R. I. 4520 May 1949

UNITED STATES
DEPARTMENT OF THE INTERIOR
J. A. KRUG, SECRETARY

BUREAU OF MINES
JAMES BOYD, DIRECTOR

REPORT OF INVESTIGATIONS

INVESTIGATION OF COAL DEPOSITS IN SOUTH CENTRAL ALASKA AND THE KENAI PENINSULA

BY

ALBERT L. TOENGES AND THEODORE R. JOLLEY

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By Albert L. Toenges[2] and Theodore R. Jolley[3]

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ILLUSTRATIONS

INTRODUCTION

The development of Alaska depends on the existence of an adequate fuel supply in the Territory. The need to investigate coal deposits was recognized as early as 1911, when the first investigations were conducted in Alaska by engineers of the Bureau of Mines.

Conditions existing in the Bering River and Matanuska coal fields, as found by Dr. Robert A. Holmes, former Director of the Bureau of Mines, are described by the Honorable W. L. Fisher, former Secretary of the Interior.4/

Following Dr. Holmes' investigation, a party of Bureau of Mines engineers headed by R. Y. Williams visited the Bering River field in 1912 in cooperation with the Navy Department. A detailed examination was made of the Bering River field, and 855 tons of coal were mined from three prospects on Trout Creek. This bulk sample was delivered to the Navy for steaming and other tests. A description of the work of the field party and results of tests of the coal by the Navy Department and the Bureau of Mines has been published.5/

During 1920 to 1922, the comparative steaming properties of Alaska bituminous coal, lignite, and wood were determined by the Bureau of Mines.6/

4/ Fisher, Walter L., Alaska Coal Problems: Bureau of Mines Bull. 36, 1912, 32 pp.

5/ Report on Coal in Alaska for use in United States Navy: House of Representatives, 63d Cong., 2d Sess., Doc. No. 876, Washington, 1914.

6/ U. S. Bureau of Mines, Steaming Value of Alaska Lignite: Rept. of Investigations 2090, 1920, 2 pp.

Davis, John A., and Hopkins, Paul, Comparative Steaming Tests of Alaska Lignite and Spruce Wood: Bureau of Mines Rept. of Investigations 2103-B, 1920, 16 pp.

Davis, John A., and Hopkins, Paul, Comparative Steaming Tests of Nenana Lignite and Matanuska Bituminous Coals: Bureau of Mines Rept. of Investigations 2412, 1922, 9 pp.

In the early 1920's, the Bureau of Mines established a coal laboratory at Anchorage, where Alaska coals were analyzed. Subsequently, this laboratory was transferred to the Alaska Railroad and was used by the railroad for coal and other tests.

Since 1910, the Bureau of Mines has made analyses of coal from Alaska, and the results of these analyses have been published.7/ The coal analyzed was obtained from mines, tipples, delivered lots, and face samples of coal deposits, and these samples were obtained in the field by engineers of the Bureau of Mines and geologists of the U. S. Geological Survey.

Because of the shortage of petroleum and petroleum products in Alaska during the war, low-temperature carbonization assays of coals from the Broad Pass, Forty-Mile, Matanuska, and Nenana fields were made by the Bureau of Mines, and the results were published.8/

Coal beds in the Matanuska field contain interbedded impurities in the form of shale, clay, and bone. The coal should be cleaned mechanically to obtain a satisfactory fuel. A coal-preparation study of bituminous coal from the Eska and Evan Jones mines was made by engineers of the Bureau of Mines, and the results were published.9/

Coal production in Alaska is less than the requirements, and coal is imported to make up the deficiency. The cost of this imported coal is high. Greater production is necessary to supply coal for Army installations, industry, and homes. At present, there is only one bituminous coal mine (Evan Jones) in Alaska. The output of this mine is used at Fort Richardson, Anchorage, and by the Alaska Railroad. The economic life of this mine is limited (reported to be 3 years), and its closing, because of accidents or exhaustion, will cause great hardship to the inhabitants of Alaska. There is need to develop new, modern mines for the production of bituminous coal in the Matanuska field.

The expanding tourist and recreational facilities in the McKinley National Park will result in increasing the demand for coal, and investigation of the deposits in this area is advisable to determine the feasibility of developing mines to supply this demand.

The opening of land for settlement along the Alaska Highway in Alaska and the Richardson Highway will necessitate the development of coal reserves near these highways for a fuel supply for settlers.

A detailed investigation of coal reserves on the Kenai Peninsula is desirable to determine the reserves of coal for a source of fuel for homesteaders near Homer and for the industrial development now being considered in this area.

7/ U. S. Bureau of Mines, Analyses of Alaska Coals: Tech. Paper 682, 1946, 114 pp.

8/ Selvig, W. A., Ode, W. H., and Davis, Joseph D., Low-Temperature Carbonization of Alaska Coals: Bureau of Mines Tech. Paper 668, 1944, 16 pp.

9/ Geer, M. R., and Yancey, H. F., Washability Characteristics and Washing of Coals from the Matanuska Field of Alaska: Bureau of Mines Rept. of Investigations 3840, 1946, 17 pp.

During the summer and fall of 1946, a reconnaissance was made of these areas with the objective of formulating plans for detailed investigations of minable coal reserves. Modern mines that can be operated efficiently require large investments, and minable reserves must be known to determine whether expenditures for mine development and plant are justified. This report describes the results of this reconnaissance and makes recommendation for detailed investigations in the Wishbone Hill area, in the Matanuska field, and in the area adjacent to Homer on the Kenai Peninsula.

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Kenai Peninsula:

Basil Sinclair, president, Homer Coal Corp.
Evan Jones, general superintendent, Homer Coal Corp.
C. B. Abbott, engineer, Homer Coal Corp.
Bert Hanson, taxi driver and guide.
Holly Sterling, chief engineer, Alaska Road Commission.

Mile Post 341:

Col. J. P. Johnson, general manager, Alaska Railroad.
J. C. Cunningham, assistant general manager, Alaska Railroad.
Ted Munson, section foreman, Alaska Railroad, Lagoon.
Pat Cook, bridge and building engineer, Alaska Railroad.

McKinley Park:

Harold M. Peterson, manager, McKinley Park Hotel.
Grant Pearson, National Park Service, superintendent, McKinley Park.
Elmer Hossler, superintendent, McKinley Park Div., Alaska Road Commission.

North of McKinley Park:

Clyde Wahrhaftig, geologist, U. S. Geological Survey.

Jarvis Creek:

Charles Hickox, geologist, U. S. Geological Survey.

Diamond strip mine:

Gus Parris, leaseholder.
Jim Dodson and Larry Reed, lessors.

Healy River:

Capt. A. E. Lathrop, president, Healy Creek Coal Corp.
Emil Usibelli.

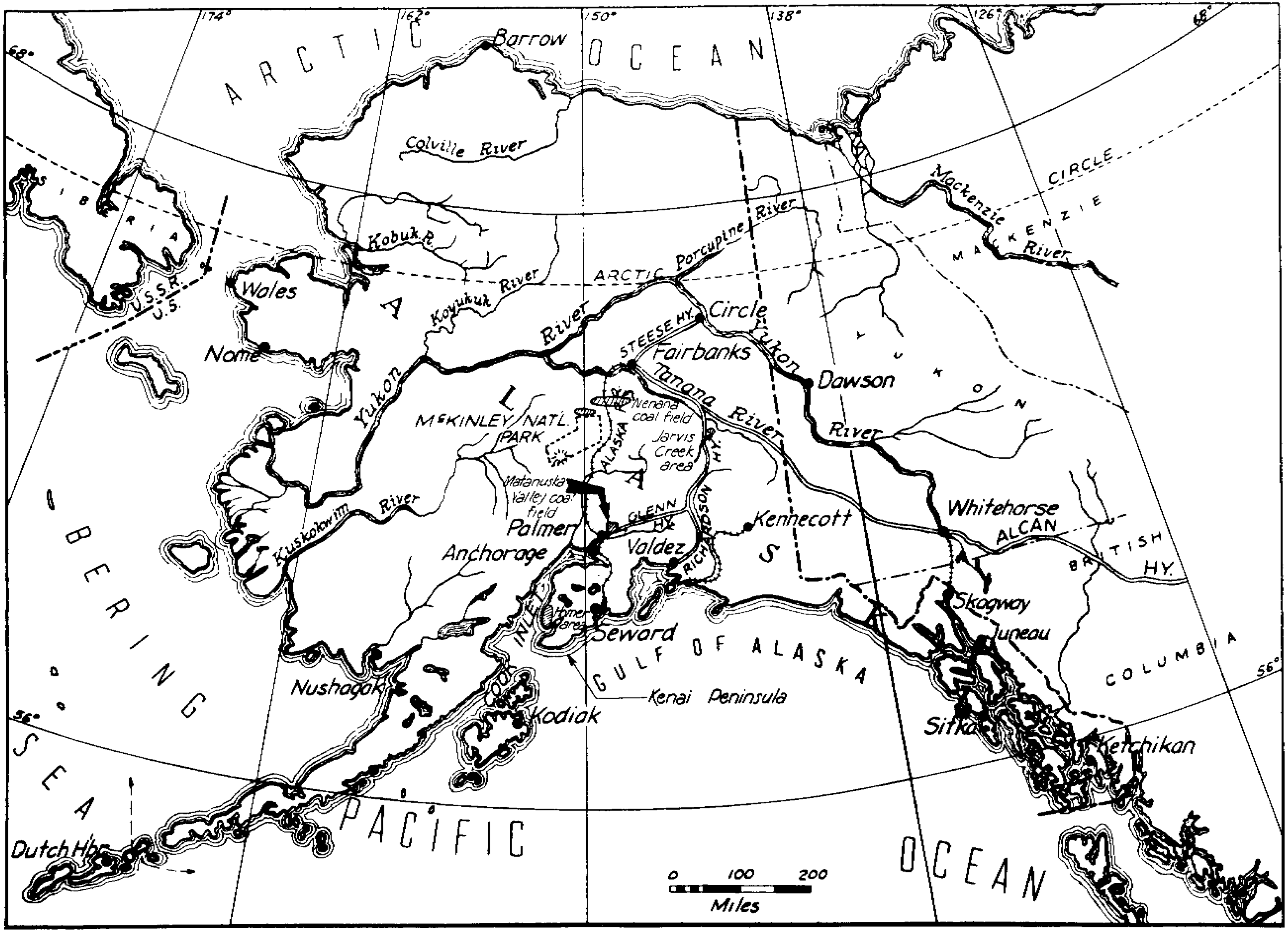

Figure I. - Areas described in report.

Matanuska Valley:

Harry Hill, president and general manager, Evan Jones Coal Co.
Tom McFarlane, superintendent, Evan Jones Coal Co.
Harvey Hiber, assistant superintendent, Evan Jones Coal Co.
Bob Tucker, engineer, Evan Jones Coal Co.
Antone Anderson, superintendent of transportation, Alaska Railroad.
Emil Phiel, assistant general manager, Buffalo Mining Co.
Frank Colobuffalo, leaseholder, Buffalo Mining Co.
W. W. Stohl, president and general manager, Buffalo Mining Co.

B. D. Stewart, Territorial Commissioner of Mines.

Thanks are extended especially to Ludlow G. Anderson, engineer in charge, District I, Health and Safety Branch, Bureau of Mines, Anchorage, Alaska, for cooperation and assistance during the reconnaissance, and to Dr. F. F. Barnes, geologist in charge of coal investigations in Alaska for the U. S. Geological Survey, who assisted in the reconnaissance and investigations.

AREAS INVESTIGATED DURING THE RECONNAISSANCE (See fig. 1.)

Matanuska Valley Coal Field

The Matanuska Valley coal field is in the valleys of the Matanuska River and its tributaries and their separating ridges. This field has been interpreted as being a sunken fault block,[10] which separated the Talkeetna range of mountains from the Chugach range. Coal exposures occur in an area approximately 25 miles long by 7 miles wide and parallel the general trend of the Matanuska Valley. Complexity of geologic structure exists in the area, and there is a prevalence of igneous intrusions, which appear to increase progressively from west to east. These features, no doubt, have influenced the rank of the coal. This is true of the high-quality coal found at Chickaloon on the eastern end of the area.

10/ Chapin, Theodore, Mining Development in the Matanuska Coal Field: U. S. Geol. Survey Bull. 712(e), 1920, p. 134.

The geology of this coal field has been described in detail.11/ Briefly, the Lower Matanuska Valley bituminous coal field occurs in the prominent Wishbone Hill syncline, which extends 7 to 10 miles in a southwesterly direction from Eska to Moose Creek. Bituminous coal is restricted to the Chickaloon formation of Tertiary age. This formation, which is below the Eska conglomerates, comprises claystone, siltstone, sandstone, a few thin beds of fine-grained conglomerates, and coal beds. These coal beds generally occur in the upper 1,400 feet of the formation. The Chickaloon formation, below the coal-bearing zone, comprises principally dark purplish-gray claystone and silty claystone. Lateral changes in the thickness of the coal beds and quality of the coal result in various coal beds being minable at one location and not at another. The following coal beds in the Matanuska Valley coal field have been tentatively correlated by the U. S. Geological Survey composite section of Wishbone Hill syncline showing correlation of beds in various mine areas:

Eska Conglomerate

Chickaloon Formation

Premier mine	Buffalo mine	Evan Jones mine	Eska mine
Jonesville coal group	Jonesville coal group	Jonesville coal group	
		4	
3	3	3	
2	2	2	
1	1	1	
		0	
		00	

11/ Payne, Thos. G., and Hopkins, David M., Geology and Coal Resources of the Western Part of the Lower Matanuska Valley Coal Field, Alaska: U. S. Geol. Survey Mimeograph Report 105117, 1944, 22 pp.
Barnes, F. F., and Byers, F. M., Jr., Geology and Coal Resources of the Eastern Part of the Lower Matanuska Valley Coal Field, Alaska: U. S. Geol. Survey Mimeograph Report 113198, 1944, 21 pp.
Tuck, Ralph, The Eska Creek Coal Deposits, Matanuska Valley, Alaska: U. S. Geol. Survey Bull. 880(d), 1937, pp. 185-214.
Waring, G. A., Core Drilling for Coal in the Moose Creek Area, Alaska: U. S. Geol. Survey Bull. 857(e), 1934, pp. 155-166.
Martin, G. C., and Katz, F. J., Geology and Coal Fields of the Lower Matanuska Valley, Alaska: U. S. Geol. Survey Bull. 500, 1912, 98 pp.
Chapin, Theodore, Mining Developments in the Matanuska Coal Field, Alaska: U. S. Geol. Survey Bull. 712(e), 1920, p. 166.
Paige, Sidney, and Knopf, Adolph, Geologic Reconnaissance in the Matanuska and Talkeetna Basins, Alaska: U. S. Geol. Survey Bull. 327, 1907, 71 pp.

Eska Conglomerate (Con.)

Premier mine	Buffalo mine	Evan Jones mine	Eska mine
Premier coal group	Premier coal group	Premier coal group	Premier coal group
1	7	5	5
2	6	6	6
2-1/2	5	7	Maitland group { Chapin
2-1/4	4	7A	Maitland group { Maitland
3A	3	7B	Maitland group { David
3	2	8	Emery
4	1	9	9
4-1/2			
	Powder House		
Eska group	Eska group	Eska group	Eska group
		Thin bed	Eska
		10	Shaw
		Thin bed	Martin
			New?
Little Eska group	Little Eska group	Little Eska group	Little Eska group

Evan Jones Mine, Jonesville, Alaska

The Evan Jones mine, which is the only producing mine in the Matanuska field, is on the Matanuska branch line of the Alaska Railroad at Jonesville, Alaska. There also is an automobile highway that extends from the mine to the Glen Highway. Jonesville is approximately 17 miles east of Palmer by highway and about 58 miles from Anchorage via Palmer. These roads can be traveled the year around, and, although 36 inches of snow may fall, both the highways and railroads are kept passable. The railroad operates on a daily schedule from Anchorage to Jonesville 6 days a week, and a bus line operates from Palmer to Jonesville.

The output of this mine, which is the largest coal mine in Alaska, came from two coal beds, No. 5 and No. 3. Mining in No. 5 coal bed was discontinued about July 1, 1946. The ash content of No. 5 coal is above 20 percent, and the impurities are difficult to remove by washing.[12] The strata overlying this bed are weak and difficult to support. The high ash content of the coal and the condition of the mine roof were factors leading to the abandonment of operations in this bed. The ash content of No. 3 coal is under 20 percent and roof conditions in the mine are better than in No. 5 bed.

12/ Work cited in footnote 9.

No. 3 coal bed is near the top of the Chickaloon coal formation and approximately 150 feet below the overlying Eska conglomerate.

No. 4 coal bed, which is approximately 50 feet above No. 3, has been mined in the south-limb workings and is reported to have been less than 4 feet thick. No. 5 bed is approximately 275 feet stratigraphically below No. 3 bed.

The mine opening is a single drift driven in rock at water level (see fig. 2). This drift passes through 300 feet of glacial drift and approximately 400 feet of rock and then penetrates the south limb of the coal-bearing formations of the syncline, which extend for about 800 feet. Six coal beds were found in this limb of the syncline: the 00, 0, 1, 2, 3 and 4. The main drift then extends approximately 800 feet north in rock to the coal formations in the north limb of the syncline. A crosscut was turned west off the main drift, where the coal-bearing formations were found, and was driven about 400 feet in rock to the No. 3 coal bed west of the Jonesville fault. The crosscut to the No. 5 bed was turned to the west off the main drift about 500 feet inby the crosscut to the No. 3 bed and was driven about 100 feet in rock, where No. 5 coal bed was encountered west of the Jonesville fault. The other coal beds cut by the main drift as it was driven north across the north limb of the syncline and the approximate interval between the beds as measured in the main drift are as follows: No. 6 - 100 feet inby No. 5; No. 7 - 100 feet inby No. 6; No. 8 - 300 feet inby No. 7; No. 9 - 160 feet inby No. 8; and No. 10 - 240 feet inby No. 9. The main drift was stopped 350 feet inby No. 10 bed. The strata between coal beds comprise shaly claystone, sandstone, and siltstone. The dip of the beds in the south limb of the syncline ranges from 11 to 30 degrees north. All minable coal has been extracted in the beds in the south limb of the syncline east of the Jonesville fault. This fault crosses the main adit about 1,400 feet north of the mine workings in the south limb.

The sequence of the beds in the north limb of the syncline is 4, 3, 2, 1, 5, 6, 7, 8, 9, and 10. The dip of these beds ranges from 25 to 35 degrees south. The coal in bed 8 was developed for about 4,700 feet west along the strike of the bed, and about 50 percent of the coal above water level was extracted. Mining in this bed was discontinued in 1942. Beds 5 and 6 were developed for approximately 2,700 feet west along the strike, and part of the coal was extracted. Mining in No. 6 bed was discontinued in 1945 and in No. 5 in 1946.

Present production is from operations in the No. 3 bed in the north limb of the syncline. The thickness of the bed ranges from 8 to 12 feet. A section of this bed, measured in the No. 8 chute, main gangway, at 18 crosscut, follows:

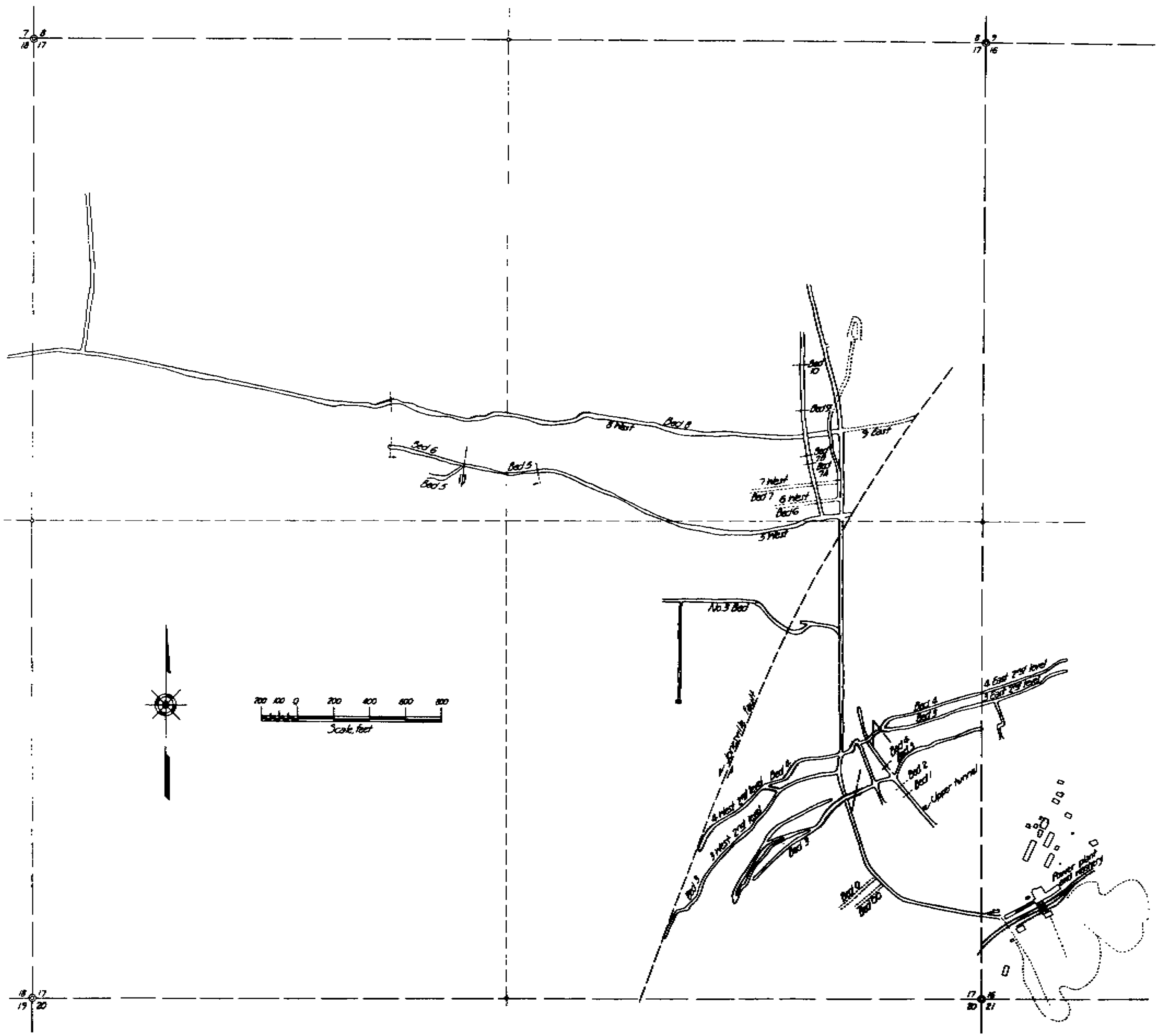

Figure 2. - General development map, Evan Jones Coal Co. mine, Jonesville, Alaska.

Description	Thickness Ft.	Thickness In.
Roof - claystone	2	
Roof coal	0	5
Hard claystone	0	1
COAL	1	5
Hard claystone	0	1/2
COAL	0	4
Fine sandstone parting	0	1/2
COAL	1	1
Siltstone, thin coal stringers	0	2
COAL	0	5
Siltstone, occasional coal stringers	0	8
COAL	2	5
Hard claystone lense	0	1/2
COAL	0	5
Claystone lense	0	1/2
COAL	0	7
Bottom coaly claystone (upper contact breaks well)	1	
Bed thickness	8	1
Coal thickness	7	1

The dip of the bed averages 35 degrees in the present workings. The chute-and-pillar system of mining is used. The haulage entry (gangway) is driven on the strike of the bed, partly in the footwall, so that the bottom of the bed is at car height. The entry is driven 8 to 10 feet wide and about 8 feet high. Three-piece timber sets are used to support the roof where necessary. The airway (counter) is 60 feet up the rise from the gangway. Rooms are turned on 50-foot centers and driven 10 feet wide and about 5 feet high up the rise on advance for a distance of about 1,100 feet. A block comprises five rooms. Crosscuts between rooms are on 50-foot centers. After the room has been driven to its limit, the upper 3 to 7 feet of the bed and pillars are extracted on retreat. Pillars are extracted by taking off successive angle slabs. The coal flows by gravity to a chute on the haulageway.

Blast holes are drilled with pneumatic drills, and the holes are charged with permissible explosives, tamped with sand stemming, and detonated electrically.

Rooms are advanced by one man, and two men are used in a place in retreat mining. At the time the mine was visited (July 1946), the entire production was from pillars, one gangway, and counter.

Six-ton storage-battery locomotives and steel drop-bottom cars with a capacity of 3 tons each are used in transporting the coal from the working places to the tipple.

Ventilation is provided by a propeller fan with a capacity of 40,000 cubic feet per minute. The fan is operated blowing, and the intake of the ventilation system is on the gangway. The air passes from the gangway to rooms, travels through the counter, and is exhausted through a room driven to the surface. There is a steam-driven, 60- by 36-inch, centrifugal fan for emergency use.

The production of the mine, which averaged 326 tons per day in June 1946, is prepared in a preparation plant. The plus 3-inch coal is hand-picked, and the minus 3-inch is washed in a jig type washer. (See fig. 3.) The coal is used by the Army, railroad, and residents of Anchorage.

Power is generated at the mine by a 300-kw., 440-volt, 3-phase, 60-cycle, alternating-current, steam turbine generator. There are two 70-kw., 440-volt, 3-phase, 60-cycle, Diesel-driven generators for emergency use.

The life of the mine, from present development, is estimated at 3 to 5 years.

Eska Creek Area

The limited life of the Evan Jones mine from present development emphasized the necessity of determining a location for another bituminous coal-mine site that could be developed in minimum time. The geology of an area east of Eska Creek in sections 10 and 15, T. 19 N., R. 3 E., had been studied by Tuck, Barnes, and Byers, U. S. Geological Survey geologists, and the report on this area was published.[13] This area is adjacent to the surface plant of the abandoned Eska mine, which includes a modern washery, power plant, and shops, arrangements for the use of which possibly could be made with the present owners of the Alaska Railroad. Barnes and Byers estimate that a potential reserve of 4 million tons of bituminous coal underlies the area. The reconnaissance indicated that the dip of the beds on the north limit of the syncline are favorable for mechanized mining, and this area was recommended for detailed investigation. The minable reserves and physical conditions in and surrounding the coal beds can be determined only by diamond drilling, and, as the estimated cost of this investigation was within the funds available, diamond drilling in this area was undertaken late in the fiscal year 1947 and was continued into 1948.

Should the investigation by diamond drilling prove minable reserves sufficient for the development of another mine in the Matanuska Valley, this reserve would be a potential emergency source of coal. As only the Evan Jones mine is producing bituminous coal for Alaska Railroad locomotives, a reserve source is essential to augment the supply while a modern mine is being developed in Wishbone Hill southwest of Jonesville. The Eska area investigation was undertaken to utilize the at present idle Alaska Railroad mine plant at Eska.

13/ Work cited in footnote 11.

Figure 3. - Surface plant Evan Jones mine.

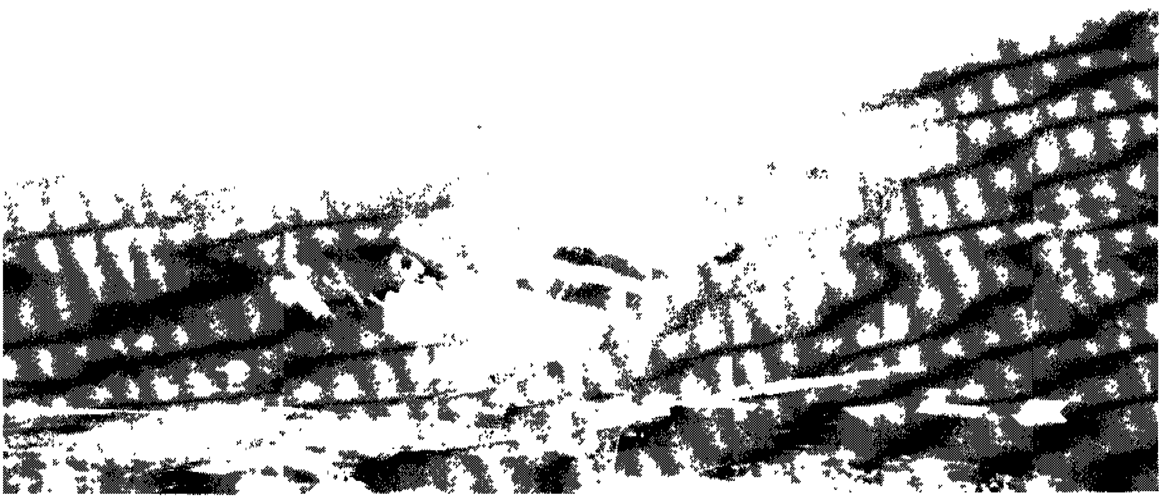

Figure 4. - Suntrana mine, Suntrana, Alaska.

Wishbone Hill, Southwest of Jonesville

Reconnaissance of an area in Wishbone Hill southwest of the Evan Jones mine indicates that there are no major faults and that the sequence of the coal beds is normal for a distance of about 20,000 feet west of the Jonesville fault in the Wishbone Hill syncline. The geology of this area has been studied and described by Barnes and Byers, geologists of the U. S. Geological Survey.[14] The workings in the No. 8 bed, which are in the north limb of the Wishbone Hill syncline in the Evan Jones mine, were developed for approximately 4,700 feet west of the Jonesville fault without encountering any major faults.

There has been no development, nor have the outcrops been traced, in the south limb of the syncline west of the Jonesville fault. The outcrops on this limb of the syncline are covered by glacial drift and slide rock. The Eska conglomerate, which overlies the coal-bearing Chickaloon formation, is probably about 1,700 feet thick in the central part of the syncline, but on the south limb this conglomerate has been eroded by glaciation, and intermittent streams have cut gorges into the conglomerate and decreased the thickness at these places. The glaciation of the Eska conglomerate has formed a steep escarpment, and the contact of the Chickaloon formation is near the base of this escarpment.

The necessity for developing a large modern mine in the Matanuska field is imperative. Loss in production at the Evan Jones mine can be offset partly by the development of a mine east of Eska Creek, should the investigation now in progress in that area prove minable reserves. However, the extent of this deposit is known to be small. The life of a mine east of Eska Creek will be very limited, and additional sources of bituminous coal should be investigated by diamond drilling.

The area suggested for investigation is centered approximately in the NE1/4SE1/4 sec. 19, T. 19 N., R. 3 E. This area is accessible by following ridges of glacial moraines from the Jonesville road to a ridge between the escarpment and two lakes. Roads could be built without difficulty on these ridges.

It is estimated that holes drilled south of and adjacent to the escarpment and the gulches would penetrate the coal beds at an average depth of 1,000 feet. The entire series of coal beds probably would be penetrated at a maximum depth of 1,500 feet. It is indicated that the lower beds of the Jonesville group, except the No. 8 bed but including beds 9 and 10, or the Eska group, decrease in economic value to the west, and the No. 8 or Emery bed could be established as the basal formation.

Development of minable reserves southwest of Jonesville is desirable for the future development of the Matanuska coal field. The Matanuska Valley branch line of the Alaska Railroad will not serve a new mine site adequately on Wishbone Hill. The present line, which follows the Matanuska River from Palmer to Sutton, is subject to washouts, and maintenance costs are extremely

14/ Work cited in footnote 11.

high. The capacity of trains is limited by steep grades between Sutton and Jonesville. Should an investigation determine minable reserves sufficient for the development of a large mine in Wishbone Hill, the relocation of the Matanuska branch line from Palmer to Jonesville on higher ground would be justified and would obviate the hazard of washouts and the steep grades now existing on this line. This new location also could serve mines that might be developed on Moose Creek.

Healy River District, Nenana Coal Field

The Nenana coal field is in the northern foothills of the Alaska Range adjacent to the Nenana River and the main line of the Alaska Railroad. The southern part of the area is drained by the Healy River and the northern part by Lignite Creek. Both streams are tributaries of the Nenana River.

The geology of the field has been described by Martin[15] and Wahrhaftig.[16] Briefly, the beds of subbituminous coal and lignite occur in the area, which is characterized by the absence of extreme structural disturbances and igneous intrusions. The thickness of the beds ranges from 6 to 50 feet, and dips of 10 to 70 degrees are present.

The coal beds are exposed along the banks of Healy Creek for about 12 miles. Both banks of this stream are formed by coal outcrops, which are 20 to 50 feet above the bottom of the stream. The No. 1 bed is the north bank of Healy Creek for a distance of 4 miles east of Suntrana. An area approximately 6 miles upstream from the Suntrana mine was investigated by the Bureau of Mines, and the results of this investigation have been published.[17]

Suntrana Mine, Suntrana, Alaska

The Suntrana mine (see fig. 4) of the Healy River Coal Corp. is on the north bank of Healy Creek approximately 112 miles south of Fairbanks and 244 miles north of Anchorage. A branch line of the railroad approximately 4-1/2 miles long extends from Healy to the mine.

The main opening is a drift driven at water level through rock. This drift intersects the various coal beds, which outcrop on the surface and dip approximately 18 to 28 degrees north. In ascending order, the coal beds are Nos. 1, 2, 3, 4, 4A, 4B, 5, and 6. The beds considered minable are Nos. 1, 2, 3, 4, and 6. Some mining has been done in No. 5, but the hanging and footwall are soft material and difficult to support and made mining difficult and costly. The coal beds, in descending order below No. 1 bed, are G, F, to A. The F bed has been developed from a rock drift, which is upstream from the

15/ Martin, G. C., The Nenana Coal Field: U. S. Geol. Survey Bull. 664, 1919, 54 pp.

16/ Wahrhaftig, Clyde, and Friedman, Jacob, Coal Deposits in the Valley of the Healy River, Alaska: U. S. Geol. Survey Mimeograph Report, 1946.

17/ Marstrander, H., Apell, G. A., Rutledge, F. A., and Hulbert, J. H., Exploration of Leasing Block No. 28 in the Nenana Coal Field, Alaska: Bureau of Mines Rept. of Investigations 3951, 1946, 21 pp.

main opening. The thickness of the beds encountered in the rock drifts is:

Bed	Thickness, feet
1	50
2	29
3	23
4	12-15
6	30
F	20

The mine was opened in 1921, and mining has been done underground in most of the beds. At the time the mine was visited (July 1946), mining was confined to No. 3 bed. A fire in this bed necessitated sealing it with concrete at the entry and constructing sand seals inby the fire. The sand seals were constructed by mining the coal and caving the sand in the overlying strata. The No. 3 bed has been developed inby the seal by driving a crosscut from the gangway in No. 4 bed to No. 3 bed and advancing the gangway along the strike of No. 3 bed. Rooms are turned on 50-foot centers and driven 8 feet wide by 8 feet high up the pitch for about 200 feet. Crosscuts between rooms are on 50-foot centers. After two rooms have been developed, the pillar between rooms is split by driving a room 8 feet wide by 8 feet high. Extraction of the full thickness of the bed begins at the face of the room by taking successive cuts off the pillar at about 45 degrees and mining the top coal in rooms. Batteries constructed of timber are built about every 35 feet. Coal is drawn into chutes from the battery until a high percentage of cave rock appears. Broken coal is drawn from the rooms at a rate that will provide height for the men working on the roof coal. Approximately 2 feet of top coal is left to support the overlying sand during mining. This top coal falls later. The coal is not cut and is shot off the solid after being drilled with hand-held electric auger drills and blasted with permissible explosive detonated by fuse and cap.

Usually, the gangways are driven on the strike of the bed to the property line, and extraction is on the retreat. Electric hoists are used in the rooms to transport timbers and supplies to the faces.

The coal passes by gravity in steel-lined chutes to steel, drop-bottom cars in the entry. Loaded trips are transported to the tipple by storage-battery locomotives. The coal is hand-picked and screened to produce 6-inch lump, nut, and slack coal. The principal consuming area is Fairbanks and vicinity.

Ventilation is provided by an electrically driven propeller-type fan with a capacity of 60,000 cubic feet per minute.

The coal, which is subbituminous, is subject to spontaneous combustion, and a number of underground fires have occurred. These fires have been sealed with sand barriers.

Usibelli Strip Mine

The Usibelli strip mine is on the north bank of Healy Creek, about 2-1/2 miles east of Suntrana, Alaska. (See figs. 5 and 6.) Healy Creek is a glacial stream that floods during the spring thaw, spreads over the glacial gravel bar, and softens the low road. There are two haulage roads from Suntrana to the mine - one on the low gravel bar for summer and fall use, and one on the higher creek bank for winter and spring use. In the summer, the high-level road is soft, but in winter, when frozen, it is a good, solid road. The two roads do not extend the entire distance to the mine; they are used for the first mile east of Suntrana. A rail siding was built by extending the main track east, passing the Healy River Coal Corp. tipple tracks at Suntrana. This siding holds about 10 mine cars and parallels a hogback ridge 200 to 300 feet wide and 75 feet high, which comprises more resistant sediments and forms a short gorge in Healy Creek. The gorge is passable by fording the stream with tractors and trucks but is not suitable for continued use. The haulage road terminates in a "Y" on top of the hogback ridge, and trucks dump into a loading chute that extends from the top of the ridge to the rail cars on the siding. There is no storage except in rail cars.

The Usibelli strip mine is operating on an Army-free permit, and all coal produced is consigned to the Army. The 1946 Army contract purchases 70,000 tons of coal, with provision to increase the contract. The coal is produced from the No. 1 coal bed, which is 35 feet thick at this mine. The strike is east-west, paralleling Healy Creek, and the dip ranges 20 to 30 degrees north. The coal bed is on the north bank and is mined down the dip to water level. A Diesel-powered shovel is used for loading coal, which is done on a single-shift basis. Stripping in advance of loading is done with bulldozers and by hydraulicking, which slushes the fine sediments into Healy Creek on a 24-hour, three-shift basis. The coal bed is uncovered well in advance of mining and it is estimated that half of this year's production is uncovered (July 1946).

Future development will be toward the east following the coal bed. Portable buildings constructed in sections and bolted together have been erected at the present mine site. The portable buildings include a central heating plant, central light plant, boarding house, bunk house, shop, and office. As operations advance to the east, it is planned to extend the road and move the portable camp eastward. Eventually, mining will reach Coal Creek and Leasing Block 28, 8 miles east of Suntrana, which has been described.[18]

The Usibelli stripping is in good operating condition, and if the eastward advance along the outcrop continues, a dependable source of coal will be developed.

Previous outcrop trenching by the Mining Branch of the Bureau of Mines in Leasing Block 28 and mapping by the U. S. Geological Survey indicate enough minable reserves for these stripping operations in this area, and no investigation by diamond drilling at this time to determine minable reserves here is

18/ Work cited in footnote 17.

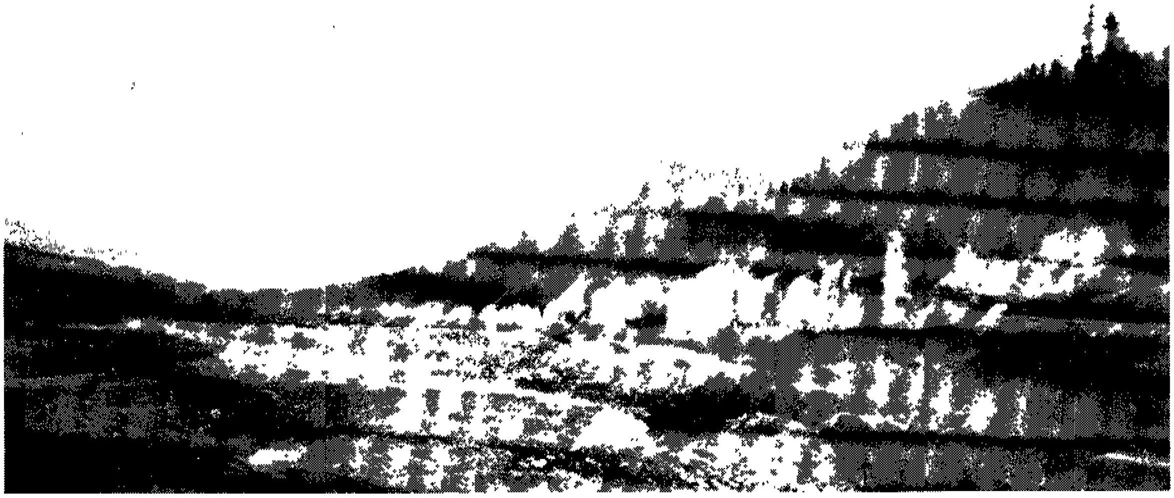

Figure 5. - Usibelli Strip mine, Healy Creek, Alaska.

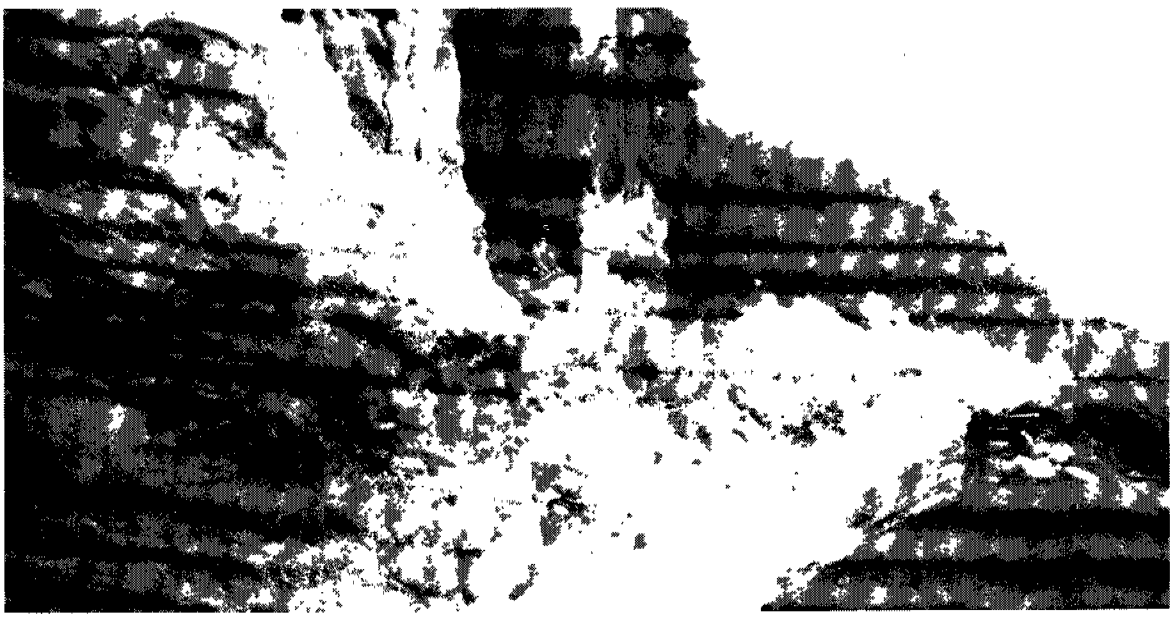

Figure 6. - Hydraulicking Usibelli mine, Healy Creek, Alaska.

recommended. No attempt has been made to mine the coal beds below the level of Healy Creek, and this additional coal is available for future development.

Diamond Strip Mine, Healy, Alaska

The Diamond strip mine is about 5 miles S. 52° W. of Healy, Alaska. The Alaska Railroad has constructed a rail siding to the mine loading ramp, which is approximately 1 mile north of the Healy railroad station. Healy is 112 miles south of Fairbanks and 244 miles north of Anchorage. A truck haulage road has been constructed from the car-load ramp to the mine. The road follows glacial moraines and is subject to temporary closure by drifting snow in winter.

Production in 1946 was 34,911 tons and came from a 40-foot coal bed that strikes S. 62° W. and dips 33 degrees northwest with the slope of the hill. Overburden has been removed with a Diesel power shovel and bulldozers. The coal is loaded with a Diesel power shovel. Approximately 50 feet of clay and glacial drift will be encountered in the next cut. The strip area was not properly prepared for mining. Overburden on the first strip-cut was cast downhill and necessitates rehandling of the spoil when subsequent cuts are made.

Future development as a strip mine at the present site is limited by the greater thickness of overburden and inadequacy of equipment. Trenches and exploration cuts west of the present mine site indicate continuation of the coal bed in that direction. Further exploration is recommended to the present leaseholders to outline future mining. Investigation by diamond drilling in this area by the Bureau of Mines at this time is not recommended.

Lignite Creek Area

There is a large reserve of Tertiary coal-bearing formation along Lignite or Hoseana Creek. Current and past investigations by the U. S. Geological Survey indicate duplication of structural conditions and occurrence of coal found in Healy Creek. This area will be described in a forthcoming report by the Geological Survey. Lignite Creek is east of the Nenana River and Alaska Railroad, which is on the west bank of the Nenana River. The area can be made accessible to rail transportation by the construction of a railroad bridge and spur into Lignite Creek. This potential source of coal is amenable to development, and the railroad is essential for transportation. The coal in the Lignite Creek area should be considered in the development of a source of coal for the proposed cement plant.

Jarvis Creek Area

The Jarvis Creek area comprises about 12 to 15 square miles of Tertiary coal-bearing formations east of Donnelly, which is on the Richardson highway and the east bank of the Delta River. The center of this area is about 5 miles east of Donnelly. Donnelly Dome, which is about 12 miles north of Donnelly, is a prominent landmark. The area is described briefly by Moffit.[19] A tractor trail begins at Mile Post 244 on the Richardson Highway about 120 miles south of Fairbanks. This trail continues east to Ober Creek and then southeast to Jarvis Creek and Little Gold Creek. An older tractor trail begins about 2 miles south of Mile Post 244 and crosses a ridge south of the headwaters of Ober Creek, thence to Jarvis Creek, and ends at Riley Creek. Both trails are circuitous and pass east along the north boundary and south along the east boundary of the Tertiary coal-bearing formation. The area is 5 miles long north and south and 3 miles wide east and west. It extends 4 miles up the west bank of Little Gold Creek and 3 miles down the west bank of Jarvis Creek from their junction and then approximately 3 miles west. The Tertiary coal-bearing formation is exposed best in the west fork of Little Gold Creek and an unnamed creek 1 mile west of Little Gold Creek. This formation is first encountered in the west side of a low ridge 3 miles east of Donnelly and rises on a gentle slope to a high escarpment cut by the unnamed creek and the west fork of Little Gold Creek. The physical features indicate a monoclinal structure with a northeast strike and a northwest dip. The outcrop of alternating beds of coal, claystone, poorly consolidated or only slightly indurated sand, and clay on the west bank of the unnamed creek contains an 8-foot coal bed and several 4-foot coal beds. The occurrence of an 8-foot coal bed indicates an area of coal. The extent of the deposit can be determined only by diamond drilling. Charles Hickox and F. F. Barnes, geologists of the U. S. Geological Survey, were verifying the interpretation of the geology of this area, and no detailed measurements of sections were made. The area is cut off on the south by the Birch Creek schist, and the northwest dip was probably caused by the subsequent elevation of the Alaska Range after deposition of the coal-bearing formation. The area evidently is an erosional remnant of coal formation in a basin in older rocks that is bounded on the south and east by older rocks and covered on the west and north by morainal gravel, in which older rock outcrops are found as islands. These islands of older rock and the morainal beds also indicate the edge of the basin. Jarvis Creek has eroded into the basin, and the remnant of coal-bearing formation becomes the south segment and has monoclinal structure. There were no exposures in which south-dipping beds were observed.

The most readily accessible and most uniform structure for development is on the west bank of the unnamed creek. The outcrop of an 8-foot coal bed can be traced for approximately 1 mile and inferred for 1/2 mile down the dip. A potential reserve of about 4 million tons of coal is inferred in this bed. The area could be developed in an emergency after the construction of 10 miles of new road. The haul to Fairbanks then would be about 135 miles.

19/ Moffit, Fred H., Geology of the Gerstle River District, Alaska: U. S. Geol. Survey Bull. 926-B, 1942, pp. 107-160.

Section of bed in Jarvis Creek area and proximate analysis, as-received basis.

Description: Outcrop at head of small creek entering Jarvis Creek a short distance below Little Gold Creek.

	Ft.	In.
X Shale	3	0
COAL	4	6
X Shale		8
COAL	1	0
X Shale		
Thickness of coal	5	6
Thickness of bed	6	2

X = excluded from sample.

	Percent
Moisture	23.0
Volatile matter	39.8
Fixed carbon	24.1
Ash	13.1
Sulfur	1.4
B.t.u.	7,815

Description: Outcrop at elevation, 3,780 ft. N. 70° W. of forks of Little Gold Creek. (See plate 3, U. S. Geol. Surv. Bull. 926-B.)

	Ft.	In.
X Sandstone	25	
X COAL	1	6
X Shale	1	1
COAL	6	3
X Sandstone		6
X Shale, thin coal		
Thickness of coal sample	6	3
Thickness of bed	8	10

X = excluded from sample.

	Percent
Moisture	20.0
Volatile matter	43.4
Fixed carbon	25.8
Ash	10.8
Sulfur	.4
B.t.u.	8,645

Description: Outcrop elevation, 3,750 ft. N. 69° W. of forks of Little Gold Creek. (See plate 3, U. S. Geol. Surv. Bull. 926-B.)

	Ft.	In.
Sand		
COAL	4	10
Shale, little coal		
Thickness of coal	4	10
Thickness of bed	4	10

	Percent
Moisture	20.6
Volatile matter	38.9
Fixed carbon	35.3
Ash	5.2
Sulfur	.4
B.t.u.	9,415

Mt. McKinley Park Area

There are several small and irregular isolated coal areas in the vicinity of Mt. McKinley Park. The coal beds are found in two geologic periods - the Cantwell formation of the Cretaceous period and the coal-bearing formation of the Tertiary period. There has been no sustained production of coal from the Cantwell formation, but it has been prospected and tested near the Alaska Railroad. The following areas were investigated in 1946:

1. In the vicinity of Mile Post 341.
2. On Riley Creek west of Mt. McKinley Park station.
3. At the headwaters of the east form of Moose Creek and Boundary Creek.
4. Between the west fork of Stoney Creek and the east fork of Moose Creek.

Mt. McKinley Bituminous Coal Mine, Yanert, Alaska (Also known as Yanert Mine) (See Fig. 7.)

This mine, which is about 6 miles south of Mt. McKinley Park station at Mile Post 341 on the Alaska Railroad, was in operation about 1915 and has been abandoned. The main entry is about 1,200 feet west and about 400 feet above the Alaska Railroad track. An old sketch plan shows that the main gangway entry was driven along the strike for a distance of 700 feet. At approximately 100 feet inby the portal, Counter No. 1 was turned up the dip and driven 54 feet, where the counter was turned to follow the strike of the bed. Seven chutes were driven from the main gangway to the counter. The first chute was driven to the surface for ventilation. Chutes 4, 5, and 6 were driven up the dip from 50 to 100 feet above the counter. Production was small, but one railroad car was shipped to Nenana and tested in the steam plant. It was reported that the test proved the coal to be unsatisfactory because clinker was formed, which covered the entire grate in the boiler. The entry had caved at the portal and was not open in 1946. The sketch of the mine shows a branch

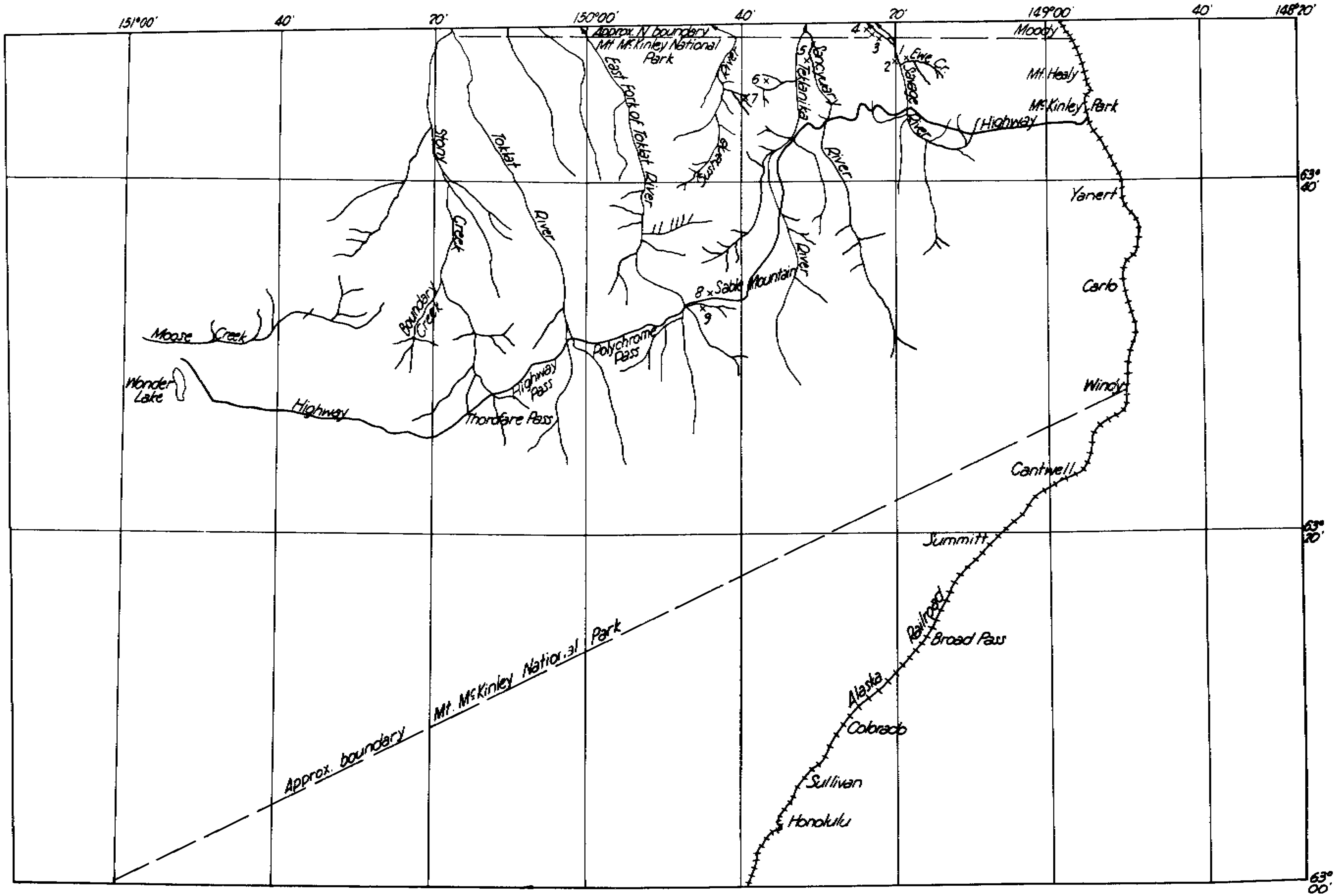

Figure 7. - Area adjacent to north boundary McKinley National Park.

in the main gangway 500 feet inby the portal and also a curve in the counter, which indicates a faulted, folded, or abnormal condition. The probable strike is indicated to be S. 70° W. and the dip from 40° to 60° North.

A caved surface prospect pit, which showed coal in the dump, was found about 1/2 mile west of the main entry on top of the first ridge. The outcrop of the bed was concealed. The outcrop of the roof rock was nearby, and this rock was classified as a felsitic dacite of igneous origin and therefore intrusive, subsequent in age, and likely to cut across the bedding of the older sedimentary coal beds.

Coal bloom was observed 1-1/2 miles west and 2 miles east of the main entry on the east and west sides of a north-south gulch. The actual outcrops were not uncovered, and the bloom was intermittent and covered by recent surface erosion.

The surface outcrops were highly weathered, but a general structural trend was indicated in an east-west direction. The coal formation was identified as Cantwell formation of Cretaceous age, which generally comprises thin coal beds, sandstones, gray claystone, black claystone, and conglomerates. None of the thin coal beds appear to be minable, and no mining is known in the Cantwell formation in this locality.

In the vicinity of Mile Post 342, a black claystone with thin streaks of coal 1/8 inch thick was observed. From a distance, the outcrop appears to be coal, but upon close examination no coal of commercial importance was found.

The Mt. McKinley bituminous coal mine dump consisted chiefly of coal and coaly claystone, which was extracted during the development of the gangway, counter, and chutes in the mine. The dumps were large and indicated a thick parting of claystone. A grab sample of this coal and coaly claystone was taken, and the analysis, as-received basis, follows:

	Percent
Moisture	14.4
Volatile matter	19.8
Fixed carbon	39.9
Ash	25.9
B.t.u.	9,570

The Yanert mine or Mt. McKinley bituminous coal mine has the following description in "Analyses of Alaska Coals":20/

Analyses 94166 to 94169 (p. 30). Medium volatile bituminous and weathered coals, Mount McKinley National Park district, from Yanert mine, 1 mile from Yanert siding. The bed was sampled at three points by J. A. Davis (U.S.B.M.), August 8, 1923.

20/ Bureau of Mines, Analyses of Alaska Coals: Technical Paper 682, 1946, p. 75.

Sample 94166 (weathered) was a grab sample taken in upper counter. Sample 94167 was taken at breast of main tunnel 420 feet from portal, and Sample 94168, at breast of counter 380 feet from portal.

	Analysis			
	94166	94167	94168	94169 (composite 94166-68)
Moisture	7.7	4.2	5.9	5.0
Volatile matter	11.4	24.2	18.6	21.0
Fixed carbon	64.7	59.7	56.8	58.8
Ash	16.2	11.9	18.7	15.2
Sulfur	.7	.4	.4	.4
Hydrogen	-	-	-	4.2
Carbon	-	-	-	67.4
Nitrogen	-	-	-	1.0
Oxygen	-	-	-	11.8
B.t.u.	11,050	12,180	10,590	11,350
Initial deformation temperature, °F.	2,110	2,280	2,190	-
Softening temperature, °F.	2,390	2,510	2,390	-
Fluid temperature, °F.	2,450	-	2,510	-

Riley Creek

Riley Creek is south and west of McKinley Park station. A small production of blacksmith coal was reported from this area around 1915. The Cantwell coal formation is present. Thin stringers of coal and blackstone were observed. Production from this area was very small, and no activity has been reported since 1915.

Moose Creek and Boundary Creek

The east fork of Moose Creek, Boundary Creek, and the west fork of Stoney Creek all have their headwaters in the same general area, which is about 10 miles northwest of Highway Pass on the Mt. McKinley Park highway. There are isolated outcrops of Cretaceous Cantwell coal formation in this general area. The divide separating these creeks is partly covered with recent gravel, but outcrops of coal bloom were found on the east fork of Moose Creek and Boundary Creek. The general attitude of the beds is approximately vertical with an east-west strike. The coal bloom could not be traced continuously along the strike, though small disconnected bloom showings were observed. There were no distinct outcrops or prospects. There was much surface slumping, which also obscured the trace of the bed. However, marmots and ground squirrels had dug up coal in their burrows. The adjacent area on the headwaters of Stoney Creek was of like nature, and no minable coal was observed. The area is inaccessible and of no commercial value.

Tertiary Coal-Bearing Formation (Nenana)

The coal-bearing formation of the Tertiary age extends westward from the Alaska Railroad belt for 25 to 30 miles along the north boundary of Mt. McKinley

Park. There are several small areas of coal-bearing formation within Mt. McKinley Park. Many of the outcrops were visited, sections were measured, and coal beds sampled. The coal-bearing formation outcrops are most complete and typical along Healy Creek in the vicinity of Suntrana, where a stratigraphic thickness of 1,900 feet has been measured and described as consisting of little consolidated, poorly consolidated, or only moderately indurated, gravel, shale, claystone, sand, and subbituminous coal beds. The coal beds in the Tertiary coal-bearing formation are classified subbituminous C and have been mined for many years along Healy Creek, where they are thick enough for development and where they are within 5 miles of the railroad. The coal-bearing formation was lain in basins or fresh-water lake areas on the unconformable surface of the pre-Cambrian Birch Creek schist. The basal beds of the coal-bearing formation consist of several hundred feet of smoothly rounded pebbles of chert and white quartz in a matrix of white sand and kaolinitic material with a conspicuous white color that readily identifies the base. Above the white basal gravel are alternating beds of claystone, clay, sand, and coal. Conformably above the coal-bearing formation is found the thick Nenana gravel and also irregular recent gravel of Quaternary age. The area investigated along the north boundary of Mt. McKinley Park includes the valleys and gorges of the Savage, Sanctuary, Teklanika, and Sushana Rivers. The general trend of these rivers is north and south, and they have east and west tributaries that have north and south tributaries, but all of these rivers flow from south to north away from the Alaska Range glaciers and snow banks. The coal-bearing formation within Mt. McKinley Park outcrops in small structural basins along the McKinley Park highway and is found mostly along the Toklat River and tributaries. Two of the structural basins are separated by an outward range of low mountains of the main Alaska Range. The low mountains are erosional remnants of pre-Cambrian Birch Creek schist in which the drainage pattern was formerly east and west, but elevation and formation of the Alaska Range in late Tertiary time after deposition of the early Tertiary coal-bearing formation changed the drainage pattern to north and south. This change has developed the gorges and river valleys of the present time. Deformation of coal beds was greater along the McKinley Park highway, and steeper dips are found there. Deformation is less along the north boundary of Mt. McKinley Park, and the dips are less.

The areas along the Mt. McKinley Park highway are most accessible but subject to National Park regulations pertaining to preservation of scenic features. The area along the north boundary of Mt. McKinley Park is accessible on foot or horseback. Horses are scarce, and foot travel is commonly used, though supplies can be taken in by pack train, and personal gear can be carried in back packs. One trail starts at Lignite and follows ridges west and is known as the old Cantishna trail. A second trail starts from the McKinley Park highway and follows the Savage River through the gorge to the boundary and is known as the Savage River trail. Horses are available at Lignite, and pack trains use the Cantishna trail. Foot travel is best via the Savage River trail. Transportation is available to the beginning of the Savage River trail. There is a choice of routes along the north boundary of McKinley Park. Two base camps were used. The Park Ranger shelter cabin was used as one base camp, and the second base camp, which was taken in by pack trains, set up on the

Teklanika River. Spike camps, or temporary shelters, were back-packed from the base camps and set up near areas that were to be studied.

North Boundary of Mt. McKinley Park

The area along the north boundary of Mt. McKinley Park includes the Savage, Sanctuary, Teklanika, and Sushana Rivers. Sections of coal beds in the Tertiary coal-bearing formation were measured in an area about 3 miles north and south and 15 miles east and west.

Savage River. - The outcrops along the Savage River are on the eastern side of the area. The following section of coal-bearing formation was measured on the north bank of Ewe Creek, three-tenths mile east of the Savage River and 2-1/2 miles south of the north boundary of Mt. McKinley Park (see fig. 7, loc. 1), approximate elevation 2,400 feet, strike N. 50° E., dip 12° NW.

Description	Thickness Ft.	Thickness In.
X Terrace and stream gravel (Quaternary)	1-20	+
COAL (analysis C-64425)	7	10
X Poorly consolidated sand	20	+
X Coal and coaly claystone	2	0
X Covered, sand and gravel (Quaternary)	2	+

Members marked (X) excluded.

Analysis C-64425, as-received basis:

	Percent
Moisture	26.3
Volatile matter	35.1
Fixed carbon	25.1
Ash	13.5
Sulfur	.4
B.t.u.	9,850

Birch Creek schist, which underlies unconformably the coal-bearing formation and cuts off this formation, outcrops on the south bank of Ewe Creek 100 feet from this section.

The following section of coal-bearing formation was measured on the west bank of the Savage River, 2 miles south of the north boundary of Mt. McKinley Park, 1/2 mile north of the mouth of Ewe Creek (see fig. 7, loc. 2), approximate elevation 2,300 feet, strike N. 50° E., dip 15° NW.

Description	Thickness Ft.	In.
X Terrace gravel (Quaternary)	50	+
COAL (analysis C-64424)	13	1
X Poorly consolidated sand	1	+
X Covered with terrace gravel (Quaternary)		

Members marked (X) excluded.

Analysis C-64424, as-received basis:

	Percent
Moisture	31.5
Volatile matter	36.4
Fixed carbon	28.0
Ash	4.1
Sulfur	.1
B.t.u.	7,530

The following section of coal-bearing formation was measured on the west bank of the Savage River 500 feet north of the north boundary of Mt. McKinley Park (see fig. 7, loc. 3), strike N. 60° E., dip 15° S.

Description	Thickness Ft.	In.
X Sand and gravel	25	0
X Claystone	1	+
COAL (analysis C-64423)	13	6
X Bottom, not exposed, coal bed 13' 6" plus.		

Members marked (X) excluded.

Analysis C-64423, as-received basis:

	Percent
Moisture	28.9
Volatile matter	31.2
Fixed carbon	24.0
Ash	15.9
Sulfur	.4
B.t.u.	6,320

North of this outcrop is an area in which are many slump blocks of coal but no outcrops in place. The general structure is flat-lying monoclinal beds with east and west strike and 10° N. dip, with an anticlinal and then a synclinal roll. Detailed mapping by the Geological Survey will clarify the structure. This slump area continued northward for approximately 1 mile to a cliff exposure of alternating coal beds and poorly consolidated sand, clay, and claystone. The coal beds strike east-west and dip 10° N. The cliff exposure is approximately 1,000 feet long and 100 feet high. The beds were faulted with a 10-foot upthrow on the north side of the fault at about 200 feet from the north end of the exposure. The upper coal bed appeared to decrease in thickness from 6 feet 1 inch to 4 feet 5 inches, which may have been caused by surface erosion, though lenticular coal beds are common.

The following section of coal-bearing formation and three minable coal beds were sampled by going up-dip from north to south along the cliff flanking the Savage River, starting 1 mile north of the north boundary of Mt. McKinley Park on the west bank of the Savage River (see fig. 7, loc. 4), at an elevation of approximately 2,000 feet, strike east and west, dip 9° N.

Description	Thickness	
	Ft.	In.
X Terrace sand and gravel	10	+
X Coal, highly weathered	1	8
COAL (analysis C-64420)	4	5
X Claystone and some fine sandstone	20	0
X COAL	1	8
X Claystone	0	9
COAL (analysis C-64421)	6	0
X Claystone	1	6
COAL (analysis C-64422)	8	8
X Claystone	2	0

Analysis of the above coal beds, as-received basis, follows:

	Analysis, percent		
	C-64420	C-64421	C-64422
Moisture	28.4	27.9	31.5
Volatile matter	33.3	34.4	35.9
Fixed carbon	24.3	23.3	25.6
Ash	14.0	14.4	7.0
Sulfur	.3	.3	.2
B.t.u.	6,740	6,820	7,070

The coal in these samples was weathered to some degree.

Sanctuary River. - The Sanctuary River is approximately 5 miles west of the Savage River and flows through the area along the north boundary of Mt. McKinley Park.

A section of coal-bearing formation was measured along the east bank of the Sanctuary River. Outcrops were exposed in a bank 20 to 50 feet high. The dip of the strata was steep, and several coal beds were exposed. The location of the section is 1 mile south of the north boundary of Mt. McKinley Park (see fig. 7, loc. 5), approximate elevation 2,000 feet. The beds were measured from the top bed on the north to the lower beds on the south, and intervals were measured perpendicular to the dip to give the true interval. The high dips are due to deformation by mountain building on the south and by the uplift of the older pre-Cambrian Birch Creek schist south of the outcrop that occurred after the deposition of the coal-bearing formation.

Section as follows, top, north, measured to south:

	Description	Thickness Ft.	Thickness In.
	Terrace sand and gravel	50	+
	Claystone	1	+
	COAL	3	10
	Covered (claystone and sand)	25	0
	COAL	1	4
	Claystone	0	3
	COAL	0	10
	Claystone	0	5
	COAL	1	3
	Claystone	3	0
	Poorly consolidated sand	12	0
	Claystone	2	0
	COAL (strike N. 65° E., dip 53° N., analysis C-64417).	2	10
X	Sandy claystone with pebbles	0	8
	COAL (dry, partly weathered, analysis C-64417)	2	0
	Claystone	4	0
	COAL	1	8
	Claystone (upper 20 ft. covered)	40	0
	Poorly consolidated sand	20	0
	COAL (dry, partly weathered, analysis C-64418)	4	9
	Micaceous claystone (strike N. 60° E., dip 40° N.)	1	+
	Covered	100	+
	COAL	2	0
	Covered	1	+

Analysis on as-received basis follow:

	C-64417, percent	C-64418, percent
Moisture	28.6	30.9
Volatile matter	35.5	32.4
Fixed carbon	22.7	23.5
Ash	13.2	13.2
Sulfur	.3	.3
B.t.u.	6,810	6,560

Teklanika River. - The Teklanika River is approximately 2 miles west of the Sanctuary River and flows through the area along the north boundary of Mt. McKinley Park.

The following section of coal-bearing formation was measured on the north bank of the west branch of the Teklanika River 2 miles west and 3 miles south of point where the Teklanika River crosses the north boundary of Mt. McKinley Park. (See fig. 7, loc. 6.)

Approximate elevation, 2,250 feet. Section measured from top, north to south.

Description	Thickness Ft.	Thickness In.
Quaternary terrace gravel	10-90	
COAL (No. 4 bed, analysis C-64416)	8	0
Poorly consolidated sand	8	0
COAL (strike N. 70° E., dip 15° N.)	1	0
Poorly consolidated sand	5	0
COAL (No. 3 bed, analysis C-64415)	7	0
Sandy claystone	3	0
Poorly consolidated sand	4	0
COAL	1	2
Poorly consolidated sand	10	0
Claystone with thin coal beds	10	0
COAL (No. 2 bed)	2	1
Claystone	5	0
Poorly consolidated sand and conglomerate, two thin coal beds	30	0
COAL (No. 1 bed)	3	2
Poorly consolidated basal conglomerate	20-90	

Analysis of samples taken in the above section on as-received basis, as follows:

	C-64416, percent	C-64415, percent
Moisture	27.8	28.7
Volatile matter	39.8	36.0
Fixed carbon	26.6	25.6
Ash	5.8	9.7
Sulfur	.2	.3
B.t.u.	7,631	7,150

Sushana River. - The Sushana River, which is the west boundary of the area along the north boundary of Mt. McKinley Park, is 5 miles west of the Teklanika River. This area extends about 15 miles east and west from the tributaries of the Savage River to the tributaries of the Sushana River. The west bank of the Sushana River is mostly Nenana gravel, which overlies the coal-bearing formation.

The following section of coal-bearing formation was measured on the second south tributary of the east tributary 1/2 mile south and 1 mile east of the Sushana River. (See fig. 7, loc. 7.) The east tributary flows into the main Sushana River 3 miles south of the north boundary of Mt. McKinley Park. The approximate elevation where section was measured is 2,950 feet.

Description	Thickness Ft.	In.
Quaternary terrace gravel	50	+
Poorly consolidated sand	20	+
Claystone	2	0
COAL (No. 4 bed (?), analysis C-64419, strike N. 80° E., dip 9° N., dry, partly weathered)	8	8
X Claystone	1	0
Terrace gravel	20	+
X COAL (estimated thickness, 15 ft., exposed 3 ft., covered with stream and alluvial gravel)	3	+

Members marked (X) excluded from sample.

Analysis C-64419 on as-received basis, follows:

	Percent
Moisture	32.7
Volatile matter	37.9
Fixed carbon	23.9
Ash	5.5
Sulfur	.2
B.t.u.	7,090

A continuation of the measured section on this south tributary was observed in the next south branch of the east tributary. The coal beds shown in the following section were in slump blocks, which were deeply covered and badly weathered.

Description	Thickness, feet
Quaternary sand and gravel	50+
COAL	4
Poorly consolidated sand and gravel	20+
COAL	8
Poorly consolidated sand and gravel	25+
COAL	8
Covered, sand and gravel	50+
COAL	6
Covered, sand and gravel	50+
COAL	5
Sand and gravel	20+
Rounded chert and white quartz pebbles of basal coal-bearing formation	100+
Pre-Cambrian Birch Creek schist	100+

The pre-Cambrian Birch Creek schist is the unconformable old land surface on which the coal-bearing formation was deposited and marks the boundary and basal limits of the coal-bearing formation. Erosion remnants of Birch Creek schist indicate the absence of coal-bearing formation and are generally found at higher altitudes.

The area of coal-bearing formation along the north boundary of Mt. McKinley Park is about 20 miles long, east and west, and extends about 5 miles north and south and contains several coal beds of minable thickness. The terrace gravel of Quaternary age and tundra grass obscure and cover the area between coal outcrops, and none of the coal beds can be traced from outcrop in one river to outcrops in the next river, but a continuity is suggested. The U. S. Geological Survey will describe and map the area in detail. The minable coal beds in this area are situated 12 to 25 miles west of the Alaska Railroad and 6 to 10 miles north of the Mt. McKinley Park highway.

No development by the Bureau of Mines of minable reserves in this area is recommended at this time because of inaccessibility.

Mt. McKinley Park Highway (See fig. 7.)

There are several areas along the Mt. McKinley Park highway in which coal-bearing formations of Tertiary age are found. These areas are described in reference to mile posts from McKinley Park station west along the highway, streams, and passes. The best-exposed outcrops of coal beds are along the Toklat River. The coal-bearing formations along the highway were deformed by the elevation of the Alaska Range and related mountains flanking the main range. Steep dips and vertical beds are common. Sable Mountain, Polychrome Pass, Highway Pass, and Thorofare Pass comprise igneous intrusions that were intruded in the mountain building. The intrusion of these igneous rocks was a direct cause of deformation that resulted in steep dips in the sedimentary coal-bearing formation.

Mile Post 39. - The following section of coal-bearing formation was measured 200 feet above and 1/2 mile north of Mile Post 39 on the Mt. McKinley Park highway west of Sable Mountain. (See fig. 7, loc. 8.) The outcrop can be traced for 1,400 feet along a strike N. 80° W. The dip is 60° south. The large outcrop is visible from the road, and the meadow between the outcrop and the road is usually inhabited by one or two Toklat grizzly bears, which are a menace to intruders.

Description	Thickness Ft.	Thickness In.
Terrace sand and gravel	10	-
Coal, highly weathered	10	+
Clay and sand	6	6
COAL (analysis C-64413)	26	6
Poorly consolidated sand	1	+
Sand and gravel	100	-

Analysis C-64413, as-received basis, follows:

	Percent
Moisture	32.0
Volatile matter	34.6
Fixed carbon	24.1
Ash	9.3
Sulfur	.3
B.t.u.	6,610

The site is within half a mile of the Mt. McKinley Park highway and could be developed readily in an emergency, but development of a mine within the park is restricted.

Mile Post 42. - The Alaska Road Commission operated a mine on the east fork of the Toklat River at Mile Post 42. The entry was open in coal for 300 feet but was very wet, and the timber was rotted. It was unsafe to enter the old unventilated rooms. The strike of the bed was N. 70° E., the dip 30° south, and the altitude approximately 3,700 feet. Production from this mine was small and probably stopped 10 years ago. Selective loading was practiced, picking out claystone by hand and screening out the slack, which was either gobbed in the mine or wasted on the dump. It was reported that without circulation of air, the roof was frozen and was strong, but after an airway was opened and air circulated, the frozen roof thawed and caved. The following section of coal-bearing formation was measured on the outcrop (see fig. 7, loc. 9):

	Thickness	
Description	Ft.	In.
Terrace sand and gravel	10-50	
Claystone	5	0
COAL (C-64414)	2	9
X Coaly claystone	0	1
COAL (C-64414)	3	9
X Claystone	2	0
X Coal and coaly claystone	1	6
COAL (C-64414)	7	2
X Sandy claystone	1	+
Sand and gravel	50	+

Members marked (X) not included.

Analysis C-64414, as follows:

	Percent
Moisture	23.6
Volatile matter	35.6
Fixed carbon	33.2
Ash	7.6
Sulfur	.4
B.t.u.	8,350

The following section of coal-bearing formation was measured on the north side of the east fork of the Toklat River adjacent to and 1/4 mile east of the Old Alaska Road Commission mine, approximate altitude 3,800 feet, strike N. 80° E., dip 30° S.

Description	Thickness Ft.	In.
Terrace gravel	10-50	
COAL	4-5	0
Poorly consolidated sand	5	0
Coaly claystone	3	0
COAL	3	0
Poorly consolidated sand	7	0
COAL	4	6
Poorly consolidated sand	1	+
Covered	50	+

This coal section probably represents beds below the section of the Alaska Road Commission mine. Coal-bearing formation was observed east of this section, but there were no minable outcrops. Coal could be mined at this section but the beds would require exploration to determine the extent.

Polychrome Pass. - Crossing the main east fork of the Toklat River and continuing up the west fork of the Toklat River and south of the highway, almost vertical coal beds were observed. The following section was measured on the south bank of the west fork of the east fork of the Toklat River south of Polychrome Pass at gravel bar elevation 3,700 feet, strike N. 80° E., dip 80° S. to vertical, measured south to north or top to bottom.

Description	Thickness Ft.	In.
Terrace sand and gravel	10-50	
Claystone	1	+
COAL	4	0
Claystone, coaly on north side	7	0
Coaly claystone	1	0
COAL	1	9
Coaly claystone	0	6
COAL	2	6
Gray claystone	0	6
COAL	3	0
Clay	1	0
COAL	2	0
(Continuing west and north)		
Claystone and siltstone	6	6
Coaly claystone and coal interbedded	60	0
COAL	28	0
River gravel	500	0
Quartz porphyry and andesite	2,000	0

The uppermost coal bed, 28 feet thick, was 500 feet from the outcrop of the intrusive porphyry and andesite, but the deformation from the intrusion and heat from the igneous rock had not caused any apparent metamorphism. These coal beds are not minable because they do not extend over 20 feet above the river bar and are too near the river to develop.

There is an area of coal formation near Highway Pass, but no coal beds of minable thickness were observed.

The area, a half mile north of Mile Post 39, in which the 26-foot 6-inch coal bed with 9.3 percent ash occurs, is the most suitable for an emergency source of coal for Mt. McKinley Park. The Mt. McKinley Park highway is an all-weather road with good bridges and crossings on the Teklanika and Savage Rivers. Development of a mine and transportation of coal over the highway would be subject to National Park regulations and approval. Surfacing material for road maintenance and construction is available.

Kenai Peninsula in Vicinity of Homer

An increase in the demand for coal in the Kenai Peninsula is anticipated because of the increase in population due to the agricultural development of the area and the construction of new highways. Numerous outcrops of coal beds were reported on the peninsula, and the development of modern mines in this area would furnish an additional supply of coal for domestic use and for the Army at Fort Richardson. This additional supply of coal would obviate dependence on supplies from the Matanuska field. Modern mines cannot be developed economically unless the minable reserves and physical and chemical characteristics of the coal are known, and a preliminary reconnaissance of some areas on the peninsula in the vicinity of Homer was made in cooperation with a geologist of the U. S. Geological Survey.

The area has been subdivided into sections and opened for homesteading. Homer, which is about 120 air miles southwest of Anchorage, is a small hamlet on Kachemak Bay adjacent to Cook Inlet and is the center of activity in the area.

The topography is marked by two prominent plateaus or benches. The first bench slopes gently from the mud flats of the coast to the base of a bluff, which is about 300 feet elevation. There is a gradual rise from this bluff, which parallels the coast of Coal Bay, to an altitude of about 500 feet at the second bench. The distinction between the two benches disappears when the coast is formed by a perpendicular cliff 200 to 300 feet high, though a bench-like topography is general and very distinctive. Streams have eroded long, deep canyons into the second or upper bench.

The Kenai coal formation is found along the northwest coast of the Kenai Peninsula and extends several miles inland. It consists of poorly consolidated sand, clay, claystone, and coal beds. The coal beds dip to the northwest, are the most resistant to erosion, and are a capping on the sediments and result in waterfalls in the stream bottoms and canyons. The canyons are gently sloping between waterfalls and sometimes open as basins. The coal beds are exposed in the waterfalls, perpendicular walls of the canyons, or benches. The coal beds were not correlated from canyon to canyon, but bed correlation by detailed mapping or plane table surveying will be done by the U. S. Geological Survey. There is some evidence of glaciation, but there are no large morain deposits. Occasionally, areas of reddish sediments and clinkered claystone mark local or continuous zones in which coal beds have been burned. No burning coal beds were observed, though in winter there is evidence that some of the beds are burning beneath the surface. Some of the coal beds are of minable thickness, and each homestead has an accessible source of fuel either within the homestead or adjacent to the homestead. In several instances, houses were built very close or adjacent to a coal bed that was hand-mined for fuel.

The area near the vicinity of Homer has been developed by graded and graveled roads that comprise a main road along each bench and two roads connecting the upper and lower benches. Roads in sandy or gravel areas do not require surfacing, and this condition is most typical of the upper bench. In addition to the main roads, there are farm roads that extend to the base of the second bench and into some of the canyons. The canyons are easily traversed on foot, and there are trails in some of them. A waterfall can be easily circled or by-passed.

Vegetation comprises grass and weeds 3 to 4 feet high, spruce, cottonwood, and willows. The cottonwoods are as much as 40 feet high in protected basins but disappear as the altitude increases. Willows and spruce continue up the slope but are most plentiful on protected or leeward slopes. The lower bench land is the most arable, principally because of the lower altitude, which lengthens the growing season. Potatoes, root vegetables, celery, lettuce, cabbage, strawberries, and hay are grown. Livestock consists of horses, cows, and sheep, though total livestock is limited by the scarcity of winter feed and hay.

The canyons traversed are described. No attempt is made to correlate the coal beds exposed in these canyons except where correlation is obvious. The area will be mapped by the U. S. Geological Survey to show coal beds in detail, and the beds will be correlated at that time.

The first traverse was made in Bidarki Creek, which is west of the Homer Coal Corp. mine. The mouth of Bidarki Creek is on the beach, but a 200-foot cliff at the beach forms a waterfall from the top of the cliff. (See fig. 8, loc. 1.) Several coal beds strengthen the cliff and cause it to be perpendicular. The Cooper coal bed, which is 6 feet, 4 inches thick, is 50 feet above the beach. There are several thin coal beds above and below the Cooper bed.

The top of the cliff, 200 feet above the beach, is a coal bed 7 feet 6 inches thick with interbedded claystone and coal. A section of this bed, which is about 150 feet above the Cooper bed, measured at the outcrop, 1,000 feet west of the Homer mine, is as follows (fig. 8, loc. 2):

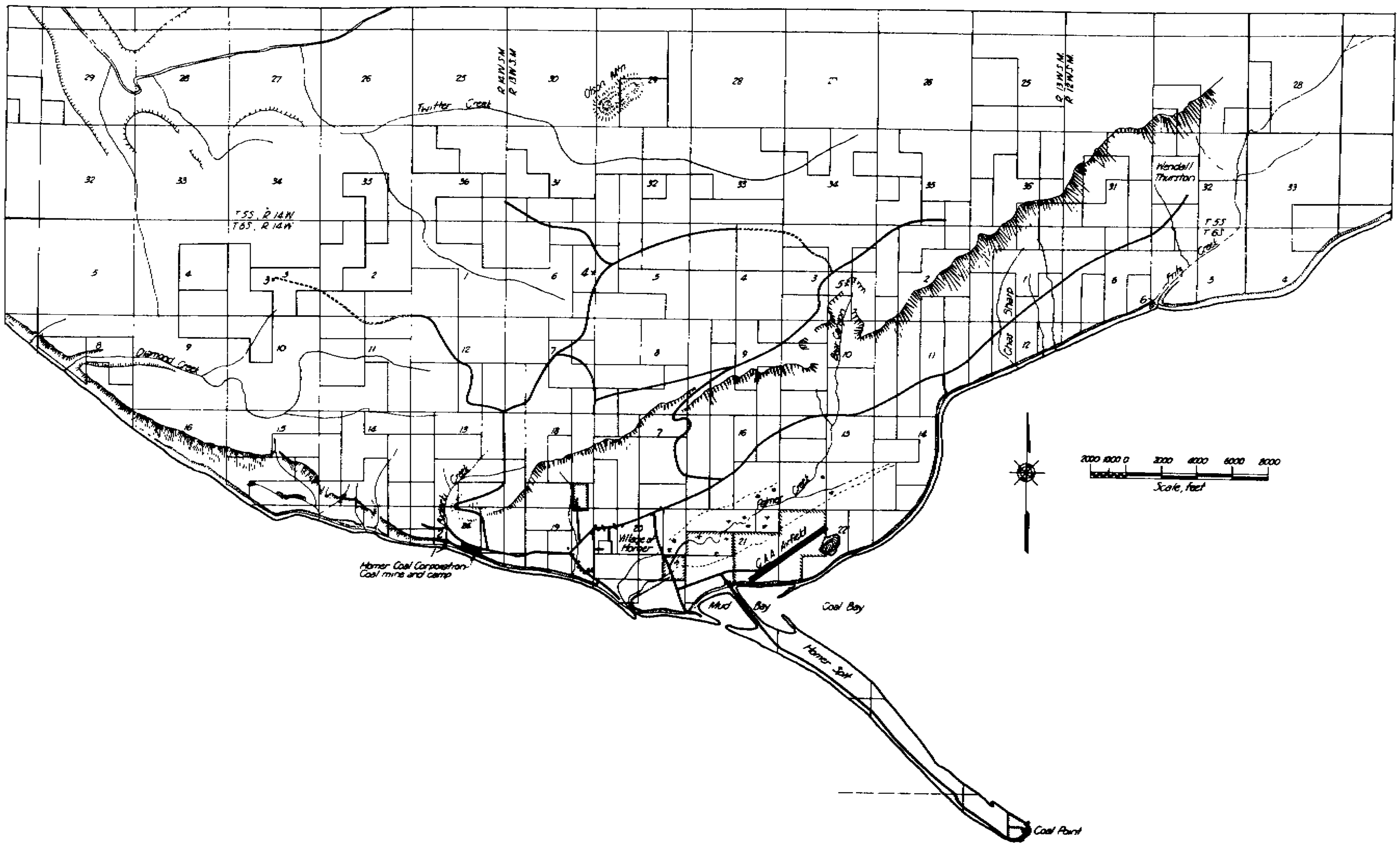

Figure 8. - Sketch map, Homer-Kenai peninsula area.

Description	Thickness Ft.	In.
X Light-gray clay	3	+
X Interbedded thin claystone and thin coal.	1	5-1/2
X Claystone	1	1
COAL	2	0
X Shaly siltstone	0	1-1/2
COAL	0	9
X Coaly claystone	0	1
X COAL	0	1
X Shaly coal claystone	0	3
COAL	1	0
X Gray claystone	5	+
Bed thickness	4	3-1/2
Coal thickness	3	9

Members marked (X) excluded from sample.

Analysis C-61955, as-received, follows:

	Percent
Moisture	24.2
Volatile matter	34.9
Fixed carbon	33.1
Ash	7.8
Sulfur	.3
B.t.u.	8,490

Continuing up Bidarki Creek from the top of the coast cliff, two 4-foot coal beds were observed - one, one-fourth of the distance from the mouth to the source, and the second, three-fourths of the distance from the mouth to the source. Numerous other coal beds ranging from 6 inches to 3 feet in thickness were observed. Occasionally, slide rock covered the outcrops. The coal beds in Bidarki Creek did not cause high waterfalls, but distinct benches were formed.

West of Bidarki Creek, above the Kachemak Bay coast, the bench land division is not distinct; however, in this area the outcrops of coal beds form small benches and escarpments. Several large slide blocks were observed about 1 mile west of Bidarki Creek extending from Diamond Creek to the coast west of Bluff Point. These slides have obscured the normal structure. A trail half a mile in from the coast follows the strike of a 3-foot coal bed for a quarter of a mile, and this probably is the limit of extent along Diamond Creek of the slide area inland from the coast.

Above the head or source of Bidarki Creek, a 4-1/2-foot coal bed was observed near several homestead dwellings. A 4-1/2-foot bed of coal was measured in the approximate center of the SE. 1/4 of sec. 12, T. 6 S., R. 14 W. This bed was 4 feet near the center of the SW. 1/4 of sec. 12, T. 6 S., R. 14 W. These two outcrops are half a mile apart and appear to be the same coal bed with a general east-west strike and a north dip of 5° to 7°.

Farther north and west, a little south of the center of sec. 3, T. 6 S., R. 14 W., coal had been mined from an outcrop with an east-west strike and a dip of 5° to 7° N. The section follows (see fig. 8, loc. 3):

Description	Thickness Ft.	In.
Light-gray claystone	2	+
Coaly claystone	0	3
Silty claystone	0	3
COAL	1	5
Coaly claystone and dirty coal (some lenses)	0	9
COAL	4	3
Gray claystone	2	+

East of Bidarki Creek, and starting near the quarter corner on the south side of the SE. 1/4 of sec. 16, T. 6 S., R. 13 W., a traverse was made up Woodard's Creek from the end of the road to the C.A.A. radio station. Approximately 1,000 feet up the gulch from the end of the road a 3-1/2-foot coal bed with a 2° dip to the north was measured. Two coal beds were found about half a mile from the end of the road up the gulch; the first coal bed was 12 inches to 18 inches in thickness and the second was 2 to 3 feet thick.

A 5-foot coal bed was observed about 1 mile up a gulch and approximately 1-1/2 miles from the village of Homer lying in approximately the center of sec. 18, T. 6 S., R. 13 W., at an altitude of approximately 500 feet. Dips of about 2° to the north were observed on an east-west strike. A waterfall was formed by the 5-foot coal bed. Red ferruginous claystone was found 50 feet above the 5-foot coal bed. Four thin coal beds 8 to 18 inches thick, about 12 feet apart, were found 80 feet above the 5-foot coal bed.

Two miles north of this area, near the center of sec. 5, T. 6 S., R. 13 W., a 2-foot bed of coal had been mined. Near the northeast corner of the SE. 1/4 of sec. 6, T. 6 S., R. 13 W., about 5 feet of coal had been mined. A measured section (see fig. 8, loc. 4) with a strike N. 45° E. and a 12° NW. dip is as follows:

Description	Thickness Ft.	In.
Claystone (roof)	1	+
COAL	0	7
Claystone	2	8
COAL	1	1
Claystone	0	3
COAL	0	10
Claystone	1	0
COAL	0	2
Claystone	0	6
COAL	2	3
Siltstone (floor)	1	+

A traverse down Bear Canyon, which is the longest and largest canyon to the east, started at a 3-foot coal bed mined by Mr. Woodman in the NW. 1/4, SE. 1/4, sec. 3, T. 6 S., R. 13 W., strike N. 50° E., dip 9° NW. (see fig. 8, loc. 5). Many waterfalls are formed by coal beds. The upper part of the canyon comprises mostly sandy sediments. However, the sediments in the lower part of the canyon are shaly. Twelve coal beds were observed below the first, and these beds, in descending order, are: No. 1, 3 feet; No. 2, 3 feet; No. 3, series of four thin beds; No. 4, 3 feet 9 inches; No. 5, 4 feet; No. 6, 2 feet (strike N. 70° E., dip 9° NW.); No. 7, 1 foot; No. 8, 2 feet 8 inches; No. 9, 1 foot 6 inches; No. 10, 1 foot 7 inches; No. 11, 5 feet 6 inches; No. 12, 1 foot coal, 1 foot clay, 1 foot coal.

The next gulch east, sometimes referred to as Waterman's, north of the Charles Sharp property, begins in sec. 1, T. 6 S., R. 13 W., and extends to the center of the SE. 1/4, sec. 36, T. 5 S., R. 13 W. One 3-foot coal bed, one 3-1/2-foot coal bed, and 12 coal beds ranging from 6 inches to 2 feet in thickness were observed. The strike of the 3-1/2-foot coal bed is N. 50° E., with a dip of 9° NW. The coal beds in the lower part of the canyon were covered with slides and could not be measured. The covered areas probably contain coal beds that are found in the adjacent canyons.

The farthest east canyon traversed began at the old Thurston Homestead in the NW. 1/4, sec. 32 and SW. 1/4, sec. 29, T. 5 S., R. 12 W. Many thin beds of coal and some reddish claystone were observed. The coal beds in the lower half of the canyon appeared to be flat. The sediments in the upper half of the canyon were sandy. A measured section of one bed is as follows:

Description	Thickness	
	Ft.	In.
Claystone	5	+
COAL	2	5
Claystone	0	3
COAL	0	4
Claystone	5	+

The following coal bed was measured at the mouth of Fritz Creek (see fig. 8, loc. 6):

Description	Thickness	
	Ft.	In.
Claystone roof (concealed)	-	-
COAL	0	10
Claystone, somewhat coaly	0	3-1/2
COAL	0	3
Claystone	0	4
COAL	0	3
Fine brown siltstone	0	2
COAL	0	4
Gray claystone	0	6

Strike N. 70° E., dip 8° N.

Homer Coal Corp. Mine

This mine is about 1-1/2 miles northwest of Homer, Alaska, on the shore of Kachemak Bay, and access to it from Homer is over the Kenai Peninsula highway, which connects Kenai points and is projected to be built to Anchorage around Turnagain Arm. The mine is 10 miles from the dock on Homer Spit, which accommodates ocean-going vessels.

The present output is from development. The area was first opened in the Cooper bed in about 1900, and the following abandoned openings were observed in the vicinity of the Homer mine: Alsip slope, Alsip tunnel, English Company shaft and tunnel, and Morgan shaft and dock site.

The extent of the underground workings in these abandoned openings is not known. However, one of the entries of the Homer mine encountered old workings at 32 feet inby the portal. It appears that the Homer mine is being developed in an area that has been partly mined.

The present openings of the mine are two entries about 150 feet apart. No. 1 entry had been advanced 30 feet and No. 2 entry 53 feet at the time of this investigation.

These entries are driven on the apparent strike of the Cooper bed, which is N. 70° E., dip 7° N. After the true strike of the bed is determined by the entries, it is planned to drive a slope from the outby entry up the dip of the bed to the surface.

The shore line at the mine is a perpendicular cliff 120 feet high, which decreases in height east of the mine and increases to 200 feet in height northwest of the mine. An inclined track has been built on the face of the cliff, and from the base of the incline a track has been constructed on a bench beneath the Cooper bed to the portals of No. 1 and No. 2 entries.

A section of the Cooper bed in the entry follows:

Description	Thickness Ft.	Thickness In.
X Roof; claystone	0	9+
COAL	2	11
X Clay	0	1
COAL	1	10
X Clay	0	2
COAL	1	4
X Bottom, siltstone	0	6+
Bed thickness	6	5
Coal thickness	6	2

Members marked (X) excluded from sample.

Analysis C-61783, as-received, follows:

	Percent
Moisture	16.5
Volatile matter	30.3
Fixed carbon	41.1
Ash	12.1
Sulfur	.4
B.t.u.	9,020

The Kenai coal formation contains several coal beds and openings and outcrops in these beds were observed in all of the north and south gulches that extend into the upper bench land in the Homer area. The probable area extends 10 miles east and west and 3 miles north and south. Areas probably underlain with coal are accessible to roads, but the Kenai coal formation has been identified for many miles. The minable reserve can be determined by an investigation by diamond drilling.

The local demand for coal in the Kenai Peninsula at this time is not large, but this demand will increase as population grows. The dock at Homer is free of ice in winter, and coal could be shipped by boat to Seward and then by rail to Anchorage, as Cook Inlet is ice-bound between Homer and Anchorage in winter. However, water shipment is possible to Anchorage from April 15 to November 15. A cement plant may be constructed at Seldovia, which is across Kachemak Bay from Homer. The source of fuel for this plant would be in the Homer area.

The reconnaissance in the vicinity of Homer indicated physical conditions favorable for a modern mechanized mine. The extent of minable reserves and characteristics of the bed must be known before the investment necessary to plan and develop such a mine can be made. These conditions can be determined only by an investigation by diamond drilling. The present demand does not warrant such an investigation, but the time required for the work is considerable, and a diamond-drilling program should be started on the Kenai Peninsula within the next 3 years.

The Kenai coal formation extends north of Homer, and coal is found on Kenai Peninsula in the vicinity of Ninilchik, Happy Valley, Kasilof, and Kenai. The coal has been used locally as a source of fuel, but the extent of the deposits is not known. The same coal formation appears to cross Cook Inlet to Tyonek and has been reported in the vicinity of Anchorage, Eagle River, Little Susitna River at Wasilla and Houston, and on the tributaries of the Big Susitna River near the Yentna River. Glacial debris and muskeg swamps cover parts of these areas, and the beds have not been traced consistently, but several intermittent productive areas have been active in the past. It is anticipated that further development may be expected from any or all of these areas in the future. Lack of relief and elevation has made some of the areas susceptible to water-flooding and surface seepage. Most of this coal is subbituminous. Time would not permit investigation of these areas during this reconnaissance.