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GEOLOGY AND COAL RESOURCES OF THE WOOD RIVER FIELD, NENANA BASIN

By

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ABSTRACT

The Wood River coal field occupies one of a series of isolated basins of the Nenana coal province on the north-central flank of the Alaska Range. It lies about 60 miles due south of Fairbanks, 40 miles east-northeast of Healy, the Alaska Railroad, and the Parks Highway, and 65 miles west-northwest of the Richardson Highway and the Jarvis Creek field. The Wood River field lies about 2 miles northeast of the Mystic Creek field, which is of considerable less importance. The Wood River field encompasses an area of less than 40 mi^2 stretching northeastward from Mystic Mountain, and is generally restricted to the north and west side of Wood River. A high-angle fault cutting across the north flank of Mystic Mountain forms the southern boundary of the coal field.

The belt includes a nearly complete stratigraphic section of the Tertiary coal-bearing group from the Healy Creek Formation upward to the Grubstake Formation. The coal-bearing group strata are products of terrestrial (continental) sedimentation, including fresh-water stream-laid, lacustrine, and poorly-drained swamp deposits. Economically minable coals are found in a 600-ft thick stratigraphic interval of the Suntrana Formation. The series is exposed dipping (20-45°) from the schist ridge of Mystic Mountain beneath Pliocene Nenana Gravels and unconsolidated Quaternary terrace deposits north of Coal Creek. The beds considered currently minable include an aggregate 50 ft of coal of which 30 ft is estimated to be recoverable. The thickest seam is about 12 ft. No drilling has been done in the field and the continuity of the

seams to the north is unknown. Indeed, regional uplift and crumpling of the beds may have given them an exaggerated thickness on outcrop.

The coals are of subbituminous C rank, and average 7800 Btu/lb, 0.5 percent sulfur, 11 percent ash, and 23 percent moisture on an as-received basis. Mean-maximum vitrinite reflectance ($\bar{R}om$) is 0.27 percent. Petrologically, the coals are composed of 83.7 percent huminite, 13.5 percent liptinite, and 2.8 percent inertinite.

Potentially-minable coal resources of the field to a projected overburden limit of 500 ft, and including all beds greater than or equal to 2.5 ft thick, are estimated to be at least 65 million short tons and may be as much as 200 million short tons.

INTRODUCTION

The Wood River coal field occurs within the Bonnifield region (Prindle, 1907; Capps, 1912) of interior Alaska on the north-central flank of the Alaska Range. The Bonnifield region was named after John E. Bonnifield, an early explorer of this region lying between the Nenana and Delta Rivers. The Wood River field occupies one of at least 10 subbasins comprising the Nenana basin proper (Figure 1). The coal field encompasses less than 40 mi^2. It is best exposed along the headwaters of Coal Creek, a tributary of Wood River, in southwestern Fairbanks A-2 quadrangle and northwestern Healy D-2 quadrangle. The coal field stretches northeastward from Mystic Mountain and is generally restricted to the north and west side of Wood River.

Figure 1--NEAR HERE

HISTORY

Prindle (1907) studied the coals of the Wood River area. Capps (1912) delineated the coal fields of the Nenana basin in nearly their currently known configuration. Clyde Wahrhaftig began work in the Nenana basin in the early 1940's and has continued intermittently until the present day with the publication of numerous geologic and coal resource studies. His maps of the Healy D-2 and Fairbanks A-2 quadrangles, which include the Wood River field, were published in 1970. Wahrhaftig did much of the early work that defined the geology and coal resources of Wood River field.

PHYSIOGRAPHY

The Wood River field lies in the foothills belt of the north-central Alaska Range south of the Tanana Flats. Wood River is one of the main northward-flowing drainages running

transverse to the ridges of the foothills and ultimately joining the Tanana River.

The coal field stretches northward from a rim of large badland or gully exposures cut in the coal-bearing rocks flanking Coal Creek and dipping from the schist ridge of Mystic Mountain on the south (Figure 2). The Wood River field includes one of the best (if not the best) displays of castellated, differentially-weathered badland-type topography in the Nenana basin. Coal Creek forms a low-cut valley, essentially a bolson-like feature, surrounded on all sides except for the relatively narrow drainage outlet on the east side of the coal field.

Figure 2---NEAR HERE

GENERAL GEOLOGY

A generalized geologic map of the Wood River coal field and vicinity is shown in figure 3. The field includes a 10-mile long by 3-mile wide outcrop belt of coal-bearing group rocks stretching northeastward from the high-angle Mystic Mountain fault. The coal field is located on the downthrown block (footwall) of the Mystic Mountain fault. Metamorphic and metavolcanic rocks of the Totatlanika Schist bound the coal field on the south, and the broad Tanana Flats forms its northern boundary. Keevy Peak is located 7-8 miles southwest of the coal field. The Mystic Creek coal field is situated between Keevy Peak and Mystic Mountain only 2-3 miles from the Wood River field. The West Delta field is about 15 miles east of the Wood River field. Of these fields, Wood River is clearly the most important, containing substantially more potentially-minable coal resources.

Figure 3---NEAR HERE

The coal-bearing rocks of the Mystic Creek and West Delta fields are currently mapped as an undifferentiated unit. The rocks are generally thought to be broadly correlative with those of the Healy Creek Formation (Wahrhaftig and others, 1969). General stratigraphic relations of the formations of the coal-bearing group are shown in figure 4.

Figure 4---NEAR HERE

A more detailed geology map and cross section of the Wood River field are shown in figure 5, as adapted from the inch: mile quadrangle maps of Wahrhaftig (1970 a,b). It appears that the coal-bearing rocks dip fairly rapidly out of the zone of economic viability beneath substantial thicknesses of Quaternary sediments of the southern Tanana Flats.

Figure 5---NEAR HERE

STRUCTURE

The Wood River field is one of a series of structurally similar, disconnected subbasins that comprise the Nenana basin. The axis of the relatively small, isolated, Wood River subbasin is aligned east-west parallel to the general trend of the mountains in the foothills belt. The coal beds in exposed sections north of Coal Creek in the Suntrana Formation generally dip from 20-45°. A high-angle fault slices across the northern side of Mystic Mountain (Wahrhaftig, 1970) separating Paleozoic metamorphic-metavolcanic rocks and Mesozoic granitic rocks from coal-bearing group rocks. Healy Creek Formation beds near the fault are highly contorted to moderately deformed as shown in a ravine south of Coal Creek on the notheast side of Mystic Mountain.

STRATIGRAPHY

The coal-bearing group of the Wood River field rests directly on an irregular surface of Paleozoic (Mississippian?) metamorphic-metavolcanic rocks of the Totatlanika Schist (Mystic Creek, Chute Creek, and California Creek Members) that forms the base on which the coal field developed (Wahrhaftig, 1970). Mesozoic granite also bounds the coal field on the south.

The Tertiary coal-bearing group is an informal geologic unit that was subdivided by Wahrhaftig and others (1969) into five formations (in ascending order) based on bio- and lithostratigraphy and age dating: Healy Creek Formation, Sanctuary Formation, Suntrana Formation, Lignite Creek Formation, and Grubstake Formation.[1]

The Wood River field includes a nearly complete stratigraphic section of the coal-bearing group. This is one of only a few occurrences of this type in the Nenana basin. The series of coal-bearing rocks of the field are exposed dipping from the schist ridge of Mystic Mountain beneath the gravels north of Coal Creek.

The Healy Creek Formation (late Oligocene-Miocene) of the Wood River field includes interbedded sandstones, conglomerates, claystones, and subbituminous coals. Strata of the formation adjacent to the Mystic Mountain fault in the ravine at the south side of the field are highly contorted to moderately folded. It contains abundant naturally baked rocks which are competent and stand out in relief along local ridge crests. Claystones within the formation contain abundant siderite-cemented concretions from inches to several feet in diameter. These concretions weather deep red to bright orange and are found scattered on the slopes of the badland outcrops in the southern part of Wood River field.

The Sanctuary Formation (middle Miocene) is present exposed on Coal Creek and includes some thin coal and bone layers near the top of the unit. It is primarily a chocolate-brown to yellowish-brown weathering shale that is gray on fresh exposures.

[1]Wahrhaftig (in press) has recently formally renamed the coal-bearing group the Usibelli Group.

The Suntrana Formation (middle Miocene) exhibits a maximum thickness of 1,000 ft on Coal Creek. It consists mainly of sandstone, claystone, and coal. Paleocurrent directions measured from persistent crossbedding in sandstones of the unit are westward in the Wood River field (Wahrhaftig and others, 1969).

The Lignite Creek Formation (middle to late Miocene) consists of a coal-bearing facies and a noncoal-bearing facies. The coal-bearing facies is exposed in the southern part of the Wood River field, where it is about 800-ft thick (Wahrhaftig and others, 1969). The facies includes interbedded buff sandstones, greenish-gray claystones, arkosic conglomerates, and relatively thinner and more discontinuous coal beds than in the Suntrana Formation.

The Grubstake Formation (late Miocene) is over 1500-ft thick north of Coal Creek, but the base of the unit is not exposed in the field. It consists predominantly of dark claystone and sandstone and fine conglomerate. Ash beds, which have been found in the Grubstake Formation in other areas, have not been observed in the Wood River field (Wahrhaftig and others, 1969).

The Nenana Gravel (Pliocene) forms an escarpment north of Coal Creek, and Quaternary and Holocene terraces have formed above the Nenana Gravel.

Four main stratigraphic sections (MM1-MM4) were described and measured in the coal-bearing exposures north of Coal Creek (Table 1). The sections were used to construct the cross section of figure 6. Six of the thicker coal seams were sampled at section MM2. These samples were analyzed in the laboratory, and will form the basis for further discussion in later sections of this paper. Figure 7 shows the upper five seams sampled at site MM2.

Table 1, Figures 6,7---NEAR HERE

DEPOSITIONAL ENVIRONMENTS

The Wood River field represents one of several depocenters formed toward the southern margin of the paleo-basin where subsidence was greatest and substantial thicknesses of coal-forming materials accumulated. The coal-bearing rocks of the field are products of continental fluvial deposition, including stream-laid, lacustrine, and poorly-drained swamp deposits. Clastics are generally believed to have a northern provenance.

COAL PETROLOGY

Petrologically, the coals of the Wood River field are composed of 83.7 percent huminite, 13.5 percent liptinite, and 2.8 percent inertinite on average. This suggests that the coals formed mainly from tree-vegetation peats with abundant preservation of woody materials as huminites. Table 2 summarizes the petrology of Wood River field coal samples. The ternary plot of figure 8 shows the similar petrologic composition of Suntrana Formation and Healy Creek Formation samples from the field.

Table 2, Figure 8---NEAR HERE

Mean-maximum vitrinite-reflectance values ($\bar{R}$om) for analyzed Suntrana Formation coal samples of Wood River field average 0.27 percent. Samples from the Healy Creek Formation reveal an average $\bar{R}$om of 0.42 percent (Table 3). A frequency histogram for Wood River field samples is shown in figure 9.

Table 3, Figure 9---NEAR HERE

COAL QUALITY

The coals of the Suntrana Formation sampled from the exposures north of Coal Creek, Wood River field, are potentially minable. They average 7800 Btu/lb, 23 percent moisture, 11 per-

cent ash, and 0.5 percent sulfur on an as-received basis (Table 4, Figures 10-13). They average 8850 Btu/lb on a moist, mineral-matter free basis and are of subbituminous C rank (Table 5). They are comparable in quality to Susitna lowland, Alaska and Powder River basin coals.

Tables 4,5, Figures 10-13---NEAR HERE

The coals of the Healy Creek Formation sampled from the structurally deformed strata at the south end of Wood River field are not economically minable although they are somewhat higher in overall quality. They average 8700 Btu/lb, 21.5 percent moisture, 4.5 percent ash, and 0.25 percent sulfur on an as-received basis (Table 4).

COAL RESOURCES

The Suntrana Formation contains the bulk of the economically minable resources of the Wood River coal field. Because of structural disturbance, it is not expected that the coals in the Healy Creek Formation at the south side of the field are minable. Although the Wood River field is somewhat isolated in the central part of the Nenana basin, it is still considered to have high future coal-development potential. An effective development plan would undoubtedly involve a multiple-seam stripping (open pit surface mining) operation.

No drilling has been done in the field and the continuity of the seams to the north is unknown. The coal-bearing rocks appear to dip into the subsurface beneath the southern Tanana Flats. The sampled interval of the Suntrana Formation in the Wood River field includes about 50 ft of coal of which 30 ft is considered to be minable in beds over 2.5-ft and up to 12-ft thick (Figure 14). However, regional uplift and crumpling of the beds may have given the seams an exaggerated thickness on outcrop.

Figure 14---NEAR HERE

Potentially minable coal resources of the Wood River field to a projected overburden limit of 500 ft and including all beds greater than or equal to 2.5-ft thick are estimated with high assurance to be at least 65 million short tons (Merritt, 1985; Figure 15 and Table 6). In total, they may amount to as much as 200 million short tons.

Figure 15, Table 6---NEAR HERE

CONCLUSIONS

The Wood River field, although relatively isolated in the central part of the Nenana basin, nevertheless is considered to be one of the most important fields of the region. It is believed to hold high potential for future development as a multiple-seam strip-mining operation. The Suntrana Formation of the Tertiary coal-bearing group may contain as much as 200 million short tons of potentially minable subbituminous coal resources in beds ranging to 12-ft thick. A small-scale, well-defined drilling program is recommended for the future in order to determine the continuity and delimit the true extent of the Wood River field coal deposits.

REFERENCES CITED

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Wahrhaftig, Clyde, 1970a, Geologic map of the Fairbanks A-2 Quadrangle: U.S. Geological Survey Map GQ 808, scale 1:63,360.

_____, 1970b, Geologic map of the Healy D-2 Quadrangle: U.S. Geological Survey Map GQ 804, scale 1:63,360.

Wahrhaftig, Clyde, Wolfe, J.A., Leopold, E.B., and Lanphere, M.A., 1969, The coal-bearing group in the Nenana coal field, Alaska: U.S. Geological Survey Bulletin 1274-D, 30 p.

FIGURE CAPTIONS

Figure

1....Major coal fields of the Nenana basin and northern limits of deposition of formations (after Wahrhaftig and others, 1969). Key: 1=northern limit of deposition of Grubstake Formation; 2=approximate zone of interfingering of the coal-bearing and noncoal-bearing facies of the Lignite Creek Formation; 3=northern limit of deposition of Suntrana Formation; 4=northern limit of deposition of the Sanctuary Formation; 5=northern limit of deposition of the Healy Creek Formation; and 6=coal field.

2....General view of the main exposure of coal-bearing group rocks on the north side of Coal Creek (foreground), Wood River field. Note the excellent development of castellated, differentially-weathered sandstones in the badland topography.

3....Regional geologic map (scale 1:250,000) of the Wood River coal field and vicinity, Nenana basin. Note the locations of adjacent coal fields---Mystic Creek and West Delta---and the broad Tanana Flats bounding the coal fields on the north.

4....General stratigraphic relations and correlation for geologic units as depicted on figure 2.

5....Detailed geologic map and cross section A-A' (scale 1:63,360) of the Wood River coal field. Note the near-vertical Mystic Mountain fault and the general northward dip of coal-bearing group rocks.

6....Highly generalized and exaggerated west-east lithologic

Figure

cross section of coal-bearing strata at Coal Creek, Wood River field. Note the locations of described and measured sections MM1, MM2, MM3, and MM4 and sampled coal beds 1-6.

7....Outcrop view of the top five sampled coal seams at Coal Creek, Wood River field. Average thicknesses of the seams here are: 1-12 ft; 2-7 ft; 3-3.5 ft; 4-5.5 ft; and 5-2.5 ft.

8....General ternary plot for the petrologic composition of Wood River field coal samples. End members shown are the three major maceral groups. As shown, all samples contain over 75 percent huminite.

9....Vitrinite reflectance frequency histogram for Wood River field coal samples. Number in parentheses, braces and brackets respectively indicates the total number of grains counted at the given reflectance interval for Suntrana Formation coals, Healy Creek Formation coals, and all Wood River field samples.

10....Comparison of the heating values (Btu/lb) on different bases for the 6 main coal seams sampled at the Coal Creek section, Wood River field. The mean value for each basis is also annotated.

11....Comparison of the moisture contents (%) on as-received and equilibrium-moisture bases for the 6 main coal seams sampled at the Coal Creek section, Wood River field. The mean value for each basis is also annotated.

12....Comparison of the ash contents (%) on different bases for the 6 main coal seams sampled at the Coal Creek section, Wood River field. The mean value for each basis is also

Figure

annotated.

13....Comparison of the total sulfur contents (%) on different bases for the 6 main coal seams sampled at the Coal Creek section, Wood River field. The mean value for each basis is also annotated, and the percent pyritic sulfur is indicated in those samples analyzed.

14....Close-up view of Seam 1 at the top of the Coal Creek section, Wood River field. The seam is about 12-ft thick.

15....Estimated coal resources of the Wood River field, Alaska at low, moderate, and high geologic assurance levels (in millions of short tons). Estimates include all seams greater than or equal to 2.5-ft thick and to an overburden limit of 500 ft.

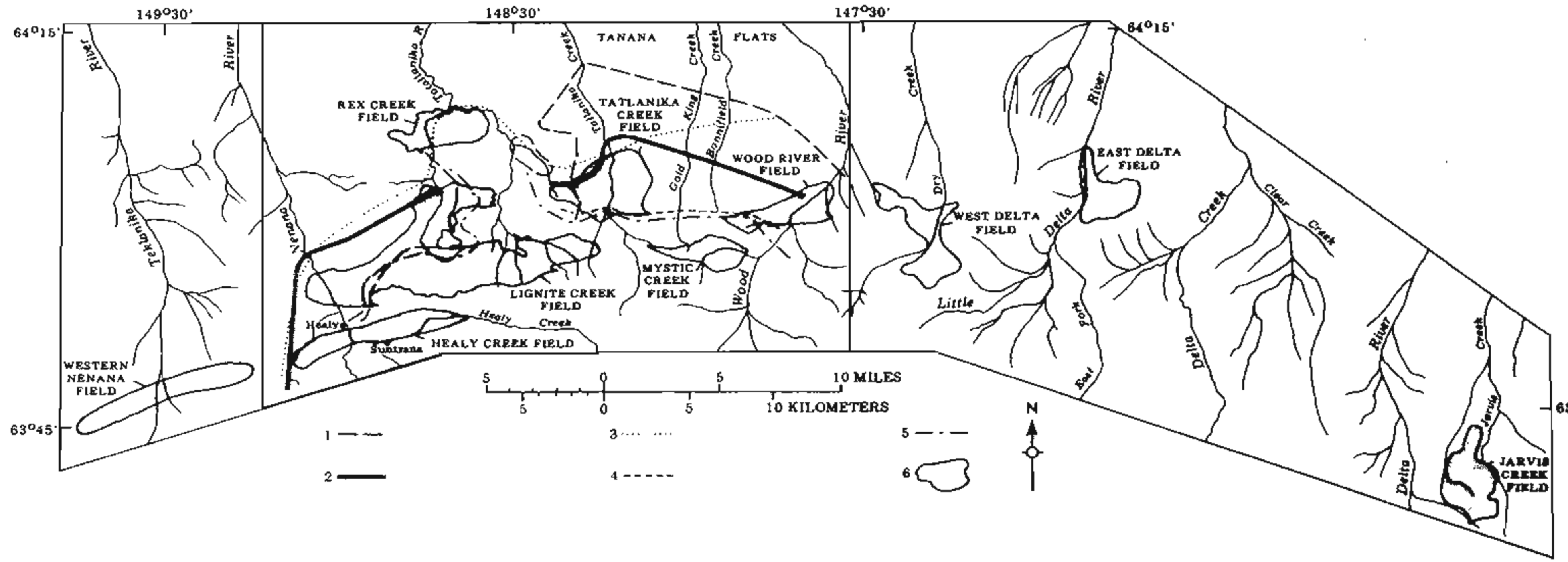

149°30'
148°30'
147°30'
64°15'
63°45'
TANANA FLATS
REX CREEK FIELD
TATLANIKA CREEK FIELD
WOOD RIVER FIELD
WEST DELTA FIELD
EAST DELTA FIELD
LIGNITE CREEK FIELD
MYSTIC CREEK FIELD
HEALY CREEK FIELD
WESTERN NENANA FIELD
JARVIS CREEK FIELD
Healy
Suntrana
10 MILES
10 KILOMETERS
N

Figure 1

Figure 2

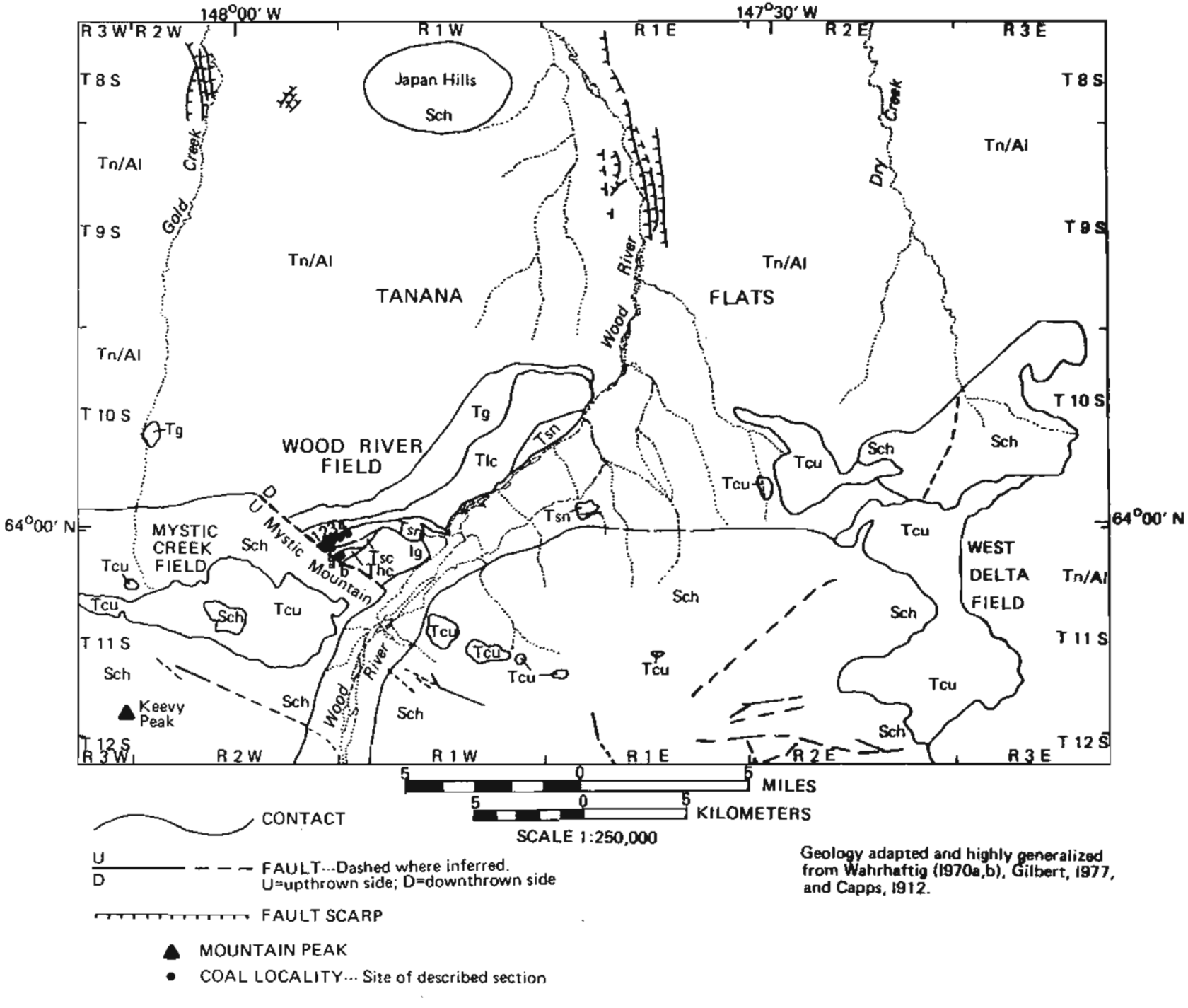

148°00′ W
147°30′ W
R 3 W
R 2 W
R 1 W
R 1 E
R 2 E
R 3 E
T 8 S
T 9 S
T 10 S
T 11 S
T 12 S
64°00′ N
Japan Hills
Sch
Gold Creek
Dry Creek
Wood River
TANANA
FLATS
WOOD RIVER
FIELD
MYSTIC
CREEK
FIELD
WEST
DELTA
FIELD
Mystic Mountain
Keevy
Peak
Tn/Al
Tg
Tlc
Tsn
Tsr
Tsc
Thc
lg
Tcu
Sch
MILES
KILOMETERS
SCALE 1:250,000
CONTACT
FAULT---Dashed where inferred.
U=upthrown side; D=downthrown side
FAULT SCARP
MOUNTAIN PEAK
COAL LOCALITY--- Site of described section
Geology adapted and highly generalized
from Wahrhaftig (1970a,b), Gilbert, 1977,
and Capps, 1912.

Figure 3

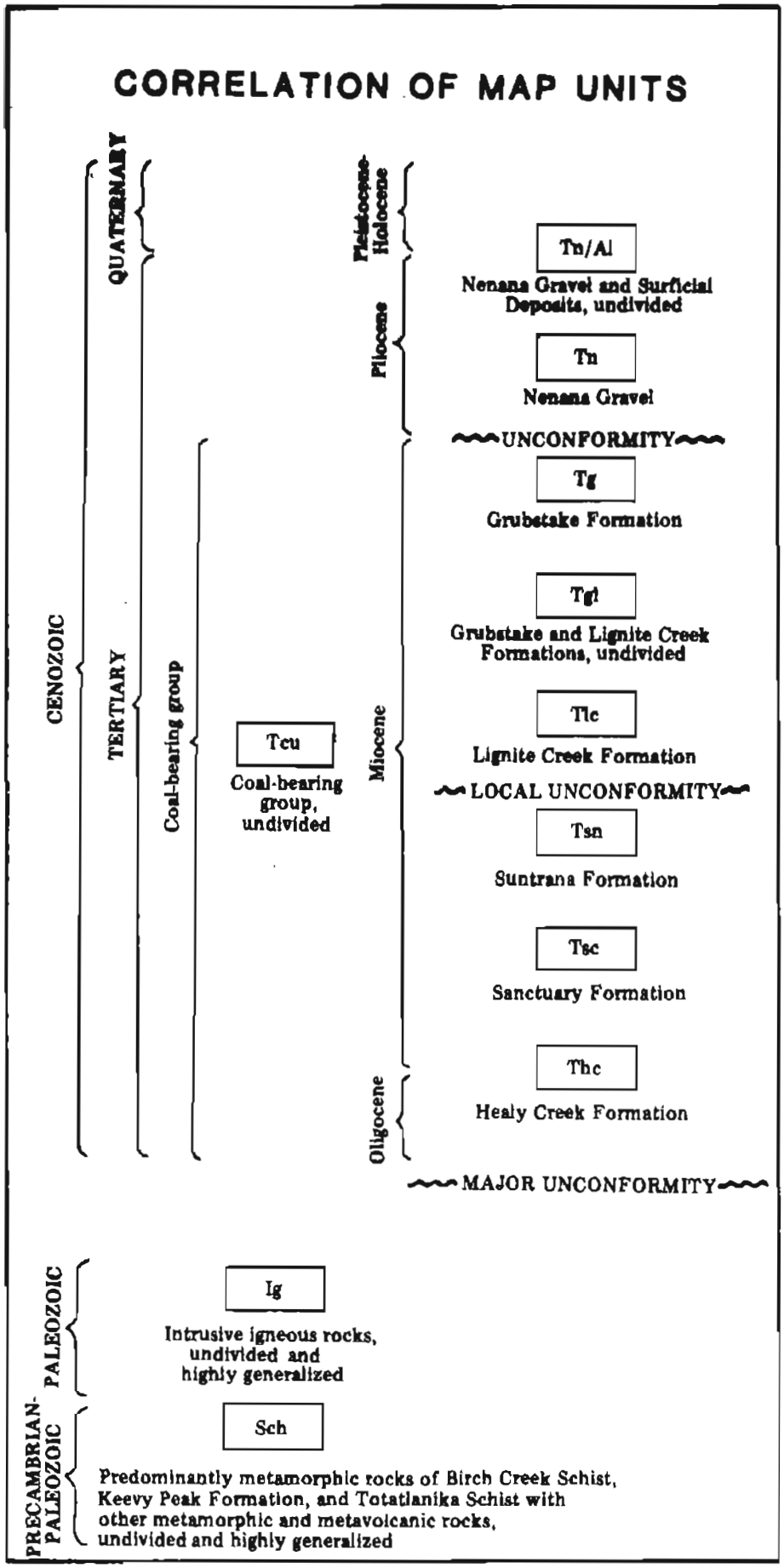
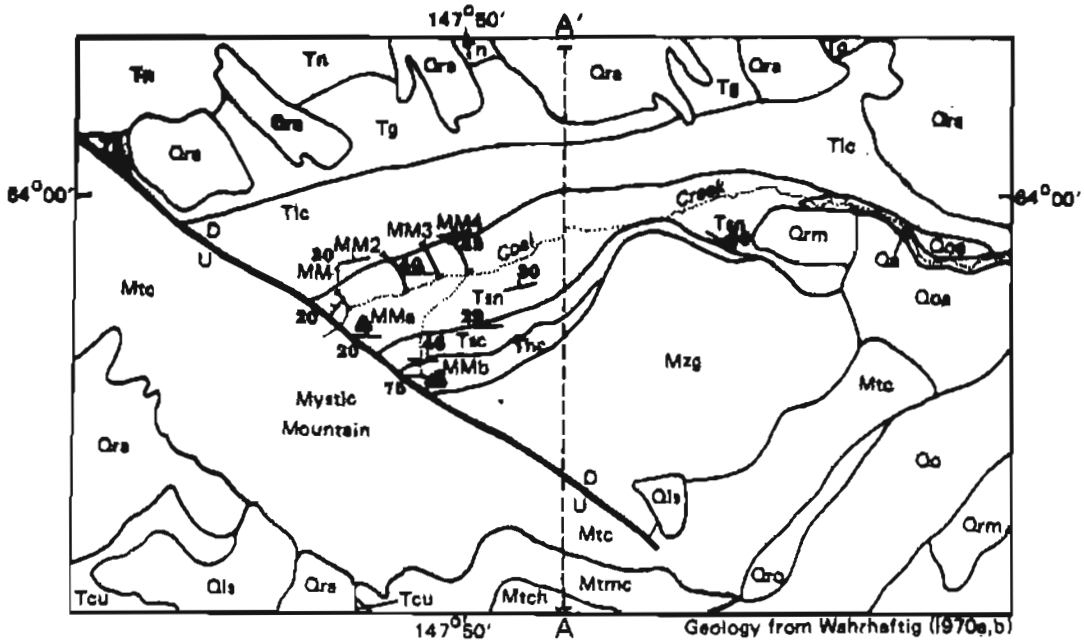

CORRELATION OF MAP UNITS
CENOZOIC
QUATERNARY
TERTIARY
Coal-bearing group
Pleistocene-Holocene
Pliocene
Miocene
Oligocene
Tn/Al
Nenana Gravel and Surficial Deposits, undivided
Tn
Nenana Gravel
UNCONFORMITY
Tg
Grubstake Formation
Tgl
Grubstake and Lignite Creek Formations, undivided
Tlc
Lignite Creek Formation
LOCAL UNCONFORMITY
Tsn
Suntrana Formation
Tsc
Sanctuary Formation
Thc
Healy Creek Formation
MAJOR UNCONFORMITY
Tcu
Coal-bearing group, undivided
PALEOZOIC
Ig
Intrusive igneous rocks, undivided and highly generalized
PRECAMBRIAN-PALEOZOIC
Sch
Predominantly metamorphic rocks of Birch Creek Schist, Keevy Peak Formation, and Totatlanika Schist with other metamorphic and metavolcanic rocks, undivided and highly generalized

Figure 4



QUATERNARY DEPOSITS
- HOLOCENE
  - Qa=alluvium
  - Qo=outwash gravel
  - Qls=landslide deposits
  - Qoa=alluvial fan
- PLEISTOCENE
  - Qra=alluvium and pediment gravel
  - Qro=outwash gravel
  - Qrm=morainal deposits

...Unconformity...

TERTIARY
- PLIOCENE
  - Tn=Nenana Gravel
  - ...Unconformity...
- MIOCENE
  - Tcu=Coal-bearing group, undivided
  - Tg=Grubstake Formation
  - Tlc=Lignite Creek Formation
  - Tsn=Suntrana Formation
  - Tsc=Sanctuary Formation

OLIGOCENE AND MIOCENE
- Thc=Healy Creek Formation
- ...Major Unconformity...

MESOZOIC
- Mzg=granite

PALEOZOIC
- MISSISSIPPIAN(?)
  - Totatlanika Schist
    - Mtmc=Mystic Creek Member
    - Mtch=Chute Creek Member
    - Mtc=California Creek Member

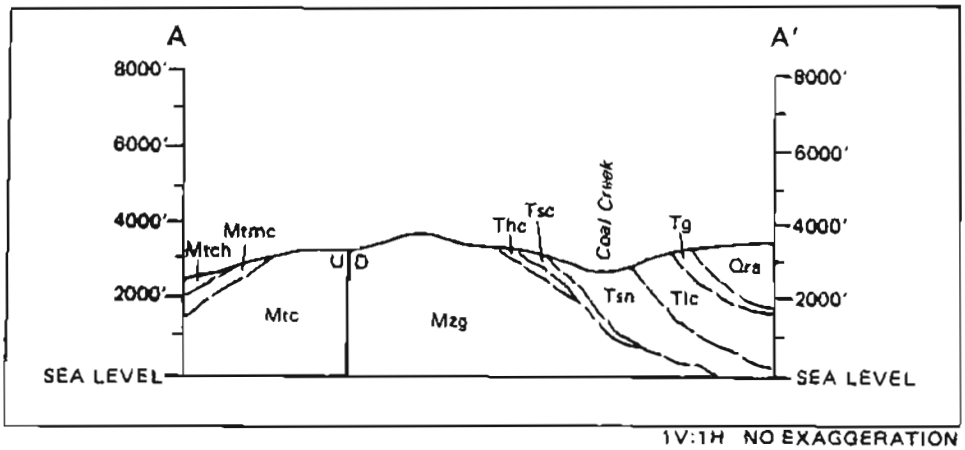
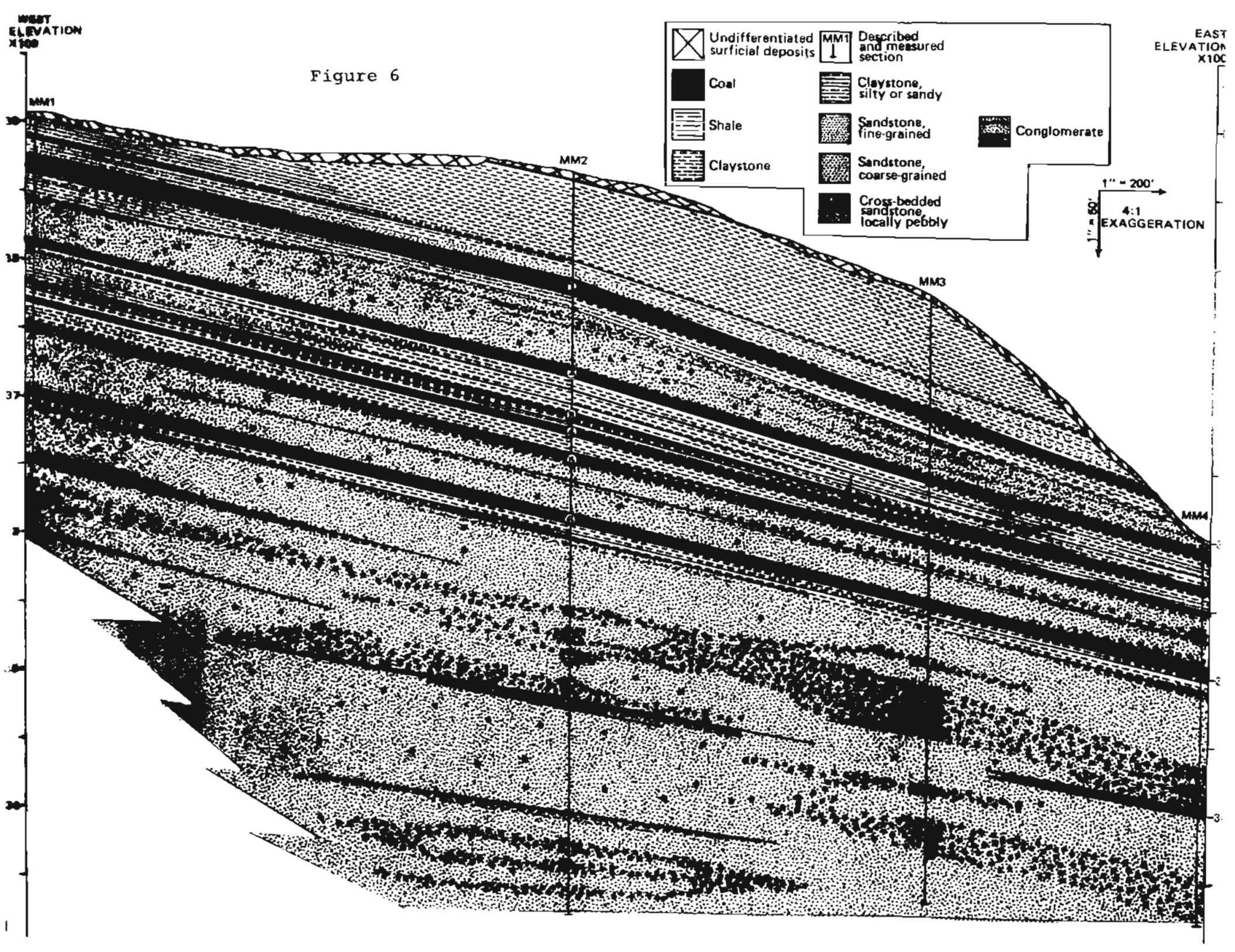


Figure 5

Figure 6


WEST
ELEVATION
X100
EAST
ELEVATION
X100
MM1
MM2
MM3
MM4
Undifferentiated surficial deposits
MM1 Described and measured section
Coal
Claystone, silty or sandy
Shale
Sandstone, fine-grained
Conglomerate
Claystone
Sandstone, coarse-grained
Cross-bedded sandstone, locally pebbly
1" = 200'
1" = 50'
4:1
EXAGGERATION

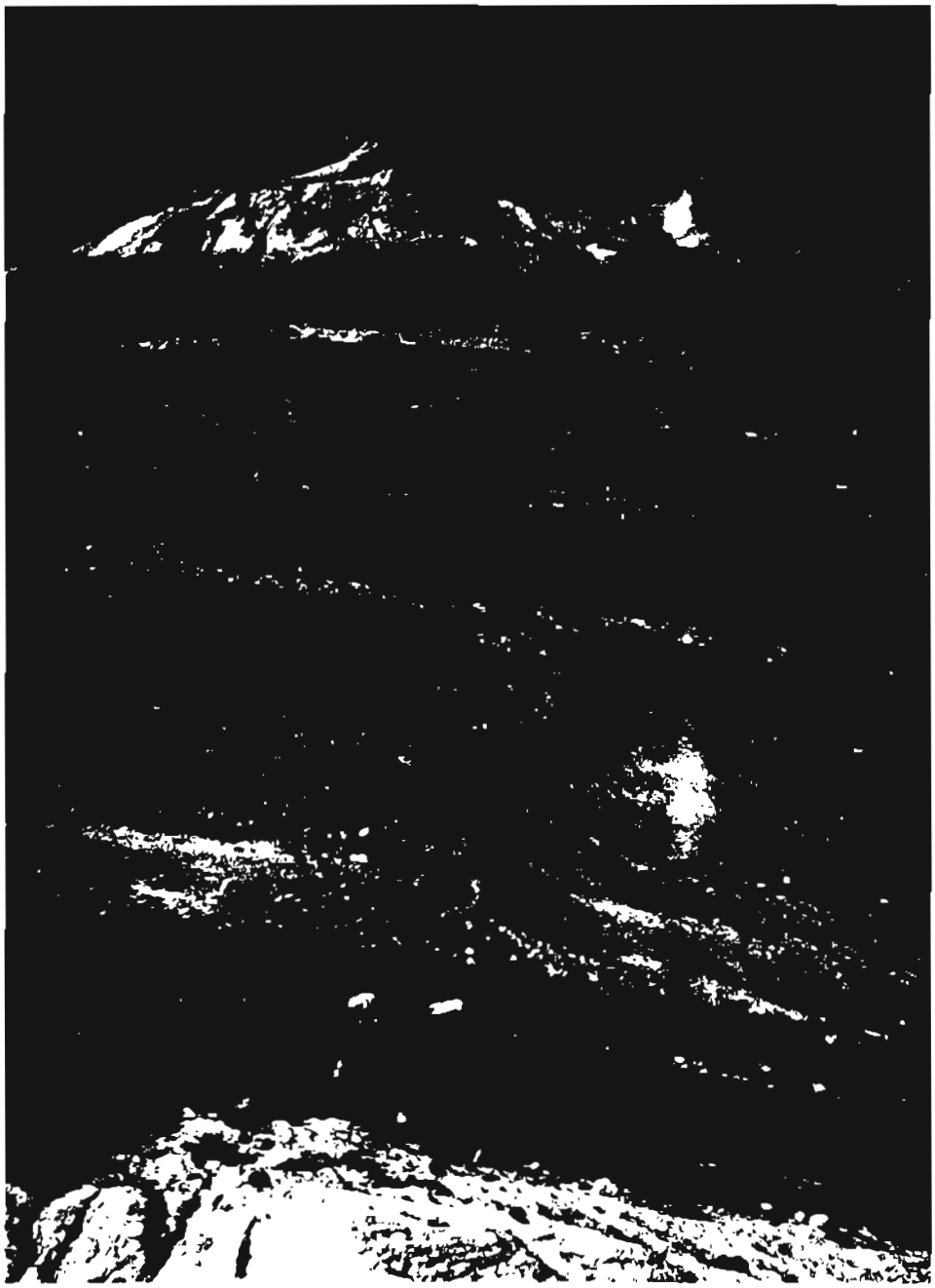


Figure 7

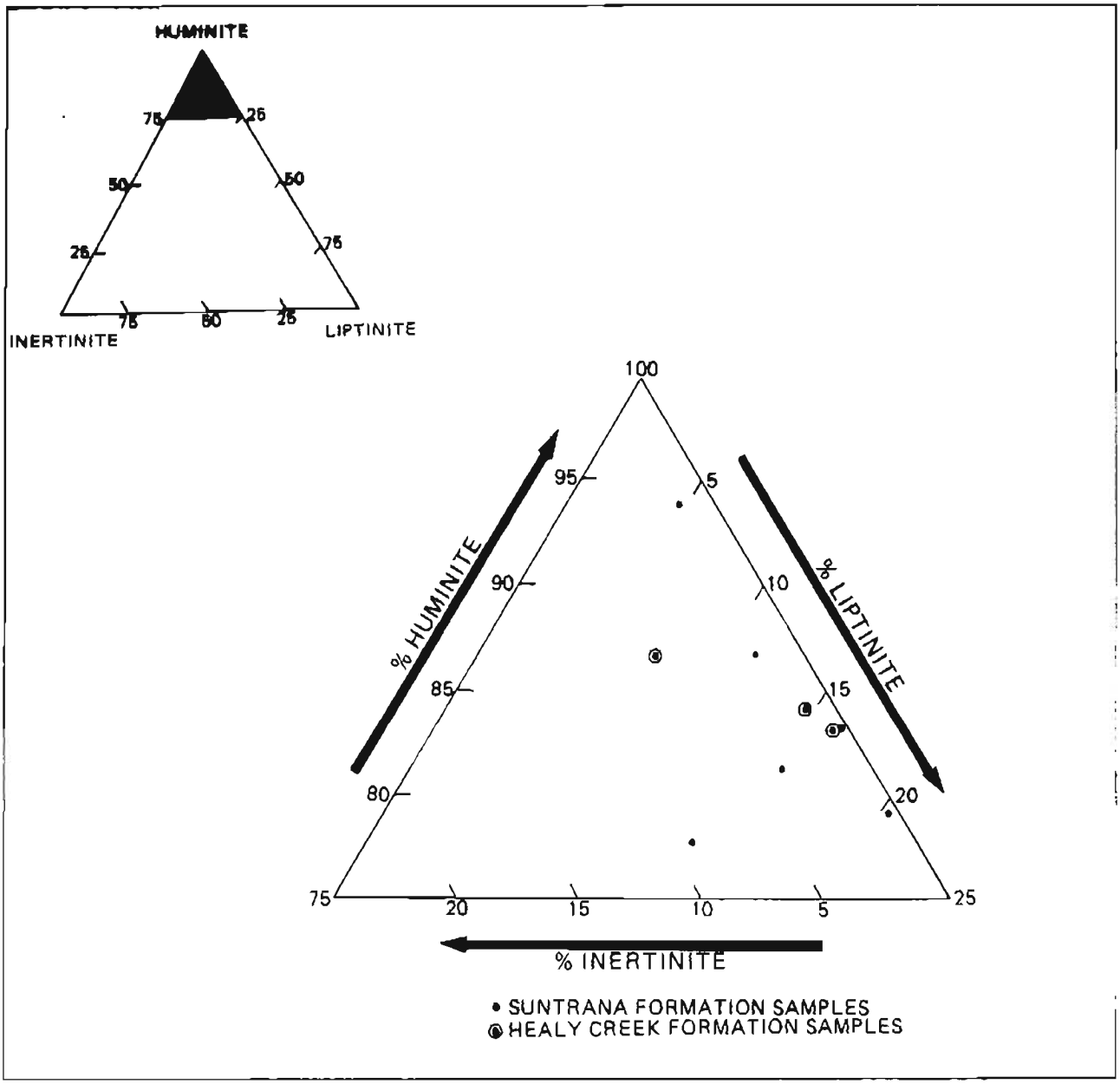

HUMINITE
75
25
50
50
25
75
75
50
25
INERTINITE
LIPTINITE
100
95
5
90
10
85
15
80
20
75
20
15
10
5
25
% HUMINITE
% LIPTINITE
% INERTINITE
• SUNTRANA FORMATION SAMPLES
◉ HEALY CREEK FORMATION SAMPLES

Figure 8

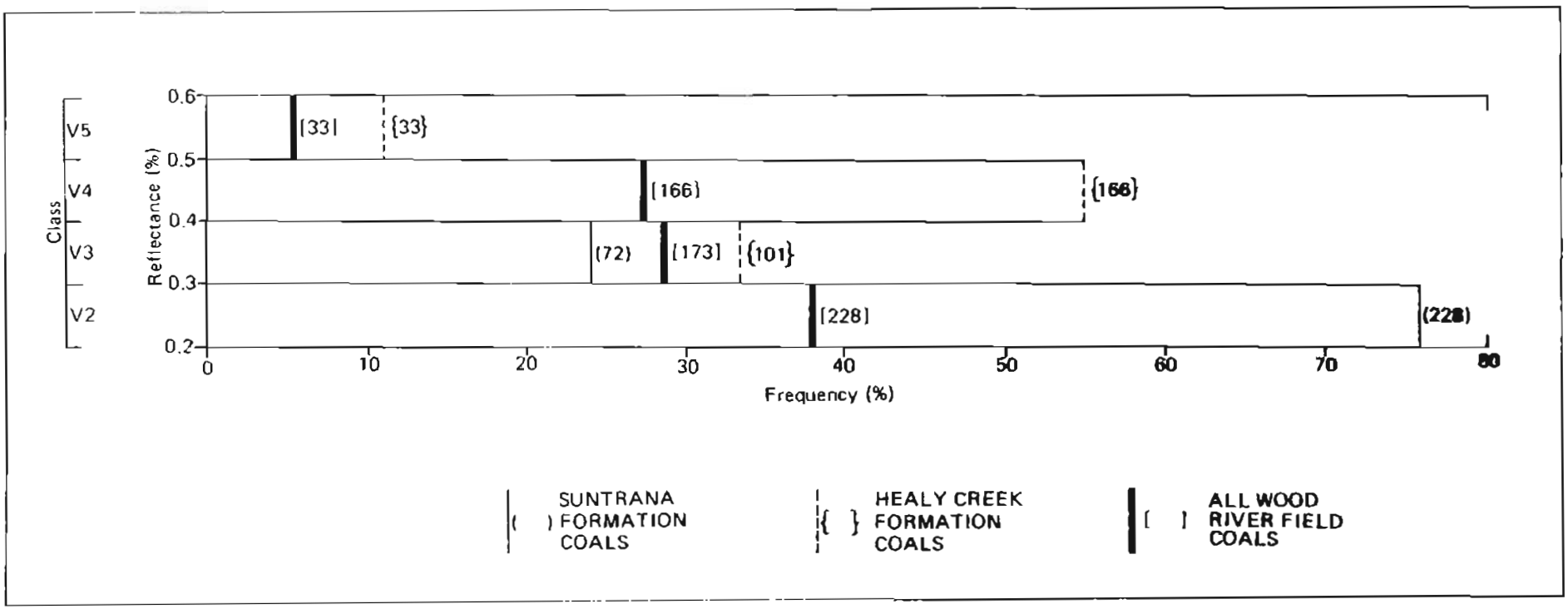

Class
V5
V4
V3
V2
Reflectance (%)
0.6
0.5
0.4
0.3
0.2
[33]
{33}
[166]
{166}
(72)
[173]
{101}
[228]
(228)
0
10
20
30
40
50
60
70
80
Frequency (%)
( ) SUNTRANA FORMATION COALS
{ } HEALY CREEK FORMATION COALS
[ ] ALL WOOD RIVER FIELD COALS

Figure 9

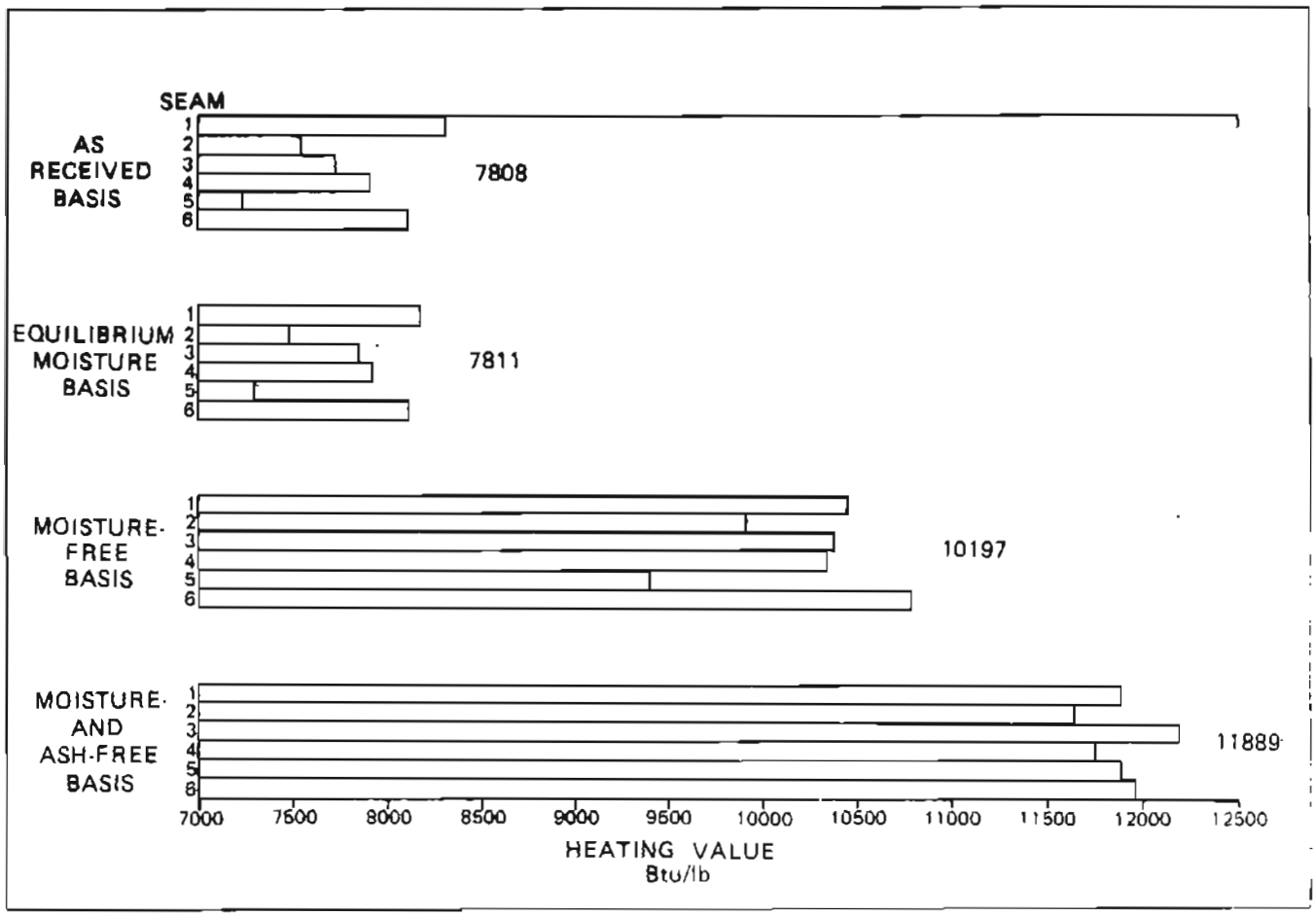

SEAM
AS RECEIVED BASIS
1
2
3
4
5
6
7808
EQUILIBRIUM MOISTURE BASIS
7811
MOISTURE-FREE BASIS
10197
MOISTURE- AND ASH-FREE BASIS
11889
7000
7500
8000
8500
9000
9500
10000
10500
11000
11500
12000
12500
HEATING VALUE
Btu/lb

Figure 10

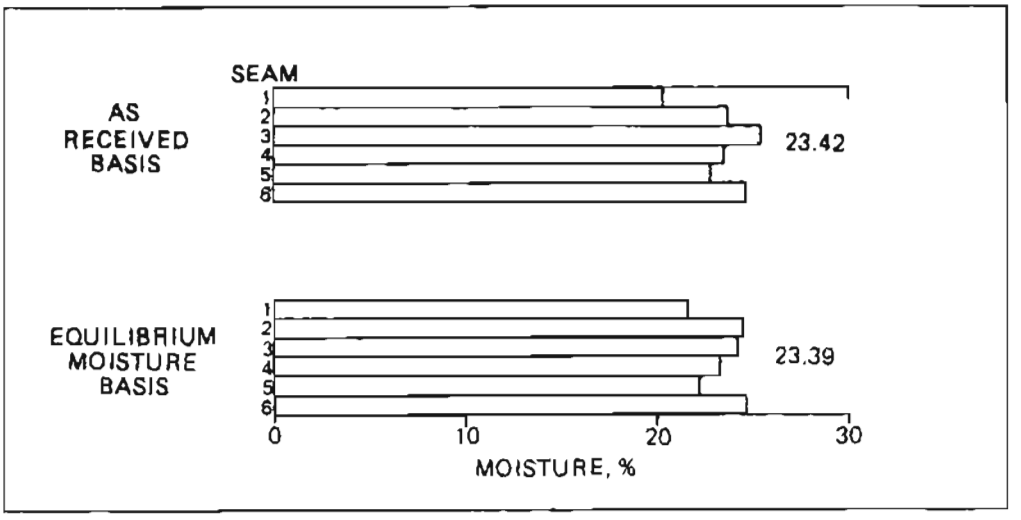

SEAM
AS RECEIVED BASIS
1
2
3
4
5
6
23.42
EQUILIBRIUM MOISTURE BASIS
1
2
3
4
5
6
23.39
0
10
20
30
MOISTURE, %

Figure 11

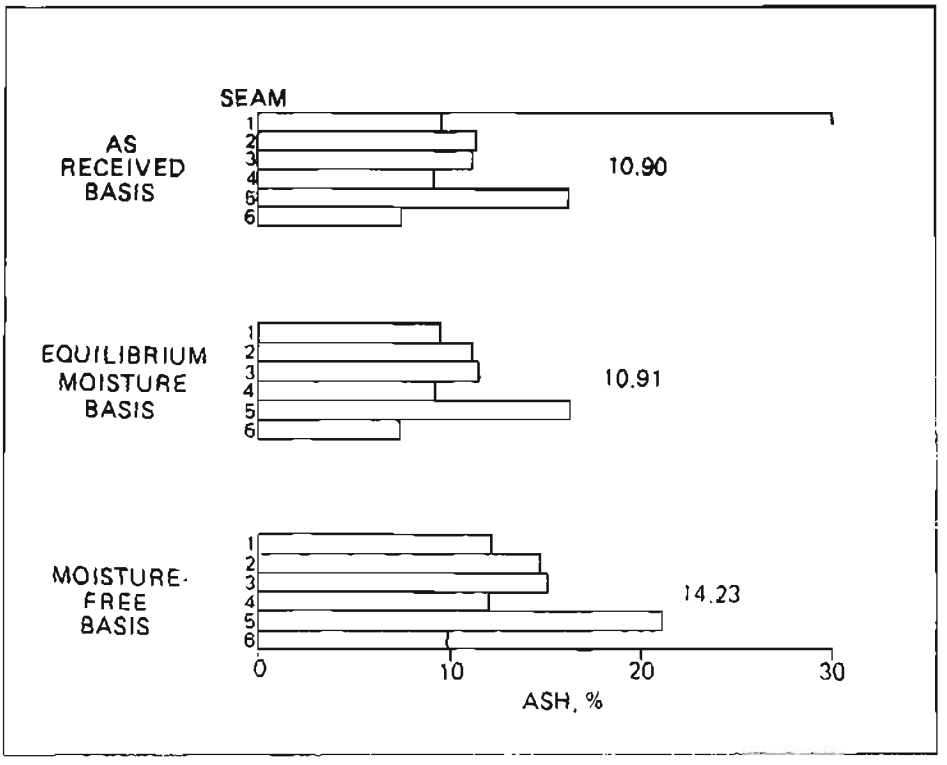

SEAM
AS RECEIVED BASIS
1
2
3
4
5
6
10.90
EQUILIBRIUM MOISTURE BASIS
1
2
3
4
5
6
10.91
MOISTURE-FREE BASIS
1
2
3
4
5
6
14.23
0
10
20
30
ASH, %

Figure 12

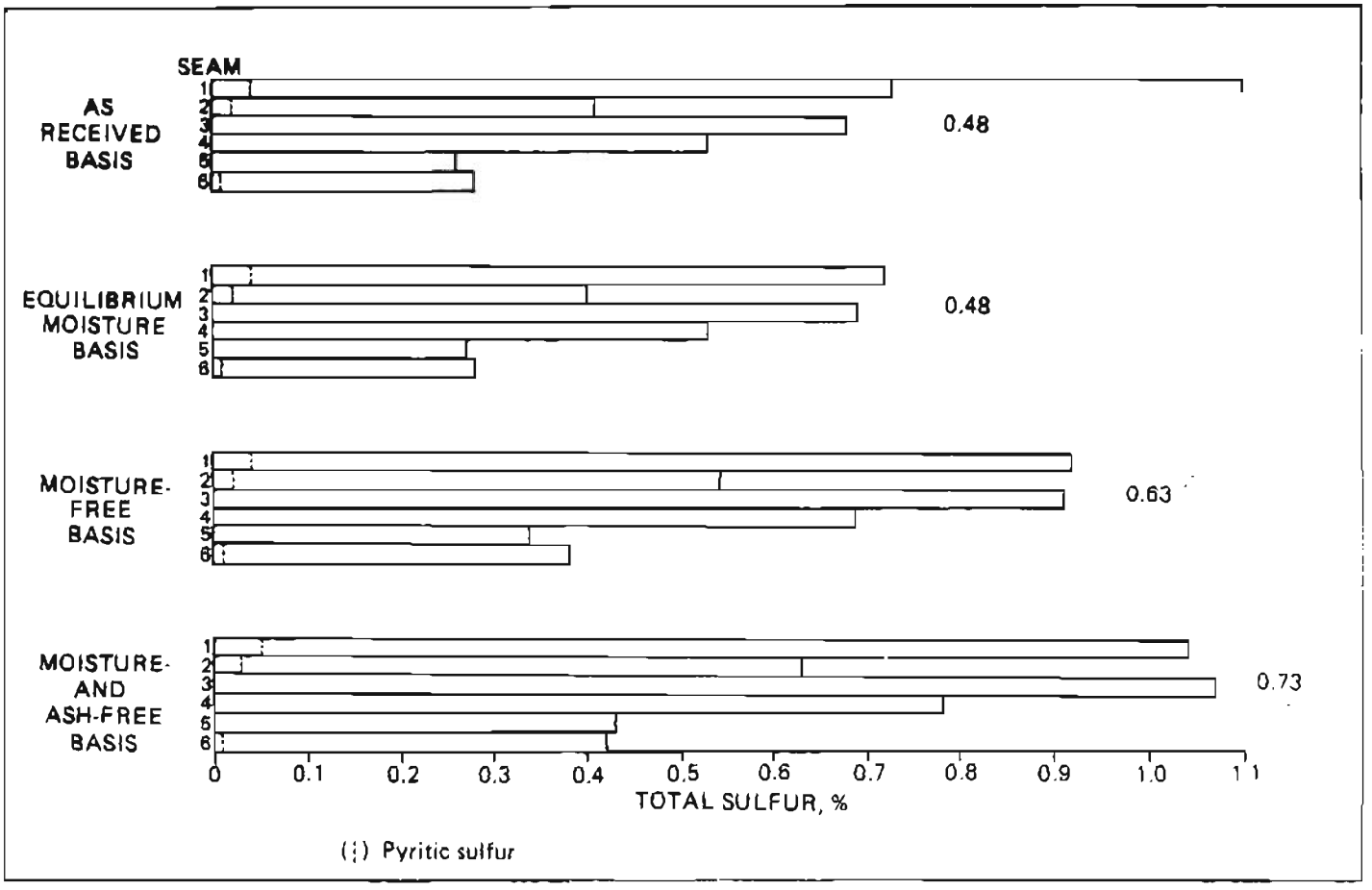

SEAM
AS RECEIVED BASIS
0.48
EQUILIBRIUM MOISTURE BASIS
0.48
MOISTURE-FREE BASIS
0.63
MOISTURE- AND ASH-FREE BASIS
0.73
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
TOTAL SULFUR, %
(¦) Pyritic sulfur

Figure 13

Figure 14

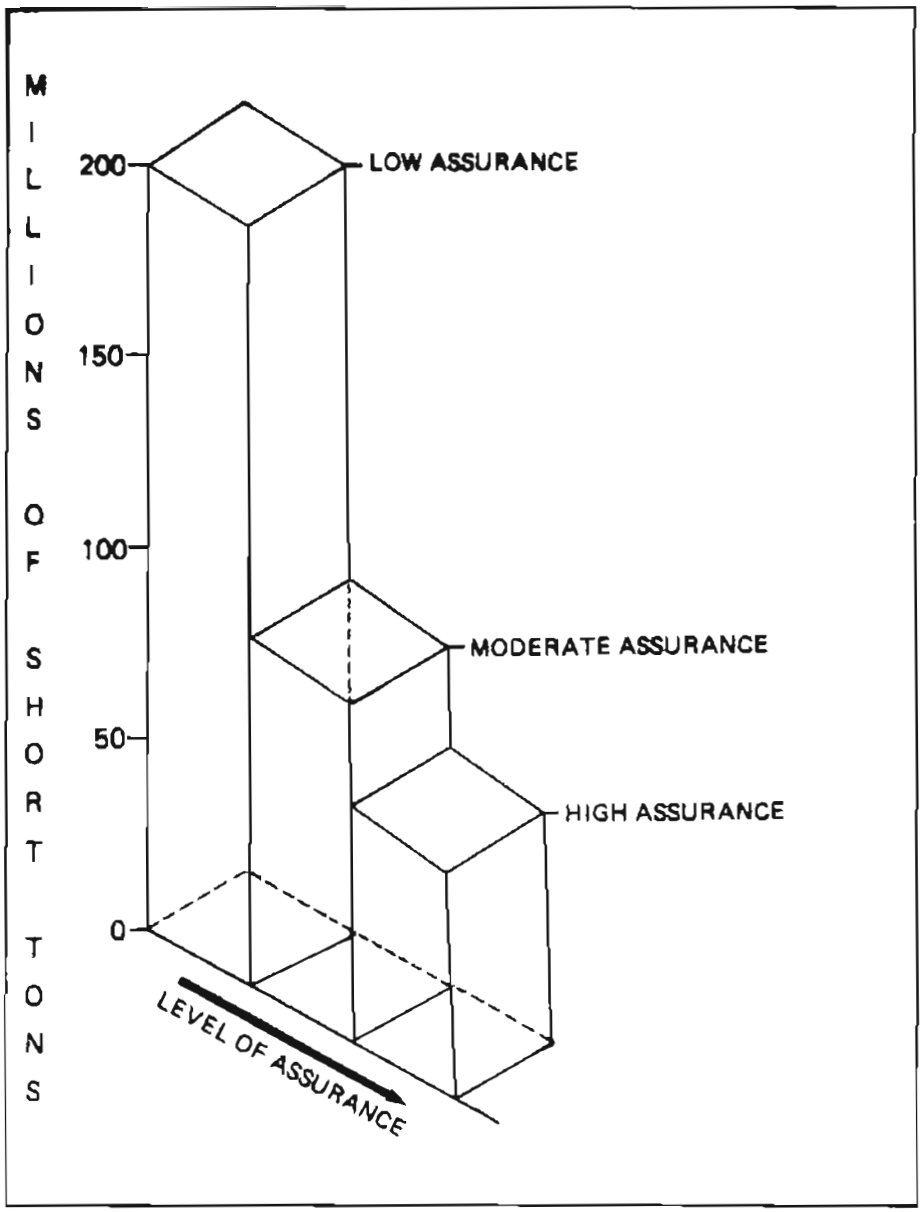

MILLIONS OF SHORT TONS
200
150
100
50
0
LOW ASSURANCE
MODERATE ASSURANCE
HIGH ASSURANCE
LEVEL OF ASSURANCE

Figure 15

Table 1. Coal locality summary and sample inventory for the Wood River field.

Locale Name	Locale Code	Township	Range	Section	Outcrop Section Thickness Measured	Number of Coal Beds	Maximum Coal Bed Thickness	Dip	Coal Samples	Comments
Mystic Mountain	MM1	11S.	2W.	1	305 ft (93 m)+	12	12 ft	10°	---	Exposures of Suntrana and Lignite Creek Formations on north wall of Coal Creek canyon northeast of Mystic Mountain, Wood River field, with dramatic, differentially-weathered castellated sandstones.
Mystic Mountain	MM2	11S.	2W.	1	545 ft (166 m)+	15	12 ft	15-30°	6, MM2-1 to MM2-6	See figure 6.
Mystic Mountain	MM3	11S.	2W.	1	435 ft (133 m)+	10-12	8 ft	30°	---	See figure 6.
Mystic Mountain	MM4	11S.	1W.	6	280 ft (85 m)+	8-10	8 ft	20°	---	See figure 6.
Mystic Mountain	MMa	11S.	2W.	1	---	1(?)	---	---	---	Folded coal bed occupying core of small syncline in Suntrana Formation underlain by a whitish sandstone.

Table 1 (con.)

Locale Name	Locale Code	Township	Range	Section	Outcrop Section Thickness Measured	Number of Coal Beds	Maximum Coal Bed Thickness	Dip	Coal Samples	Comments
Mystic Mountain	MMb	11S.	2W.	1	---	3(?)+	30 ft	Upper beds 45°, lower bed 70-75°	3, MMb-1, -3, -5	Jumbled Healy Creek Formation sediments adjacent to Mystic Mountain fault about 0.5 mi (0.8 km) south of Coal Creek. Coal beds folded and locally contorted. Overlying Sanctuary Formation and Suntrana Formation strata more regularly bedded. Abundant baked rocks occur in interval.

Table 2. Quantitative maceral analysis of Wood River field coal samples, volume percent, mineral-matter-free basis.

Sample	Ulminite/ vitrinite	Pseudo- vitrinite	Porigelinite	Phlobaphi- nite	Pseudophlo- baphinite	Humodetri- nite	TOTAL HUMINITE	Fusinite	Semi- fusinite	Sclero- tinite	Macri- nite	Inerto- detrinite	TOTAL INERTINITE	Cutinite	Sporinite	Resinite/ suberinite/ exsudatinite	Alginite	Lipto- detrinite	TOTAL LIPTINITE
MM2-1	90.1	0.0	0.0	0.2	0.0	3.6	93.9	0.0	0.0	0.1	0.4	0.9	1.4	0.0	0.0	4.7	0.0	0.0	4.7
MM2-2	81.6	0.0	0.0	0.5	0.0	4.5	86.6	0.1	0.0	0.0	0.2	1.8	2.1	0.0	0.0	11.3	0.0	0.0	11.3
MM2-3	68.0	0.0	1.0	1.8	0.7	7.6	79.1	0.0	0.6	0.0	0.0	0.0	0.6	0.0	0.5	19.8	0.0	0.0	20.3
MM2-4	77.5	0.0	1.6	0.2	0.1	3.9	83.3	0.0	0.1	0.0	0.1	0.0	0.2	0.7	0.1	15.5	0.0	0.2	16.5
MM2-5	68.1	0.0	0.8	1.1	0.5	7.2	77.7	0.8	2.6	0.2	2.4	3.1	9.1	0.0	0.1	13.1	0.0	0.0	13.2
MM2-6	77.3	0.0	0.0	0.4	0.1	3.9	81.7	0.2	0.1	0.0	0.3	2.6	3.2	0.0	0.0	15.1	0.0	0.0	15.1
MMb-1	78.5	0.0	0.1	0.1	0.8	4.8	84.3	0.0	0.0	0.2	0.1	0.8	1.1	0.0	0.3	14.3	0.0	0.0	14.6
MMb-3	81.9	0.0	0.1	0.0	0.5	0.6	83.1	0.0	0.0	0.0	0.3	0.1	0.4	0.0	0.3	16.2	0.0	0.0	16.5
MMb-5	83.2	0.0	0.9	0.0	1.2	1.3	86.6	0.1	0.0	0.7	0.0	0.3	1.1	0.0	0.3	12.0	0.0	0.0	12.3

Table 3. Vitrinite reflectance data for Wood River field coal samples.

Sample Number	Frequency class distribution				$\overline{R}$om (%)
	V2	V3	V4	V5	
MM2-1	85	15			0.26
MM2-2	91	9			0.26
MM2-6	52	48			0.29
MMb-1		51	49		0.39
MMb-3		15	61	24	0.45
MMb-5		35	56	9	0.41

Table 4. Proximate and ultimate analysis data for Wood River field coal samples.

SAMPLE NUMBER	BASIS*	MOISTURE (%)	VOLATILE MATTER,%	FIXED CARBON,%	ASH (%)	HEATING VALUE Btu/lb	C,%	H,%	N,%	O,%	SULFUR,% PYRITIC	SULFUR,% TOTAL
MM2-1	1	20.35	37.56	32.39	9.70	8322	48.62	6.09	0.77	34.09	0.04	0.73
	2	21.58	36.98	31.89	9.55	8193	47.87	6.17	0.75	34.93	0.04	0.72
	3	-----	47.16	40.66	12.18	10448	61.04	4.79	0.96	24.90	0.04	0.92
	4	-----	53.70	46.30	-----	11897	69.51	5.45	1.09	22.90	0.05	1.04
MM2-2	1	23.77	34.27	30.60	11.36	7547	44.32	6.02	0.63	37.27	0.02	0.41
	2	24.49	33.95	30.31	11.25	7476	43.90	6.07	0.62	37.76	0.02	0.40
	3	-----	44.96	40.14	14.90	9901	58.14	4.41	0.83	25.60	0.02	0.54
	4	-----	52.83	47.17	-----	11634	68.31	5.18	0.97	24.91	0.03	0.63
MM2-3	1	25.36	35.65	27.74	11.26	7725						0.68
	2	24.16	36.22	28.18	11.44	7849						0.69
	3	-----	47.76	37.16	15.08	10350						0.91
	4	-----	56.24	43.76	-----	12188						1.07
MM2-4	1	23.48	34.70	32.56	9.27	7904						0.53
	2	23.28	34.79	32.64	9.29	7924						0.53
	3	-----	45.35	42.55	12.11	10329						0.69
	4	-----	51.59	48.41	-----	11752						0.78
MM2-5	1	22.84	34.60	26.25	16.31	7238						0.26
	2	22.20	34.88	26.47	16.45	7298						0.27
	3	-----	44.84	34.02	21.14	9381						0.34
	4	-----	56.86	43.14	-----	11896						0.43
MM2-6	1	24.70	36.27	31.54	7.49	8114	48.23	6.38	0.66	36.96	0.01	0.28
	2	24.61	36.32	31.57	7.50	8124	48.29	6.37	0.66	36.90	0.01	0.28
	3	-----	48.17	41.88	9.95	10775	64.05	4.80	0.88	24.75	0.01	0.38
	4	-----	53.49	46.51	-----	11966	71.12	5.33	0.98	22.15	0.01	0.42

*1-As received; 2-Equilibrium moisture; 3-Moisture free; 4-Moisture and ash free.

Table 4 (con.)

SAMPLE NUMBER	BASIS*	MOISTURE (%)	VOLATILE MATTER,%	FIXED CARBON,%	ASH (%)	HEATING VALUE Btu/lb	C,%	H,%	N,%	O,%	SULFUR,% PYRITIC	SULFUR,% TOTAL
MMb-1	1	27.57	34.48	32.22	5.73	7771						0.19
	2	18.92	38.60	36.07	6.41	8699						0.21
	3	-----	47.60	44.49	7.91	10729						0.27
	4	-----	51.69	48.31	----	11650						0.29
MMb-3	1	19.38	38.72	40.09	1.81	9379						0.35
	2	17.55	39.60	41.00	1.85	9592						0.36
	3	-----	48.03	49.72	2.25	11634						0.44
	4	-----	49.13	50.87	----	11902						0.45
MMb-5	1	18.03	39.29	36.56	6.12	8958						0.25
	2	16.32	40.10	37.32	6.25	9145						0.25
	3	-----	47.93	44.60	7.47	10928						0.30
	4	-----	51.80	48.20	----	11811						0.33

*1-As received; 2-Equilibrium moisture; 3-Moisture free; 4-Moisture and ash free.

Table 5. Coal quality calculations, Wood River field samples.

COAL SAMPLE NO.	FUEL RATIO $\frac{F.C.}{V.M.}$	CARBON RATIO $\frac{F.C.}{F.C.+V.M.} \times 100$	PERCH AND RUSSELL RATIO $\frac{\text{moist, Mm-free Btu}}{\text{dry, Mm-free Btu}}$	H VALUE (LORD) $\frac{Btu-4050S}{100-(M+A+S)} \times 100$	MINERAL MATTER(%) PARR FORMULA $1.08A+0.55S$	DULONG'S EQUATION* $\frac{1}{100}[14,544 \times \%C + 62028(\%H-\%O/8) + 4050\%S]$	MOIST Mm-FREE BTU $\frac{Btu-50S}{100-(1.08A+0.55S)} \times 100$	RANK
MM2-1	0.86	46.30	0.77	77.43	10.9	8108	9135	SubC
MM2-2	0.89	47.17	0.73	91.70	12.5	7238	8508	SubC
MM2-3	0.78	43.76	0.73	79.34	12.5	----	8955	SubC
MM2-4	0.94	48.40	0.75	86.36	10.3	----	8806	SubC
MM2-5	0.76	43.14	0.75	101.58	17.8	----	8875	SubC
MM2-6	0.87	46.50	0.74	103.39	8.2	8126	8839	SubC
MMb-1	0.93	48.31	0.80	105.40	6.3	----	9346	SubC
MMb-3	1.04	50.87	0.82	101.37	2.1	----	9789	SubB
MMb-5	0.93	48.20	0.83	105.37	6.6	----	9808	SubB

*Approximate heating value calculated from ultimate analysis data.

Table 6. Estimates of potentially minable coal resources of Wood River field, Nenana basin, projected to an overburden limit of 500 ft (150 m) and including all beds greater than or equal to 2.5-ft thick.

Level of geologic assurance	Resources	
	Million short tons	Million metric tons
High assurance	65	59
Moderate assurance	90	82
Low assurance	200	181