.0 (MCZ L)
R 13.1
NR 16.6
R 6.6
C 0.7 (L)
R 5.2
NR 11.3
R 3.9
C 1.3 (L)
R 26.9
NR 64.0

16 (cont.)

C 1.0 (L)
NR 65.6
R 8.2+

17

R 13.3
NR 12.0
R 13.8
NR 10.3
R 13.0
C 3.3 (MCZ 5)
R 23.3
C 1.1 (MCZ 11)
R 5.2
C 3.9 (MCZ 10)
R 3.0
C 1.6 (MCZ L)
R <0.5
C 0.5 (MCZ L)
R 12.8

17 (cont.)

C 2.5 (MCZ 1)
R 6.6
NR 3.0
C 0.8 (MCZ L)
R 42.0
C 2.5 (L)
R 14.8
C 2.8 (L)
R 1.3
C 0.8 (L)
R 23.3

18

GL 5700 (est.)

	Adj.	(Meas.)	
R	37.0	(48.3)	
C	3.1	(4.0)	(MCZ L)
R	42.1	(55.0)	
C	3.4	(4.5)	(MCZ L)
R	46.9	(61.2)	
C	4.6	(6.0)	(MCZ 10)
R	1.5	(2.0)	
C	1.9	(2.5)	(MCZ L)
R	2.7	(3.5)	
C	3.1	(4.0)	(MCZ 1)
R	7.4	(9.7)	
C	1.9	(2.5)	(MCZ L)

18 (cont.)

	Adj.	(Meas.)	
R	40.7	(53.1)	
C	1.5	(2.0)	(L)
R	24.3	(31.7)	
TD		(290)	

19

R 64.0
C 1.8 (MCZ L)
R 36.7
NR 6.2
R 1.6
C 2.3 (MCZ L)
R 4.6
C 2.1 (MCZ 11)
R 10.8
C 2.1 (MCZ 10)
R 24.0
C 3.3+ (MCZ 1)
NR

20

R 25.9
C 0.3 (L)
R <0.5
C 0.5 (L)
R 84.3
NR 24.0
R 19.0
NR 13.1
R 4.4
C 0.7 (MCZ L)
R 4.3
C 1.0 (MCZ 11)
R 6.2
C 1.8 (MCZ 10)
R <0.5

20 (cont.)

C 1.3 (MCZ 10)
R 2.0
C 0.7 (MCZ L)
R 2.0
C 1.3 (MCZ L)
R 4.9
C 2.5 (MCZ 12)
R 10.5
C 1.3 (MCZ 1)
R 2.6
NR 3.3
R 23.6
NR 3.6
R 3.9
C 2.5 (L)

20 (cont.)

R 1.0
C 1.6 (L)
R 5.6
NR 16.7
R 5.1
C 0.5 (L)
R 3.3
NR 4.9
R 24.3
NR 55.1
R 7.2
C 1.0 (L)
R 15.1

21

R 12.1
NR 42.3
R 1.3
C 1.6 (MCZ L)
R 4.9
C 1.0 (MCZ L)
R 8.2
C 0.5 (MCZ L)
R 6.6
C 3.1 (MCZ L)
R 25.3
C 0.5 (MCZ L)
R 5.2
C 2.6 (MCZ 11)
R 5.9

21 (cont.)

C 0.5 (MCZ L)
R 8.2
C 2.6 (MCZ 10)
R 2.3
C 0.5 (MCZ L)
R 3.6
C 3.4 (MCZ 12)
R 0.7
C 0.8 (MCZ 12)
R 5.2
C 2.5 (MCZ 1)
R 2.5
C 3.9 (MCZ L)
R 12.5
C 2.3 (L)

21 (cont.)

R 37.7
C 1.6 (L)
R 3.9
NR 8.9
R 13.8
C 2.6 (L)
R 9.5
NR 38.7
R 8.5
C 1.0 (L)
R 50.5

22

R 10.2
NR 28.5
R 22.0
NR 19.0
R 7.9
C 1.6 (MCZ L)
R 2.0
C 1.0 (MCZ L)
R 29.2
C 2.3 (MCZ 10)
R 3.0
C 4.1 (MCZ 12)
R <0.5
C 2.3 (MCZ 12)
R 3.0

22 (cont.)

C 3.3 (MCZ 1)
R 2.1
C 3.6 (MCZ L)
R 42.3
NR 52.2
R 37.9

23

R 24.3
C 3.9 (MCZ 11)
R 0.7
NR 3.6
R 13.6
C 4.9 (MCZ 10)
R 4.3
C 1.6+ (MCZ 12)
NR 11.8+
R 12.8
C 2.6 (L)
R 27.2
NR 9.5
C 1.6 (L)
R 7.2

23 (cont.)

C 2.3 (L)
R 3.9
C 1.3 (L)
R 5.2
NR 6.6+

27

R 11.5
NR 25.3
R 9.5
NR 16.7
R 17.4
NR 12.8
R 8.2
C 1.6 (MCZ L)
R 2.0
NR 11.0
R 3.9
C 4.3 (MCZ 13)
R 3.3
NR 5.6
R 3.8

27 (cont.)

C 1.0 (MCZ L)
R 1.0
C 1.6 (MCZ L)
R 5.4
BC 1.8 (MCZ L)
R 1.7
NR 13.1
R 17.4
C 0.7 (MCZ L)
R <0.5
C 0.7 (MCZ L)
R 0.7
C 3.6 (MCZ L)
R 11.2
C 2.0 (MCZ L)

27 (cont.)

R 25.9
NR 3.6
R 3.3
NR 9.5
R 33.3
NR 14.1
R 14.4

28

R 5.4
NR 3.0
R 4.6
C 1.0 (L)
R 35.8
C 0.7 (MCZ L)
R 29.8
C 0.8 (MCZ L)
R 19.0
C 0.3 (MCZ L)
R 2.3
C 1.8 (MCZ L)
R <0.5
C 3.1 (MCZ L)
R 3.0

28 (cont.)

C 2.9 (MCZ 13)
R <0.5
C 1.1 (MCZ 13)
R 7.0
C 1.1 (MCZ L)
R 9.2
NR 9.8
R 17.1
NR 4.3
R 7.5

31

R 17.9+
NR 14.1
C 1.5+ (L)
NR

34

R 14.0
C 1.0 (MCZ L)
R 7.0
C 3.6 (MCZ L)
R 2.3
NR 4.9
R 20.0
C 1.5 (L)
R 5.2
NR 14.1
R 9.8+

35

R 60.0+
C 1.0 (MCZ L)
R 5.0
NR 46.0
C 0.9 (L)
NR 17.0
C 3.2 (L)
NR 5.0
C 1.0 (L)
NR 24.0
C 0.7 (L)
NR 5.0
C 0.2 (L)
NR 19.0
C 0.2 (L)

35 (cont.)

NR 12.0
C 0.9 (L)
NR 11.0
C 0.2 (L)
NR 11.0
C 0.7 (L)
NR 280.0
C 1.3 (L)
NR 50.0
C 1.6 (L)
NR 55.0
R 3.0
C 0.6 (L)
R 3.0
C 4.0 (L)

35 (cont.)

R 4.0
C 1.0 (L)
R 6.0
C 1.0 (L)
NR 18.0
R 12.0
C 0.9 (L)
R 18.0
NR 26.0
C 1.4 (L)
NR 26.0
R 2.0
NR 21.0
C 0.8 (L)
R 3.0

35 (cont.)

NR 48.0
R 7.0+

45

R 13.8+
NR 9.5
R 10.8
NR 12.1
R 30.5
C 3.0 (MCZ 17)
R 2.6
NR 10.5
R 3.3

46

R 11.2
NR 21.6
R 4.6
C 0.7 (MCZ 17)
R <0.5
C 0.8 (MCZ 17)
R 3.0
NR 6.2
R 72.2
C 0.7 (MCZ L)
R <0.5
C 0.7 (MCZ L)
R 3.0
C 0.7 (MCZ L)
R 3.3

46 (cont.)

C 3.9 (MCZ 13)
R 1.0
C 1.0 (MCZ 13)
R 5.2

47

R 20-38
C 9.5 (MCZ 14)
R 1.6
C 1.2 (MCZ 14)
R 4.5

49

R 10.5
NR 24.3
R 15.4
C 10.8 (MCZ 14)
R 1+

50

GL 5504
R 34.0
C 8.5 (MCZ 15)
R 10.5
C 4.0 (MCZ 14)
R 0.2
C 1.5 (MCZ 14)
R 2.0
C 1.0 (MCZ 14)
R 1.2
C 1.0+ (MCZ 14)
TD 64

51

GL 5527
R 64.0
C 8.5 (MCZ 15)
R 14.5
C 5.0 (MCZ 14)
R 1.5
C 5.5 (MCZ 14)
R 3.0
TD 102

52

R 5.2+
NR 15.1
R 3.9
C 0.6 (MCZ 17)
R <0.5
C 0.5 (MCZ 17)
R 2.0
NR 41.7
R 4.9
C 1.1 (MCZ L)
R 5.9
C 3.4 (MCZ 13)
R 1.0+

53

R 39.0
NR 6.6
R 14.1
C 1.3 (MCZ L)
R 6.9
C 0.7 (MCZ L)
R 9.5
C 1.3 (MCZ L)
R 2.3
C 1.3 (MCZ 13)
R <0.5
C 0.5 (MCZ 13)
R 26.2

56

R 5.9
NR 28.2
R 6.9
C 1.1 (MCZ L)
R 3.6
C 1.0 (MCZ L)
R 19.7
NR 7.5
R 3.6
C 1.4 (MCZ 15)
R <0.5
C 1.2 (MCZ 15)
R 9.5
C 4.3 (MCZ 14)
R 7.9

57

R 10.2
NR 5.9
R 47.9
C 0.7 (MCZ L)
R 13.1
C 1.8 (MCZ L)
R <0.5
C 1.5 (MCZ L)
R 9.8
NR 5.2
R 9.5
C 0.8 (MCZ L)
R 21.0
NR 3.3
R 3.6

57 (cont.)

C 2.1 (MCZ 16)
R 3.0
C 1.0 (MCZ L)
R 5.2
C 2.0 (MCZ 15)
R <0.5
C 1.8 (MCZ 15)
R 19.7
C 4.1 (MCZ 14)
R 11.2
NR 47.2
R 24.0
C 2.1 (L)
R <0.5
C 0.5 (L)

57 (cont.)

R 23.0
NR 51.2
R 7.5

58

R 25.3
NR 4.6
R 3.0
C 2.3 (MCZ 13)
R 9.5
NR 6.6
R 7.2
C 1.1 (MCZ L)
R 10.5
C 2.1 (MCZ 16)
R <0.5
C 1.0 (MCZ 16)
R 9.2
NR 11.2
R 8.9

58 (cont.)

C 5.9 (MCZ 14)
R 0.7
C 0.7 (MCZ 14)
R 0.7

59

R 20.7
NR 5.9
R 22.6
C 0.7 (MCZ L)
R 2.3
C 0.8 (MCZ 13)
R 30.8
C 1.2 (MCZ 16)
R <0.5
C 1.2 (MCZ 16)
R 1.3
C 0.5 (MCZ 16)
R <0.5
C 0.5 (MCZ 16)
R 4.6

59 (cont.)

NR 11.2
R 9.8
C 4.9 (MCZ 14)
R 0.7
C 0.7 (MCZ 14)
R 12.8
NR 10.2
R 9.2

60

R 4.3
C 0.7 (MCZ L)
R 4.6
C 1.3 (MCZ L)
R 9.5
C 1.8 (MCZ 13)
R 3.0+

61

R 8.9
NR 3.0
R 17.1
C 3.6 (MCZ 16)
R 0.9
C 1.8 (MCZ 16)
R 6.2

62

R 10.2
NR 5.2
R 4.9
C 3.0 (MCZ L)
R 3.6
C 2.0 (MCZ L)
R 0.8
C 1.6 (MCZ L)
R 0.9
C 0.9 (MCZ L)
R <0.5
C 2.2 (MCZ L)
R 1.5
C 1.0 (MCZ L)
R 3.6+

63

R 7.4
*CL 1.0 (MCZ L)
R 8.0
C 2.6 (MCZ L)
R 0.7
C 3.6 (MCZ L)
R 9.5

64

R 30.2
NR 4.3
R 3.3
NR 5.2
R 3.9
NR 2.6
R 6.6
C 1.8 (L)
R 29.5
C 1.3 (L)
R 2.3
C 1.0 (L)
R 14.8
C 1.3 (L)
R 13.1

64 (cont.)

C 0.5 (L)
R 35.1
C 0.5 (L)
R 33.1
C 0.8 (L)
R 42.6+

72

R 5.0+
C 1.2 (L)
NR 40.5
C 1.5 (L)
NR 4.0
C 0.7 (L)
NR 10.0
C 0.7 (L)
NR 17.0
R 0.4
NR 43.0
R 45.0
C 1.4 (L)
R 39.0+

73

NR 6.6+
R 22.6
C 0.8 (L)
R 11.5
NR 18.0
R 22.0
C 0.7 (L)
R 4.3
C 1.3 (L)
R 0.7
NR 2.6
R 0.7
C 1.1 (L)
R 2.6
NR 5.9

73 (cont.)

R 7.9
NR 4.3
R 1.0
C 0.7 (L)
R 20.7
NR 18.4
R 6.9
C 0.5 (L)
R 1.3
NR 4.3
R 11.2
C 0.5 (L)
R <0.5
C 2.0 (L)
R 0.5

73 (cont.)

NR 2.3
R 11.5+

74

GL 6184
R 25.4
C 8.8 (MCZ 15)
R 17.0
C 6.1 (MCZ 14)
R 0.4
C 2.4 (MCZ 14)
R 18.5
TD 79

75

GL 6075
R 29.5
C 6.5 (MCZ 15)
R 24.0
C 9.8 (MCZ 14)
R 25.9
C 1.0 (L)
R 5.5
TD 102

78

GL 5928
R 18.0
C 2.0 (MCZ L)
R 35.5
C 8.7 (MCZ 14)
R 35.6
TD 100

81

R 11.5+
C 7.4 (MCZ 16)
R 0.7
C 0.7 (MCZ L)
R 0.7
C 0.9 (MCZ L)
R 89.2
C 0.7 (L)
R 100.1
NR 6.2
R 4.6
C 1.0 (L)
R 25.9
C 0.7 (L)
R 37.4+

82

R 25.3
C 0.3 (MCZ L)
R 6.6
C 0.5 (MCZ L)
R 2.3
C 0.3 (MCZ L)
R 3.6
C 2.8 (MCZ 16)
R 0.7
C 1.1 (MCZ 16)
R <0.5
C 3.0 (MCZ 16)
R <0.5
C 0.8 (MCZ 16)
R 3.6

82 (cont.)

C 1.5 (MCZ L)
R 15.4
NR 15.7
R 10.8+

83

R 9.2
NR 11.5
R 3.3
C 3.4 (MCZ L)
R 11.2
NR 11.8
R 16.1
C 2.1 (MCZ L)
R 1.6
C 0.3 (MCZ L)
R 11.5

84

GL 5751
R 41.0
C 4.0 (MCZ L)
R 26.0
C 0.1 (MCZ L)
R 6.0
C 1.0 (MCZ L)
R 33.0
C 0.1 (MCZ L)
R 6.0
C 0.1 (MCZ L)
R 8.0
C 2.0 (MCZ L)
R 10.5
C 10.5 (MCZ 15)

84 (cont.)

R 43.5
C 0.1 (L)
R 7.0
TD 199

85

GL 5402
R 62.0
C 4.0 (MCZ L)
R 19.0
C 6.0+ (MCZ L)
TD 91.0

86

R 50.5
C 0.7 (MCZ L)
R 148.3
NR 8.2
R 29.6
BC 1.8 (L)
R 0.1
C 0.5 (L)
R 2.6
NR 5.9
R 1.0

87

R 24.6+
NR 7.9
R 25.6
NR 18.4
R 88.2
C 1.6 (L)
R 30.5
NR 11.5
R 51.5
C 0.7 (MCZ L)
R 17.4
C 0.9 (MCZ 18)
R <0.5
C 0.6 (MCZ 18)
R 8.9

87 (cont.)

C 0.7 (MCZ L)
R 4.9
C 1.5 (MCZ 13)
R <0.5
C 1.5 (MCZ 13)
R 35.4
NR 6.2
R 8.5
C 2.8 (MCZ 15)
R <0.5
C 3.6 (MCZ 15)
R 3.6
NR 3.0
R 3.0
C 4.8 (MCZ 14)

87 (cont.)

R <0.5
C 0.9 (MCZ 14)
R 3.3+

88

NR
C 6.2 (MCZ 15)
R 0.2
C 1.0 (MCZ 15)
R 11.0
C 6.5 (MCZ 14)
R 0.3
C 2.7+ (MCZ 14)
NR

89

R 37.8+
NR 30.2
R 14.8
C 1.0 (L)
R 5.2
NR 16.4
R 99.7
C 0.8 (MCZ L)
R 11.5
C 1.0 (MCZ L)
R 4.6
C 1.5 (MCZ 18)
R <0.5
C 1.8 (MCZ 18)
R 63.6

89 (cont.)

C 7.2 (MCZ 15)
R 12.8
C 6.4 (MCZ 14)
R <0.5
C 1.3 (MCZ 14)
R 3.3+

90

GL 5430
R 10.9
C 6.9 (MCZ 14)
R 0.1
C 1.9 (MCZ 14)
R 11.2
TD 31.0

91

NR 3.3+
R 2.0
C 4.6 (MCZ 18)
R 83.3
C 7.9 (MCZ 15)
R 13.8
C 5.6+ (MCZ 14)
R <0.5
C 0.5+ (MCZ 14)
NR

92

R 106.0+
C 1.6 (L)
R 98.8
NR 9.5
R 16.4
C 1.1 (MCZ L)
R 1.0
C 0.5 (MCZ L)
R 1.3
C 1.6 (MCZ L)
R 12.8
C 1.1 (MCZ L)
R 4.6
C 4.3 (MCZ 18)
R 6.9

92 (cont.)

C 0.8 (MCZ L)
R 3.0

93

GL 5410
R 34.0
C 0.2 (MCZ L)
R 13.0
C 8.5 (MCZ 15)
R 5.2
TD 61

94

GL 5425
R 44.0
C 4.0 (MCZ L)
R 32.5
C 6.0 (MCZ 15)
R 21.0
TD 108

95

NR
C 2.3 (MCZ L)
NR

96

NR
C 2.3 (MCZ L)
NR

97

GL 5330 (est.)
R 51.4
C 3.0 (MCZ L)
R 33.3
C 2.5 (MCZ L)
R 6.7
C 2.0 (MCZ L)
R 1.5
C 1.0 (MCZ L)
R 3.3
C 1.5 (MCZ L)
R 58.3
C 8.0 (MCZ 15)
R 8.3
C 3.0 (MCZ L)

97

R 1.7
C 2.0 (MCZ L)
R 91.5
TD 279

98

R 9.2
C 0.5 (MCZ 19)
R 0.7
C 2.0 (MCZ 19)
R 1.3
NR 3.9
R 9.2
C 0.7 (MCZ L)
R 2.3
C 0.5 (MCZ L)
R 10.2
C 0.5 (MCZ L)
R 7.9
C 7.0 (MCZ 15)
R 9.5

98 (cont.)

C 2.8 (MCZ L)
R 3.0
C 3.6 (MCZ L)
R 4.3
C 0.5 (L)
R 29.8+

105

R 13.4
NR 14.1
R 13.8
NR 8.5
R 2.3
C 1.0 (MCZ L)
R 6.6
NR 17.7
R 6.6
C 0.8 (MCZ L)
R 1.6
C 0.7 (MCZ L)
R 6.9
NR 12.8
R 6.9

105 (cont.)

C 0.3 (MCZ L)
R 8.5
C 0.3 (MCZ L)
R 0.7
C 1.2 (MCZ L)
R <0.5
C 0.6 (MCZ L)
R 2.3
NR 3.9
R 1.3
NR 17.7
R 1.3
C 3.9 (MCZ 19)
R 1.3
NR 7.5
R 16.4

108

R 7.2
NR 5.2
R 10.2
C 0.7 (L)
R 6.2
C 0.5 (L)
R 9.2
C 0.7 (MCZ L)
R 5.2
NR 3.9
R 4.9
C 1.0 (MCZ L)
R 11.8
C 2.3 (MCZ L)
R 5.9
NR 9.5

108 (cont.)

R 14.4
C 0.7 (MCZ L)
R 14.4
C 1.6 (MCZ 19)
R <0.5
C 4.8 (MCZ 19)
R 4.9
C 2.5 (MCZ L)
R 5.2
C 1.5 (MCZ 15)
R <0.5
C 1.1 (MCZ 15)
R 9.2
C 0.7 (MCZ L)
R 24.6
NR 9.5

108 (cont.)

R 11.2
NR 3.3
R 8.9
NR 3.9
R 10.2
C 1.6 (L 2)
R 43.6
C 0.8 (L)
R 27.9
C 0.5 (L)
R 9.2
C 1.0 (L)
R 17.4
NR 4.9
R 9.5+

109

R 10.5
NR 10.5
R 7.5
C 0.7 (L)
R 4.9
NR 4.6
R 3.3
C 0.7 (L)
R 2.6
NR 4.6
R 2.9
C 0.8 (L)
R 13.4
C 1.8 (MCZ L)
R 1.3

109 (cont.)

C 0.7 (MCZ L)
R 3.6
C 2.6 (MCZ L)
R 15.1
NR 2.6
R 1.6
C 2.0 (MCZ L)
R 1.6
NR 7.2
R 1.6
C 1.6 (MCZ L)
R 19.4
C 3.8 (MCZ 19)
R <0.5
C 0.9 (MCZ 19)

109 (cont.)

R 3.3
NR 3.3
R 27.6
C 1.3 (MCZ L)
R 0.7
C 2.8 (MCZ 15)
R 10.5
C 1.5 (MCZ L)
R 71.2
C 1.8 (L 2)
R 59.4
C 0.5 (L)
R 32.2
C 0.5 (L)
R 22.6+

110

R 16.0
C 1.6 (MCZ L)
R 3.1
C 0.5 (MCZ L)
R 3.3
C 1.5 (MCZ L)
R 1.3
C 0.7 (MCZ L)
R 16.3
C 0.5 (MCZ L)
R 9.4
C 1.4 (MCZ L)
R 13.0
C 0.3 (MCZ L)
R 0.4

110 (cont.)

C 0.6 (MCZ L)
R 4.6
C 4.8 (MCZ 19)
R 17.6
C 1.0 (MCZ 15)
R 5.9
C 1.2 (MCZ L)
R 2.4
C 2.4 (MCZ L)
R 13.0
NR 54.0
C 3.0
NR 5.0
R 2.5
C 0.8 (L)

110 (cont.)

NR 85.0
C 0.6 (L)
NR 10.0
C 0.6 (L)
NR 79.0
C 1.1 (L)
NR 31.0
R 2.0
NR 348.0
C 0.2 (L)
R 3.0
C 1.4 (L)
R 6.0
C 1.5 (L)
R 2.0

110 (cont.)

C 0.8 (L)
R 11.0
NR 15.0
R 2.0
NR 8.0
C 0.8 (L)
NR 19.0
C 0.6 (L)
NR 9.0
C 0.5 (L)
NR 19.0
R 8.0+

111

R 16.1+
C 0.7 (L)
R 49.2
C 1.5 (MCZ 20)
R 2.0
C 0.7 (MCZ 20)
R 7.2
C 0.5 (MCZ L)
R 11.2
C 0.7 (MCZ L)
R 1.6
C 0.5 (MCZ L)
R 8.5
C 2.3 (MCZ L)
R 13.8

111 (cont.)

C 0.5 (MCZ L)
R <0.5
C 0.5 (MCZ L)
R 19.4
C 4.8 (MCZ 19)
R <0.5
C 0.8 (MCZ 19)
R 7.2
C 3.3 (MCZ L)
R 4.6
C 2.5 (MCZ 15)
R 1.0
C 2.8 (MCZ 15)
R 36.4
NR 11.5

111 (cont.)

R 4.6
NR 5.6
R 25.6
C 3.0 (L 2)
R 38.1
NR 6.2
R 4.9
C 0.8 (L)
R 3.6
NR 3.6
R 9.2
C 1.3 (L)
R 2.0
NR 12.8
R 6.2

111 (cont.)

NR 8.2
R 32.5+

112

R 35.1
C 1.3 (L)
R 24.3
NR 7.9
R 2.0
C 0.5 (MCZ 20)
R <0.5
C 1.1 (MCZ 20)
R 1.0
C 0.8 (MCZ 20)
R 3.9
C 0.7 (MCZ L)
R 3.3
BC 2.4 (MCZ L)
R 3.2

112 (cont.)

C 1.0 (MCZ L)
R 1.0
C 0.7 (MCZ L)
R 3.6
NR 5.6
R 3.9
C 1.6 (MCZ L)
R 4.3
C 2.0 (MCZ L)
R 6.2
NR 13.1
R 7.9
C 4.6 (MCZ 19)
R 10.8
C 3.1 (MCZ L)

112 (cont.)

R 7.2
C 2.2 (MCZ 15)
R <0.5
C 3.5 (MCZ 15)
R 4.6
C 2.3 (MCZ L)
R 24.0+

113

NR 6.6+
R 10.2
NR 69.6
R 15.7
NR 6.9
R 43.3
NR 15.4
R 32.8
C 0.7 (MCZ L)
R 5.2
C 4.4+ (MCZ 20)
NR 2.6
R 8.2
NR 14.1
R 22.3

113 (cont.)

C 4.4 (MCZ 19)
R 12.5
C 0.8 (MCZ L)
R 4.9
C 0.7 (MCZ L)
R 6.6
C 1.6 (MCZ L)
R 10.8
C 3.4 (MCZ 15)
R 6.2
C 2.6 (MCZ L)
R 0.7
C 2.3 (MCZ L)
R 1.0
C 0.5 (MCZ L)

113 (cont.)

R 4.9
NR 5.6
R 2.0
C 0.8 (L)
R 5.2
NR 3.6
R 19.7
NR 20.3
R 16.1

114

R 13.9+
NR 29.5
R 11.8
C 1.3 (MCZ L)
R 29.1
C 2.5 (MCZ 20)
R <0.5
C 2.5 (MCZ 20)
R 1.0
C 0.7 (MCZ 20)
R 5.9
NR 10.5
R 18.7
C 5.9 (MCZ 19)
R 5.6

114 (cont.)

NR 7.2
R 9.2
NR 8.2
R 15.4

115

R 102.4
C 2.8 (MCZ L)
R 0.7
C 1.3 (MCZ L)
R 29.5
C 1.0 (MCZ L)
R 4.9
C 0.2 (MCZ L)
R 5.2
C 2.9 (MCZ 20)
R <0.5
C 2.0 (MCZ 20)
R 32.8
C 6.2+ (MCZ 19)
NR

116

R 13.1+
NR 9.8
C 2.0 (MCZ L)
NR 3.3
R 2.6
NR 3.9
R 2.6
NR 3.3+