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PRELIMINARY REPORT ON ANALYSES OF CRETACEOUS COALS FROM NORTHWESTERN ALASKA

by

J. E. CALLAHAN and E. G. SLOAN

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PRELIMINARY REPORT ON ANALYSES OF CRETACEOUS COALS FROM NORTHWESTERN ALASKA

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INTRODUCTION

The U.S. Bureau of Mines and the U.S. Geological Survey made several separate and cooperative investigations of the Cretaceous coals of northwestern Alaska during 1966-1975. This report tabulates data on the locations, thickness, dip and chemical analyses of coal beds sampled during that period. Data collected by the Bureau of Mines in the same area during 1966 and preceding years were presented in a 1969 report by R. S. Warfield and C. C. Boley.

ACKNOWLEDGMENTS

Various professional personnel from both the U.S. Geological Survey and the U.S. Bureau of Mines participated in the field investigations. The following is a year-by-year listing of personnel involved and the type of activity for each year:

1966 - A. A. Wanek and J. E. Callahan, USGS; geologic mapping.

1967 - A. A. Wanek, J. E. Callahan, E. M. Schell, H. D. Zeller, and W. L. Rohrer, USGS; geologic mapping, surface sampling.

1969 - A. A. Wanek, J. E. Callahan, C. B. John, and Jack Thompson, USGS; geologic mapping, surface sampling.

1970 - A. A. Wanek and J. E. Callahan, USGS; geologic mapping, surface sampling.

1972 - R. S. Warfield and Benjamin C. Pollard, USBM; J. E. Callahan and R. B. Sanders, USGS; rotary and core drilling, limited geologic mapping.

1973 - Benjamin C. Pollard, USBM; J. E. Callahan, USGS; geologic mapping, auger sampling.

1975 - J. E. Callahan and E. G. Sloan, USGS, with logistic support from USBM; geologic mapping and surface sampling.

The most significant analytical data resulted from the acquisition of unweathered coal samples from the Cape Beaufort area during the 1972 season. Robert S. Warfield of the Bureau of Mines had overall responsibility for the design of the drilling program, logistical support, direction of the drilling operations and acquisition, assembly and transportation of equipment during the early part of this season. During the latter part of the season, Benjamin C. Pollard was responsible for the drilling and sampling operations. The primary functions of the USGS participants during the 1972 season were to select drilling locations, record data and make recommendations with respect to drilling depths.

In addition to the standard Bureau of Mines proximate and ultimate analyses which were performed on all the samples, samples collected during 1972 were submitted to the Bureau's Grand Forks Energy Research Laboratory (now the Energy Research Center, Energy Research and Development Administration [ERDA], Grand Forks, North Dakota) where C. C. Boley and R. B. Porter conducted more extensive investigations of washability and coking characteristics.

Most of the samples were examined by Dr. P. D. Rao at the Mineral Industry Research Laboratory of the University of Alaska for rank determinations based on vitrinite reflectance (Rao, 1976).

Arrangement of Table 1 and processing of the data into the USGS computer system were done by E. G. Sloan.

GEOLOGIC SETTING

The basic geological framework of the region was described by Chapman and Sable (1960) as a result of post-World War II exploratory work in the Naval Petroleum Reserve No. 4 (NPR-4) and adjacent areas (figs. 1, 2, and 3). The dominant geological feature of the region is the Colville geosyncline. This feature is a depositional trough which developed concurrently with the rising Brooks Range, DeLong Mountains, and Tigara uplift (Lisburne Hills area) during Cretaceous time. The trough received as much as 20,000 feet (6096 m) of marine, nearshore marine, and continental deposits which now comprise the Torok Formation and the overlying Nanushuk Group. The Nanushuk Group underlies the northern foothills belt of the Arctic Slope from Corwin Bluff to the Canning River. In the western Arctic, the Nanushuk Group consists of two formations: the predominantly nearshore marine Kukpowruk Formation and the overlying and partially equivalent, nonmarine Corwin Formation. At its type section, Corwin Bluff, the Corwin Formation is approximately 11,000 feet (3353 m) thick and is composed of fine-grained clastic rocks (claystone, silty claystone, and siltstone) with lesser amounts of coarser clastic rocks, including a thick conglomeratic member. Scattered ironstone nodules are common throughout the section; ironstone also occurs in roughly bedded units. Bentonitic clay and bentonite are common in the upper part of the section. Coal beds occur throughout the section, but the thicker

and more continuous coals are in the upper part. Chapman and Sable (1960) described seven lithologic members totaling 15,000 feet (4572 m) at the type section, but fossil floral evidence (Smiley, 1969) indicates that Chapman and Sable's upper sandstone member (4100 feet; 1250 m) is a duplication of a lower part of the section which has been thrust over the older rocks. The individual members cannot all be identified in exposed sections northeast of the type section.

West of the Pitmegea River along the coast, the Corwin Formation occurs in at least three repetitive, predominantly homoclinal sections (including the type section) or partial sections in southwest-dipping thrust sheets. East of the Pitmegea in the foothills belt, the Nanushuk Group occurs in several large, broad east- to northeast-trending synclinal basins which are separated from each other by tightly folded or faulted anticlines. The anticlines are commonly breached, exposing the underlying Torok Formation (Lower Cretaceous).

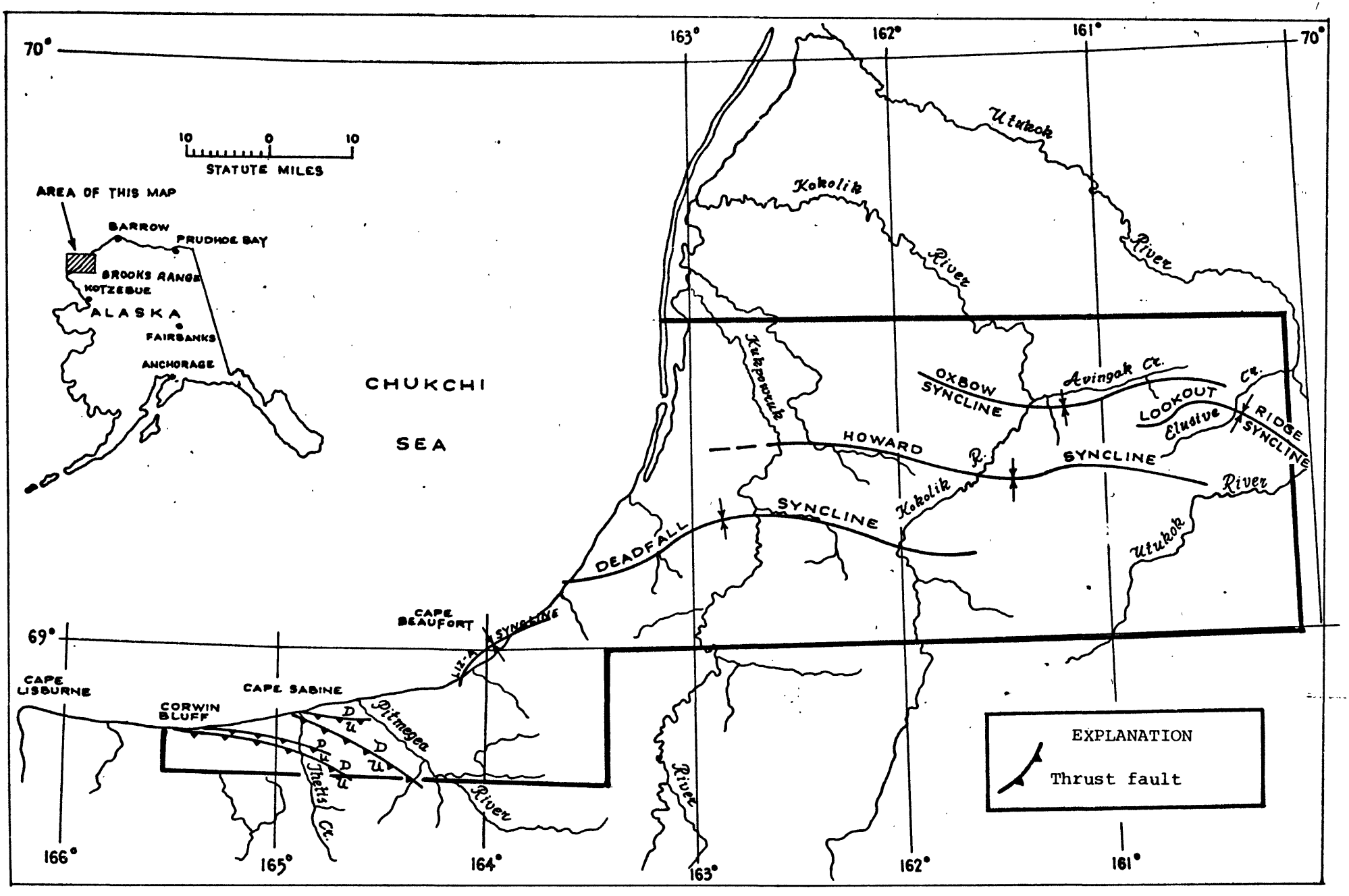

Figure 1.--Index map, northwestern Alaska.
(Area shown on plate 1 indicated by heavy line.)

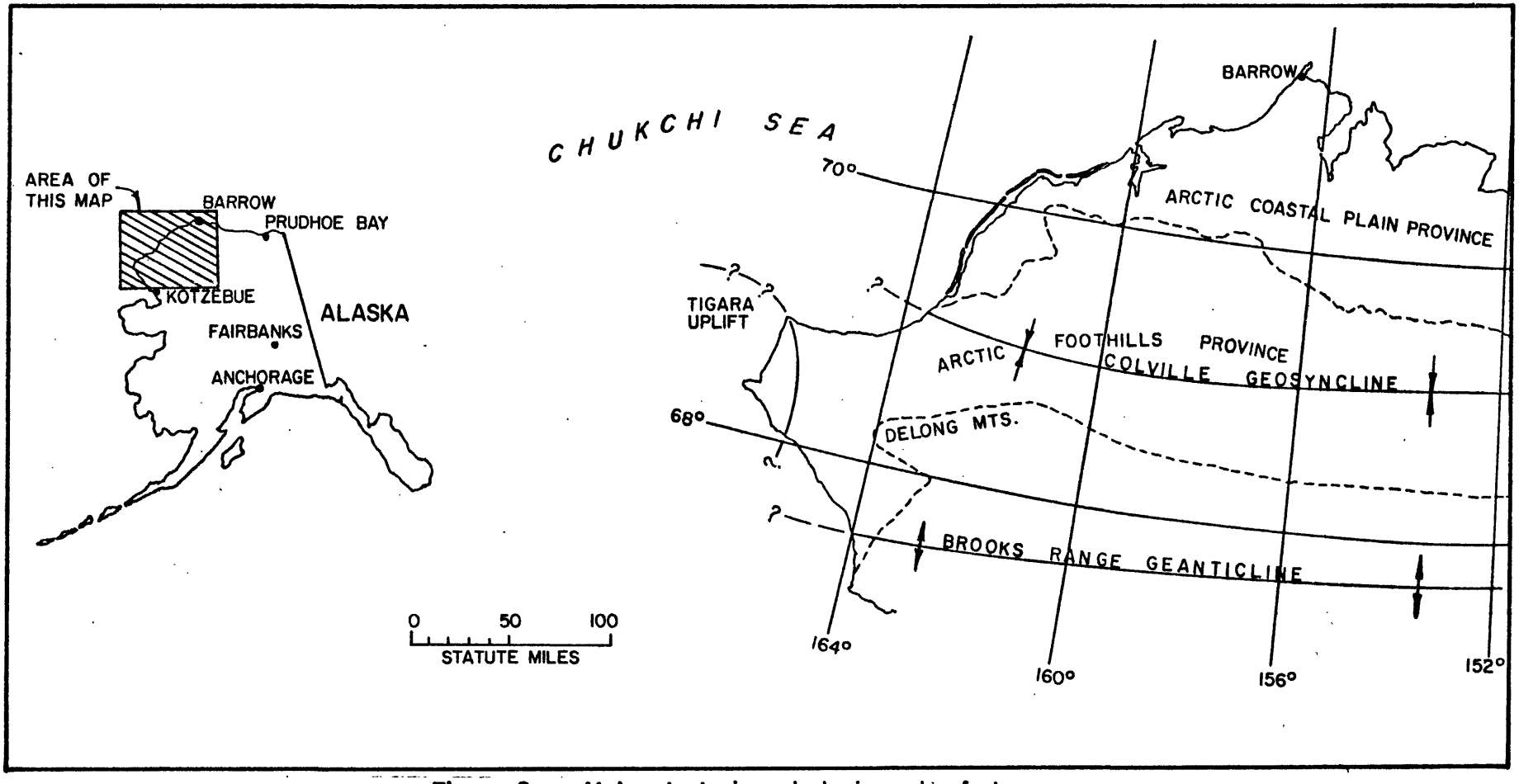

Figure 2.—— Major tectonic and physiographic features of northwestern Alaska.

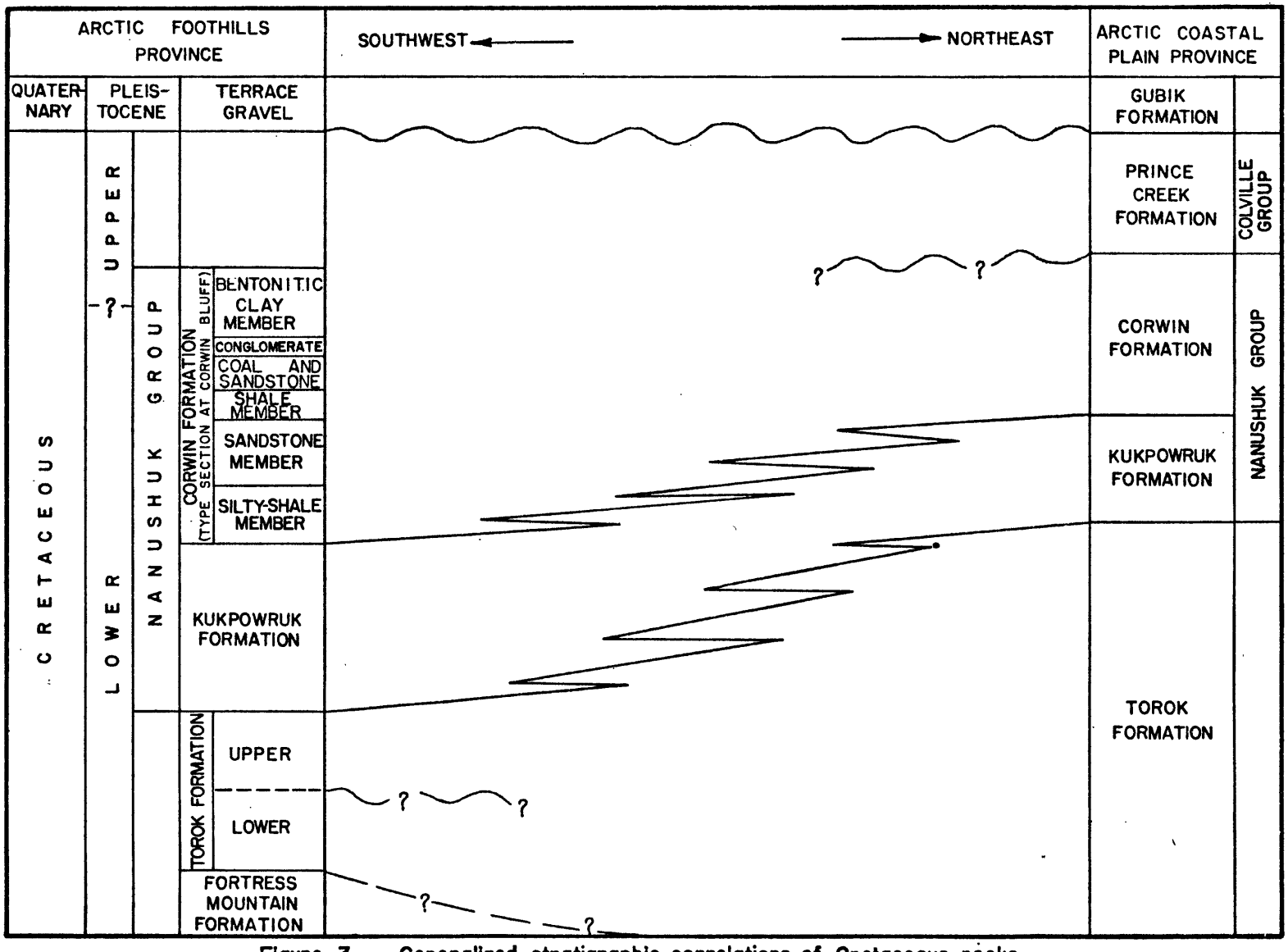

Figure 3.-- Generalized stratigraphic correlations of Cretaceous rocks and surficial deposits of northwestern Alaska. Modified from Chapman and Sable (1960), p. 69.

COAL OCCURRENCE

Outcrops are sparse throughout the region. Except at Corwin Bluff, continuously exposed stratigraphic sequences more than a few hundred feet thick are uncommon. Evidence of coal beds, except in a few stream cuts, consists of float or rubble at the bases of hogbacks formed by thick, resistant sandstone beds. Burning has produced material ranging from bright red and orange baked sandstone and claystone to completely fused, vesicular clinkers in some localities. Most coal beds were located by trenching, augering, or drilling on the basis of such indirect surface indicators.

Coals not associated with ridge-forming sandstones were rarely observed in upland areas. Because of the difficulty of operating in the ice-rich overburden material between the ridges, trenching, augering, and drilling locations were confined to the immediate vicinity of the sandstone ridges, and only those parts of the section within reach of the drill from such locations could be investigated. A genetic relationship between the ridge-forming sandstones and coal beds has not been recognized; therefore, considerably more coal may be present in the region than has been observed.

The analyses in Table 1 are listed according to geographic areas and structural basins. The Cape Beaufort and Deadfall sample localities are within synclinal basins. The Kukpowruk River samples were collected across both limbs of the Howard syncline along the river, but no other favorable sampling localities were found in the east or west extensions of that basin. The Kokolik River and Elusive Creek samples are from the Lookout Ridge syncline.

Sampling Methods

Coal samples were collected from surface exposures and hand-dug trenches, by augering, and from drill cores and cuttings. All samples were collected using standardized procedures to preserve bed moisture by sealing in doubled polyethylene bags protected by an outer canvas bag. As shown in the explanation on Plate 1, the sample numbers indicate the type of sample.

The most reliable analyses are from the cored drill holes (prefixed DH-, suffixed -C). The holes were drilled with a tricone bit to the top of the coal, and the coal sampled with a 10-foot (3.0-m) core barrel. The circulating medium was compressed air. A double-wall drill-rod system was used initially, with cuttings returned through the inner tube. Due to mechanical difficulties resulting from the weight of the double-wall drill-rod, holes DH 72-23 through 72-29 were drilled using NX casing for drill rod, which returns through the annulus between the hole wall and rod. Coring with air was successful in the early part of the 1972 season, but as the air temperature increased, moisture in the hole and condensation from the warm air introduced in the drilling process created icing problems within the core barrel. In order to complete as many holes as possible in the time available, the original plan to core all thick coal beds was abandoned, and cutting samples were relied upon.

Cuttings were collected from a cyclone separator attached to the return air circuit in the double-wall system or to a tee on the top of a length of casing in the open-hole system. Coal analyses of core samples and cuttings are reasonably consistent, although direct comparison is possible only for one bed. Bed 8 at Cape Beaufort was cored at one

locality and cuttings collected at three localities, including one drill hole adjacent to the core (see Table 1B: samples DH 72-8C, 72-8, 72-9, and 72-11). Bed 7 at Cape Beaufort was also sampled by collecting cuttings and coring from "twinned" holes, but the intervals sampled in this nonhomogeneous bed do not correspond. Similar comparisons between analyses of auger-hole samples and cores or drill cuttings indicate that augering is the least reliable method for acquiring representative samples. Generally, auger samples have very high oxygen and ash contents, indicating contamination by overlying rock or soil. Channel samples from outcropping coal beds in dry locations appear to be superior to the auger samples. The principal value of augering is to establish thickness of coal beds.

The sampling conditions shown in Table 1 (column 9) were judged on the basis of factors considered likely to affect the analytical results. Auger samples are categorically rated poor. Surface samples which contained visible moisutre (including free ice) were judged poor. Surface samples from dry outcrops accessible for proper channel sampling were judged fair. Most drill-hole cutting samples were rated good; DH 72-2 is an exception due to contamination from wet overburden material resulting from difficulties with the hole and probably due to weathering prior to deposition of the overburden. Sampling conditions must be considered in evaluating and comparing the analyses.

Table 1.--Coal analyses from northwestern Alaska

[Analyses given in percent. DH, drill hole; AH, auger hole; SS, surface sample. Sample number includes date. ---, not applicable or not determined.]

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
A Corwin Bluff Area																						
	SS 70-W11	2.7	6	54	23	SW¼SW¼	22	F	J61813	0.730	1.5	A	11,570	3.9	36.4	45.7	14.0	5.2	65.6	1.9	12.8	0.5
												B	12,040	----	37.9	47.5	14.6	4.9	68.3	2.0	9.7	.5
												C	14,100	----	44.3	55.7	----	5.8	80.0	2.4	11.2	.6
	SS 70-W17	2.5	6	54	28	NW¼NE¼	19	P	J61806	.646	.0	A	9,900	10.0	30.4	46.4	13.2	5.0	57.9	1.8	21.7	.4
												B	11,010	----	33.8	51.6	14.6	4.3	64.3	2.0	14.4	.4
												C	12,890	----	39.6	60.4	----	5.0	75.3	2.3	16.9	.5
	SS 70-W19	7.0	6	54	26	SW¼NW¼	15	P	J61807	.790	.0	A	6,010	6.0	18.5	27.2	48.3	3.2	34.9	1.1	12.3	.2
												B	6,390	----	19.7	28.9	51.4	2.7	37.1	1.2	7.4	.2
	SS 70-W27	1.5	6	54	28	NE¼NW¼	19	P	J61802	.648	.0	A	9,710	14.2	30.0	48.6	7.2	4.9	58.0	1.6	27.9	.4
												B	11,310	----	34.9	56.7	8.4	3.9	67.6	1.9	17.8	.4
												C	12,340	----	38.1	61.9	----	4.3	73.7	2.1	19.4	.5
	SS 70-W28	2.8	6	54	28	NW¼NW¼	19	P	J61800	.626	.0	A	8,400	12.9	32.5	41.0	13.6	4.7	51.4	1.5	28.4	.4
												B	9,640	----	37.2	47.1	15.7	3.7	59.0	1.7	19.5	.4
												C	11,430	----	44.1	55.9	----	4.4	70.0	2.0	23.1	.5
	SS 70-W29	2.2	6	54	28	SW¼NW¼	19	P	J61814	.542	.0	A	8,460	12.9	33.4	40.6	13.1	4.8	51.8	1.5	28.6	.2
												B	9,710	----	38.4	46.6	15.0	3.9	59.5	1.7	19.7	.2
												C	11,440	----	45.2	54.8	----	4.5	70.0	2.0	23.2	.3
	SS 70-W30A	8.5	6	54	29	SE¼NE¼	19	P	J61797	.602	.0	A	6,480	12.6	24.9	31.4	31.1	4.0	39.9	.9	23.7	.4
												B	7,410	----	28.5	36.0	35.5	2.9	45.6	1.0	14.5	.5
												C	11,500	----	44.3	55.7	----	4.5	70.8	1.5	22.4	.8
	SS 70-W30B	1.7	6	54	29	SE¼NE¼	19	P	J61803	.572	.0	A	8,970	12.9	34.0	42.1	11.0	4.9	54.8	1.3	27.6	.4
												B	10,290	----	39.0	48.3	12.7	4.0	62.8	1.4	18.7	.4
												C	11,790	----	44.7	55.3	----	4.6	72.0	1.7	21.2	.5
	SS 70-W30C	1.7	6	54	29	SE¼NE¼	19	P	J61805	.566	.0	A	9,040	13.2	32.7	44.2	9.9	4.9	54.6	1.5	28.8	.3
												B	10,420	----	37.7	50.9	11.4	4.0	62.9	1.7	19.7	.3
												C	11,770	----	42.6	57.4	----	4.5	71.0	1.9	22.3	.3
	SS 70-W30D	3.3	6	54	29	SE¼NE¼	19	P	J61795	.610	.0	A	9,770	12.3	34.1	47.8	5.8	5.1	58.9	1.5	28.3	.4
												B	11,140	----	38.9	54.5	6.6	4.3	67.2	1.7	19.7	.5
												C	11,930	----	41.7	58.3	----	4.6	71.9	1.8	21.2	.5
	SS 70-W30E	4.0	6	54	29	SE¼NE¼	19	P	J61812	.574	.0	A	6,060	12.1	25.9	30.4	31.6	3.9	37.9	1.2	25.2	.2
												B	6,900	----	29.4	34.6	36.0	2.9	43.1	1.3	16.4	.3
												C	10,780	----	46.0	54.0	----	4.5	67.3	2.1	25.7	.4
	SS 70-W31A	2.5	6	54	29	SE¼NW¼	20	P	J61810	.596	.0	A	9,670	15.7	32.4	49.0	2.9	5.0	59.2	1.3	31.3	.3
												B	11,480	----	38.5	58.1	3.4	3.9	70.2	1.5	20.7	.3
												C	11,880	----	39.8	60.2	----	4.0	72.7	1.6	21.4	.3
	SS 70-W31B	4.0	6	54	29	SE¼NW¼	20	P	J61818	.548	.0	A	8,200	17.3	31.6	40.3	10.8	4.9	50.8	1.1	32.1	.3
												B	9,920	----	38.2	48.7	13.1	3.6	61.4	1.3	20.3	.3
												C	11,410	----	44.0	56.0	----	4.1	70.6	1.5	23.4	.4
	SS 70-W32A	4.0	6	54	29	SW¼NW¼	20	F	J61804	.644	.0	A	11,690	8.0	30.4	56.3	5.3	5.1	68.5	1.3	19.6	.2
												B	12,700	----	33.0	61.3	5.7	4.5	74.4	1.4	13.8	.2
												C	13,470	----	35.0	65.0	----	4.8	78.9	1.5	14.6	.2
	SS 70-W32B	2.5	6	54	29	SW¼NW¼	20	F	J61796	.606	.0	A	10,400	12.6	28.8	53.2	5.4	4.9	62.3	1.2	25.8	.4
												B	11,900	----	33.0	60.8	6.2	4.0	71.4	1.3	16.7	.4
												C	12,680	----	35.2	64.8	----	4.3	76.0	1.4	17.8	.5

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
A. Corwin Bluff Area, Continued																						
	SS 70-W32C	1.0	6	54	29	SW¼NW¼	20	F	J61809	0.580	0.0	A	9,510	15.0	31.7	58.0	6.3	5.2	48.0	1.1	29.2	0.2
												B	11,180	----	37.3	55.3	7.4	4.1	68.2	1.3	18.7	.3
												C	12,080	----	40.3	59.7	----	4.4	73.7	1.5	20.1	.3
	SS 70-W33 Upper	6.0	6	54	29	SW¼NW¼	21	F	J61808	.652	.0	A	11,080	9.1	27.6	57.4	5.9	4.5	66.9	1.1	21.4	.2
												B	12,200	----	30.4	63.1	6.5	3.9	73.6	1.2	14.6	.2
												C	13,050	----	32.5	67.5	----	4.1	78.7	1.3	15.7	.2
	SS 70-W33 Middle	6.5	6	54	29	SW¼NW¼	21	F	J61811	.590	.0	A	12,450	5.6	39.4	50.9	4.1	5.5	71.7	1.3	17.2	.2
												B	13,190	----	41.7	54.0	4.3	5.1	75.9	1.4	13.1	.2
												C	13,780	----	43.6	56.4	----	5.3	79.4	1.4	13.7	.2
	SS 70-W33 Lower	6.0	6	54	29	SW¼NW¼	21	F	J61819	.602	.0	A	12,130	5.3	39.5	48.7	6.5	5.3	69.3	1.3	17.3	.3
												B	12,810	----	41.7	51.5	6.8	5.0	73.2	1.3	13.4	.3
												C	13,750	----	44.8	55.2	----	5.4	78.5	1.4	14.4	.3
	SS 70-W73	6.3	6	56	36	SE¼SW¼	33	F	J61815	.624	1.5	A	12,030	4.4	37.4	48.8	9.4	5.1	68.8	1.6	14.9	.2
												B	12,590	----	39.2	51.0	9.8	4.8	72.0	1.7	11.5	.2
												C	13,970	----	43.5	56.5	----	5.3	79.9	1.8	12.8	.2
	SS 70-W74	4.4	7	56	2	NE¼NE¼	33	F	J61817	.618	.0	A	9,160	13.2	35.4	44.3	7.1	5.1	56.1	1.4	30.1	.2
												B	10,550	----	40.8	51.0	8.2	4.2	64.6	1.6	21.1	.3
												C	11,500	----	44.5	55.5	----	4.5	70.4	1.8	23.0	.3
	SS 70-W80	10.8	6	56	36	SE¼SW¼	33	F	J61816	.578	.0	A	10,400	9.1	34.3	48.8	7.8	4.9	61.9	1.3	23.9	.2
												B	11,430	----	37.7	53.7	8.6	4.3	68.0	1.4	17.5	.2
												C	12,510	----	41.3	58.7	----	4.7	74.4	1.5	19.2	.2
	SS 70-W82	2.2	7	56	2	NW¼NW¼	32	P	J61798	.546	.0	A	9,080	12.7	34.0	42.4	10.9	5.1	54.6	1.3	27.7	.4
												B	10,400	----	38.9	48.6	12.5	4.2	62.6	1.4	18.8	.5
												C	11,880	----	44.4	55.6	----	4.8	71.5	1.6	21.5	.6
	SS 70-W83	3.1	7	56	2	SW¼NW¼	32	P	J61801	.548	.0	A	8,190	11.1	32.6	36.6	19.7	4.7	49.5	1.1	24.6	.4
												B	9,210	----	36.7	41.1	22.2	3.9	55.7	1.3	16.5	.4
												C	11,840	----	47.2	52.8	----	5.0	71.5	1.6	21.4	.5
	SS 70-W88	3.3	6	55	31	NE¼SW¼	48	P	J61799	.592	.0	A	9,740	11.7	32.7	47.4	8.2	4.9	58.6	1.2	26.7	.4
												B	11,030	----	37.0	53.8	9.2	4.1	66.4	1.4	18.4	.5
												C	12,150	----	40.8	59.2	----	4.5	73.1	1.6	20.3	.5
B. Cape Beaufort Area																						
1	DH 72-6	75 - 77	5	50	19	NE¼SW¼	21	G	K 6436	-----	1.0	A	9,740	5.1	30.7	40.3	23.9	4.4	56.0	1.3	14.1	.3
												B	10,270	----	32.4	42.5	25.2	4.1	59.0	1.4	10.1	.3
												C	13,720	----	43.2	56.8	----	5.5	78.8	1.9	13.5	.4
2	DH 72-6	122.7-127.1	5	50	19	NE¼SW¼	21	G	K 6967	-----	1.9	A	11,110	4.8	34.0	45.9	15.3	4.8	64.2	1.4	14.1	.2
												B	11,660	----	35.7	48.2	16.1	4.5	67.4	1.5	10.4	.2
												C	13,900	----	42.6	57.4	----	5.3	80.3	1.8	12.4	.2
2	DH 72-6	128.3-129	5	50	19	NE¼SW¼	21	G	K10048	-----	1.8	A	10,700	3.8	36.3	39.9	20.1	4.9	60.4	1.2	13.2	.3
												B	11,120	----	37.7	41.4	20.9	4.6	62.8	1.3	10.2	.3
												C	14,050	----	47.6	52.4	----	5.8	79.3	1.6	12.9	.4
3	DH 72-5	85 - 86.8	5	50	19	NE¼NE¼	21	G	K10046	-----	1.9	A	11,960	3.9	38.2	45.7	12.2	5.2	67.6	1.3	13.5	.3
												B	12,450	----	39.8	47.6	12.6	4.9	70.3	1.4	10.5	.3
												C	14,260	----	45.5	54.5	----	5.6	80.5	1.6	12.0	.3

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
B. Cape Beaufort Area, Continued																						
4	DH 72-5	90.8- 94.1	5	50	19	NE¼NE¼	21	G	K10047	-----	0.0	A	6,990	3.7	25.8	28.1	42.4	3.2	41.6	0.8	11.8	0.2
												B	7,260	----	26.7	29.2	44.0	2.9	43.2	.9	8.8	.2
												C	12,970	----	47.8	52.2	----	5.2	77.3	1.5	15.7	.3
5	SS 69-25	7.2	5	50	8	SE¼NW¼	20	P	J36261	0.693	.0	A	9,490	10.5	29.0	44.0	16.5	4.8	55.9	1.1	21.4	.3
												B	10,600	----	32.3	49.3	18.4	4.1	62.5	1.2	13.4	.4
												C	12,990	----	39.6	60.4	----	5.0	76.5	1.5	16.6	.4
6	DH 72-3	70 - 73	5	50	17	SW¼NE¼	15	G	K 6435	-----	.0	A	9,610	4.0	25.0	46.4	24.5	3.7	57.3	.9	13.6	.1
												B	10,020	----	26.1	48.4	25.5	3.4	59.7	.9	10.4	.1
												C	13,450	----	35.0	65.0	----	4.5	80.1	1.2	14.0	.2
7	SS 69-7	7.5	5	50	8	NE¼NW¼	20	P	J36243	1.270	.0	A	9,460	9.7	21.6	51.5	17.2	4.1	58.1	.9	19.5	.2
												B	10,480	----	23.9	57.0	19.1	3.4	64.3	1.0	12.0	.2
												C	12,950	----	29.5	70.5	----	4.1	79.5	1.2	14.9	.3
7	DH 72-2	80 - 86	5	50	8	CN½SE¼	14	P	K 6962	-----	.5	A	7,730	8.0	23.8	31.7	36.5	3.8	44.5	.7	14.2	.2
												B	8,400	----	25.8	34.5	39.7	3.2	48.4	.8	7.7	.2
												C	13,930	----	42.9	57.2	----	5.3	80.2	1.3	12.8	.4
7	DH 72-2	86.4- 90	5	50	8	CN½SE¼	14	P	K10043	-----	.5	A	7,730	6.1	23.2	32.5	38.2	3.7	45.0	.7	12.2	.2
												B	8,230	----	24.7	34.6	40.7	3.2	47.9	.8	7.3	.2
												C	13,870	----	41.7	58.3	----	5.3	80.8	1.3	12.3	.3
7	DH 72-2	90 - 95	5	50	8	CN½SE¼	14	P	K10044	-----	1.0	A	7,610	6.0	25.7	29.1	39.1	3.9	43.2	.8	12.9	.2
												B	8,100	----	27.4	31.0	41.6	3.4	45.9	.8	8.0	.3
												C	13,880	----	46.9	53.1	----	5.8	78.7	1.4	13.7	.4
7	DH 72-3	135.5-141	5	50	17	SW¼NE¼	15	G	K 6963	-----	.5	A	11,310	4.1	27.9	53.4	14.7	4.3	66.6	1.0	13.3	.2
												B	11,780	----	29.1	55.7	15.3	4.0	69.4	1.1	10.1	.2
												C	13,910	----	34.3	65.7	----	4.7	82.0	1.2	11.9	.2
7	DH 72-3	141 -146	5	50	17	SW¼NE¼	15	G	K 6964	-----	1.8	A	9,110	4.8	28.9	36.4	29.9	4.0	52.3	.9	12.7	.2
												B	9,580	----	30.4	38.2	31.4	3.7	55.0	.9	8.9	.2
												C	13,960	----	44.3	55.7	----	5.3	80.1	1.3	13.0	.3
7	DH 72-3	146 -151	5	50	17	SW¼NE¼	15	G	K 6965	-----	2.0	A	8,700	4.6	27.0	35.1	33.3	3.9	49.8	.8	12.0	.2
												B	9,120	----	28.3	36.8	34.9	3.5	52.2	.9	8.3	.2
												C	14,020	----	43.5	56.5	----	5.4	80.2	1.3	12.8	.3
7	DH 72-3	151 -153.5	5	50	17	SW¼NE¼	15	G	K 6966	-----	2.3	A	10,460	3.6	33.4	40.3	22.7	4.7	59.0	1.0	12.4	.3
												B	10,860	----	34.6	41.9	23.5	4.4	61.2	1.1	9.6	.3
												C	14,200	----	45.3	54.7	----	5.8	80.0	1.4	12.5	.4
7	DH 72-3C	135.3-143.3	5	50	17	SW¼NE¼	15	E	K17440	-----	1.8	A	11,057	2.8	28.3	51.7	17.2	4.1	65.1	1.0	12.4	.2
												B	11,377	----	29.2	53.2	17.7	3.9	67.0	1.0	10.2	.2
												C	13,818	----	35.4	64.6	----	4.8	81.4	1.2	12.3	.3
7	DH 72-3C[6]	135.3-143.3	5	50	17	SW¼NE¼	15	E	K17437	-----	1.9	A	12,680	2.8	31.7	57.8	7.7	4.7	73.8	1.1	12.4	.2
												B	13,040	----	32.6	59.5	7.9	4.5	75.9	1.2	10.3	.2
												C	14,170	----	35.4	64.6	----	4.9	82.4	1.3	11.2	.3
7	DH 72-3C[7]	135.3-143.3	5	50	17	SW¼NE¼	15	E	K17438	-----	.0	A	7,980	2.7	21.1	41.9	34.3	3.0	49.4	.7	12.5	.2
												B	8,200	----	21.8	43.1	35.2	2.8	50.7	.7	10.5	.2
												C	12,650	----	33.6	66.4	----	4.3	78.3	1.1	16.1	.3
7	DH 72-3C	143.3-151.3	5	50	17	SW¼NE¼	15	E	K23315	-----	.5	A	7,180	3.3	23.4	29.4	43.9	3.3	41.5	.7	10.5	.1
												B	7,423	----	24.2	30.4	45.4	3.1	42.9	.7	7.8	.1
												C	13,601	----	44.4	55.7	----	5.6	78.7	1.3	14.2	.2

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
B. Cape Beaufort Area, Continued																						
7	DH 72-3C[6]	143.3-151.3	5	50	17	SW¼NE¼	15	E	K23312	-----	2.0	A	12,530	3.2	35.3	51.7	9.9	5.2	72.4	1.1	11.2	0.2
												B	12,940	----	36.4	53.3	10.3	5.0	74.7	1.2	8.6	.2
												C	14,420	----	40.6	59.4	----	5.6	83.3	1.3	9.6	.3
7	DH 72-3C	151.3-152.9	5	50	17	SW¼NE¼	15	E	K23402	-----	2.3	A	12,500	2.5	38.7	49.7	9.1	5.2	71.1	1.2	13.2	.3
												B	12,820	----	39.7	51.0	9.3	5.1	73.0	1.2	11.2	.3
												C	14,140	----	43.8	56.2	----	5.6	80.5	1.3	12.4	.3
7	DH 72-3C[6]	151.3-152.9	5	50	17	SW¼NE¼	15	E	K23400	-----	2.4	A	13,310	2.6	39.8	53.5	4.6	5.5	75.5	1.2	12.9	.3
												B	13,660	----	40.4	54.9	4.7	5.6	77.2	1.3	10.9	.3
												C	14,330	----	42.4	57.6	----	5.9	81.0	1.3	11.4	.3
7	DH 72-3C[7]	151.3-152.9	5	50	17	SW¼NE¼	15	E	K23401	-----	.0	A	5,590	2.5	24.2	23.9	49.4	2.8	34.5	.5	12.7	.1
												B	5,740	----	24.8	24.5	50.7	2.6	35.4	.5	10.7	.1
												C	11,640	----	50.3	49.7	----	5.2	71.8	1.0	21.8	.3
7	DH 72-10C	52.2- 57.8	5	50	17	SW¼SE¼	18	E	K24414	-----	2.0	A	11,130	3.3	31.3	48.4	16.9	4.5	64.3	1.0	13.1	.2
												B	11,510	----	32.4	50.1	17.5	4.2	66.5	1.0	10.5	.2
												C	13,960	----	39.3	60.7	----	5.1	80.6	1.2	12.8	.3
7	DH 72-10C[6]	52.2- 57.8	5	50	17	SW¼SE¼	23	E	K24413	-----	2.0	A	12,720	3.0	34.3	55.4	7.4	4.9	73.0	1.1	13.4	.3
												B	13,110	----	35.3	57.1	7.6	4.7	75.3	1.1	11.1	.3
												C	14,190	----	38.2	61.8	----	5.1	81.4	1.2	12.0	.3
7	DH 72-10C[7]	52.2- 57.8	5	50	17	SW¼SE¼	23	E	K24412	-----	.0	A	7,540	3.3	23.1	36.6	37.1	3.1	46.1	.6	13.0	.2
												B	7,790	----	23.9	37.8	38.3	2.8	47.7	.6	10.4	.2
												C	12,640	----	38.7	61.3	----	4.6	77.3	.9	16.9	.3
7	DH 72-10C	57.8- 61.1	5	50	17	SW¼SE¼	18	E	K24818	-----	1.9	A	8,430	3.4	25.9	35.2	35.6	3.7	49.1	.7	10.7	.2
												B	8,720	----	26.8	36.4	36.8	3.5	50.8	.8	7.9	.2
												C	13,810	----	42.4	57.6	----	5.5	80.5	1.2	12.5	.3
7	DH 72-10C[6]	57.8- 61.1	5	50	17	SW¼SE¼	23	E	K24820	-----	2.2	A	12,600	3.0	35.6	53.0	8.5	5.1	71.9	1.1	13.2	.3
												B	12,980	----	36.7	54.6	8.7	4.9	74.1	1.1	10.9	.3
												C	14,220	----	40.2	59.8	----	5.4	81.2	1.2	11.9	.3
7	DH 72-10C[7]	57.8- 61.1	5	50	17	SW¼SE¼	23	E	K24819	-----	.0	A	6,680	3.3	21.3	30.0	45.5	3.0	40.0	.5	10.9	.1
												B	6,900	----	22.0	31.0	47.0	2.7	41.3	.5	8.3	.2
												C	13,020	----	41.4	58.6	----	5.2	78.0	1.0	15.6	.3
7	DH 72-7C	43.0- 49.7	5	50	20	NW¼SW¼	23	E	------	-----	1.9	A	11,240	3.3	31.5	49.1	16.1	4.5	65.4	.9	12.8	.3
7	DH 72-7C[6]	43.0- 49.7	5	50	20	NW¼SW¼	18	E	K23475	-----	2.2	A	12,770	3.0	33.9	55.7	7.4	4.5	73.3	1.1	13.4	.3
												B	13,170	----	34.9	57.4	7.7	4.3	75.6	1.1	11.1	.3
												C	14,260	----	37.8	62.2	----	4.7	81.8	1.2	12.0	.3
7	DH 72-7C[7]	43.0- 49.7	5	50	20	NW¼SW¼	18	E	K23476	-----	.0	A	7,360	2.5	28.3	33.4	35.9	2.8	45.7	.6	14.8	.2
												B	7,540	----	29.0	34.2	36.8	2.6	46.9	.6	12.9	.2
												C	11,930	----	45.9	54.1	----	4.2	74.2	.9	20.5	.3
7	DH 72-7C	49.7- 57.9	5	50	20	NW¼SW¼	23	E	------	-----	1.9	A	5,950	3.1	20.1	24.3	52.5	2.8	34.9	.6	9.3	.1
7	DH 72-7C[6]	49.7- 57.9	5	50	20	NW¼SW¼	18	E	K23517	-----	1.9	A	12,350	3.3	35.4	50.6	10.7	5.0	70.1	1.0	13.0	.2
												B	12,770	----	36.6	52.3	11.1	4.8	72.4	1.1	10.4	.2
												C	14,370	----	41.2	58.8	----	5.4	81.5	1.2	11.7	.3
7	DH 72-7C[7]	49.7- 57.9	5	50	20	NW¼SW¼	18	E	K23518	-----	.5	A	7,070	3.1	22.7	30.2	44.0	3.0	41.9	.6	10.3	.2
												B	7,300	----	23.5	31.1	45.4	2.8	43.3	.6	7.8	.2
												C	7,300	----	43.0	57.1	----	5.1	79.3	1.1	14.3	.3
7	DH 72-7C	57.9- 59.9	5	50	20	NW¼SW¼	23	E	------	-----	1.9	A	12,140	2.8	37.0	48.8	11.4	5.1	68.8	1.1	13.3	.3

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis: Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis: Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
B. Cape Beaufort Area, Continued																						
7	DH 72-7C[6]	57.9- 59.9	5	50	20	NW¼SW¼	23	E	K23714	-----	2.2	A	13,280	3.0	39.7	52.9	4.4	5.5	75.2	1.8	13.3	0.4
												B	13,680	----	40.9	54.5	4.6	5.3	77.5	1.2	11.0	.4
												C	13,680	----	42.9	57.1	----	5.6	81.3	1.3	11.5	.4
7	DH 72-7C[7]	57.9- 59.9	5	50	20	NW¼SW¼	23	E	23713	-----	---	A	3,720	2.5	20.0	15.0	62.4	2.5	22.8	.4	11.8	.2
												B	3,820	----	20.6	15.4	64.0	2.3	23.4	.4	9.8	.2
7	AH 73-31A	5.8- 12.0	5	51	25	SE¼SW¼	30	P	K27198	0.687	.0	A	7,170	12.4	21.9	38.5	27.2	3.8	44.9	.7	23.3	.1
												B	8,190	----	25.0	44.0	31.0	2.7	51.3	.8	14.0	.2
												C	11,870	----	36.3	63.7	----	3.9	74.4	1.2	20.3	.2
7	AH 73-31B	12.0- 19.5	5	51	25	SE¼SW¼	30	P	K27199	.696	---	A	------	11.7	25.4	37.6	25.3	---	----	---	----	---
												B	------	----	28.8	42.5	28.7	---	----	---	----	---
												C	------	----	40.3	59.7	----	---	----	---	----	---
8	SS 69-6	5.5	5	50	8	NE¼SW¼	20	P	J36242	.682	.0	A	10,470	13.3	34.1	46.3	6.3	5.6	60.9	1.2	25.6	.4
												B	12,080	----	39.3	53.4	7.3	4.8	70.3	1.4	15.8	.4
												C	13,030	----	42.4	57.6	----	5.2	75.8	1.5	17.0	.5
8	DH 72-11	84.5- 91.7	5	50	8	CN½SE¼	14	G	K 6968	-----	1.9	A	10,220	5.0	29.6	44.4	21.0	4.5	59.8	.9	13.6	.2
												B	10,750	----	31.2	46.7	22.2	4.2	62.9	1.0	9.6	.2
												C	13,810	----	40.1	60.0	----	5.3	80.8	1.3	12.4	.3
8	DH 72-11	91.7- 96.4	5	50	8	CN½SE¼	14	G	K 6969	-----	3.0	A	11,610	4.8	35.6	45.4	14.2	5.3	66.3	1.2	12.7	.2
												B	12,200	----	37.4	47.7	15.0	5.0	69.7	1.2	8.9	.2
												C	14,350	----	44.0	56.1	----	5.9	82.0	1.4	10.5	.3
8	DH 72-9	84.0- 96.3	5	50	17	SW¼SE¼	18	G	K 6438	-----	2.1	A	10,740	4.1	31.3	44.9	19.7	4.5	61.8	1.0	13.0	.1
												B	11,200	----	32.6	46.8	20.5	4.2	64.4	1.0	9.7	.1
												C	14,100	----	41.1	59.0	----	5.3	81.1	1.3	12.2	.2
8	DH 72-8	97 -110	5	50	20	NW¼SW¼	23	G	K 6437	-----	2.1	A	11,640	3.8	33.5	48.5	14.2	4.8	66.7	1.1	13.1	.2
												B	12,100	----	34.8	50.4	14.8	4.5	69.3	1.1	10.1	.2
												C	14,200	----	40.9	59.1	----	5.3	81.4	1.3	11.8	.2
8	DH 72-8C	96.9-103.4	5	50	20	NW¼SW¼	23	E	K23827	-----	1.8	A	10,880	2.9	31.4	48.0	17.6	4.3	63.9	.9	12.7	.5
												B	11,200	----	32.4	49.5	18.2	4.1	65.8	1.0	10.4	.6
												C	13,690	----	39.6	60.5	----	5.0	80.4	1.2	12.7	.7
8	DH 72-8C[6]	96.9-103.4	5	50	20	NW¼SW¼	23	E	K23829	-----	1.9	A	12,740	2.9	34.1	55.1	8.0	4.9	73.2	1.1	12.5	.3
												B	13,120	----	35.1	56.7	8.2	4.7	75.4	1.1	10.3	.3
												C	14,290	----	38.2	61.8	----	5.1	82.1	1.2	11.2	.4
8	DH 72-8C[7]	96.9-103.4	5	50	20	NW¼SW¼	23	E	K23828	-----	.0	A	7,800	2.2	27.4	36.9	33.6	3.0	48.3	.6	14.3	.2
												B	7,970	----	28.0	37.7	34.3	2.8	49.4	.6	12.7	.2
												C	12,140	----	42.6	57.4	----	4.3	75.2	.9	19.2	.3
8	DH 72-8C	103.4-109.8	5	50	20	NW¼SW¼	23	E	K23992	-----	2.0	A	12,070	3.0	35.6	49.6	11.8	5.0	69.2	1.1	12.7	.2
												B	12,440	----	36.8	51.1	12.2	4.8	71.4	1.1	10.3	.2
												C	14,160	----	41.8	58.2	----	5.5	81.3	1.3	11.8	.2
8	DH 72-8C[6]	103.4-109.8	5	50	20	NW¼SW¼	23	E	K23994	-----	2.3	A	13,030	3.0	37.2	53.5	6.4	5.2	74.0	1.2	13.0	.2
												B	13,420	----	38.3	55.1	6.6	5.0	76.2	1.2	10.7	.2
												C	14,380	----	41.0	59.0	----	5.4	81.6	1.3	11.5	.2
8	DH 72-8C[7]	103.4-109.8	5	50	20	NW¼SW¼	23	E	K23993	-----	.5	A	7,230	2.1	27.5	31.8	38.5	3.1	45.7	.6	12.0	.2
												B	7,390	----	28.1	32.5	39.4	2.9	46.7	.6	10.3	.2
												C	12,180	----	46.4	53.6	----	4.9	76.9	1.0	17.0	.3

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
B. Cape Beaufort Area, Continued																						
8	AH 73-32	3.2- 16.0	4	50	30	NW¼NE¼	24	P	K27200	0.648	0.0	A	9,230	10.1	26.6	45.1	18.2	4.5	54.9	1.0	21.1	0.3
												B	10,270	----	29.6	50.1	20.3	3.8	61.1	1.1	13.4	.3
												C	12,880	----	37.1	62.9	----	4.8	76.6	1.4	16.8	.4
9	DH 72-28	25.5- 29.7	5	50	29	NE¼SW¼	25	G	K 6445	-----	1.8	A	10,990	6.8	32.8	43.0	17.5	5.1	62.2	1.2	13.8	.2
												B	11,780	----	35.2	46.1	18.8	4.6	66.7	1.3	8.4	.3
												C	14,510	----	43.3	56.7	----	5.7	82.1	1.5	10.4	.3
10	DH 72-12	111 -119	5	50	16	NE¼SE¼	21	G	K 6439	-----	3.5	A	11,870	3.3	34.9	46.5	15.3	5.0	66.7	1.4	11.4	.3
												B	12,270	----	36.1	48.1	15.9	4.8	69.0	1.4	8.7	.3
												C	14,580	----	42.9	57.2	----	5.7	82.0	1.7	10.3	.3
10	DH 72-28	54.0- 60.8	5	50	29	NE¼SW¼	24	G	K 6446	-----	1.8	A	10,920	4.6	32.6	44.4	18.4	4.8	62.4	1.2	13.0	.3
												B	11,440	----	34.2	46.5	19.3	4.5	65.4	1.2	9.3	.3
												C	14,180	----	42.3	57.7	----	5.6	81.0	1.5	11.6	.4
10	SS 69-17	4.2	6	51	3	NE¼SE¼	48	P	J36254	.620	.0	A	8,310	20.6	31.2	41.9	6.3	5.5	51.7	1.1	35.3	.1
												B	10,470	----	39.3	52.7	8.0	4.0	65.2	1.4	21.2	.2
												C	11,380	----	42.7	57.3	----	4.3	70.8	1.5	23.2	.2
10	SS 69-28	8.8	6	51	3	NE¼SW¼	48	P	J36263	.589	.0	A	8,310	21.0	31.4	41.9	5.7	5.4	51.8	1.1	35.9	.1
												B	10,510	----	39.8	53.0	7.2	3.9	65.5	1.4	21.9	.1
												C	11,330	----	42.8	57.2	----	4.2	70.6	1.5	23.6	.1
10	SS 69-Lagoon B	10.5	6	51	6	SE¼SW¼	80	P	J36245	.515	.0	A	8,570	17.6	32.1	43.5	6.8	5.0	53.7	1.2	33.2	.1
												B	10,400	----	38.9	52.8	8.3	3.7	65.1	1.4	21.3	.2
												C	11,340	----	42.4	57.6	----	4.0	71.0	1.6	23.2	.2
11	SS 69-Lagoon C	3.9	6	51	6	SE¼SW¼	80	P	J36246	.634	.0	A	8,670	18.1	35.2	43.0	3.7	5.2	54.3	1.2	35.3	.3
												B	10,590	----	43.0	52.5	4.5	3.9	66.3	1.4	23.5	.3
												C	11,090	----	45.0	55.0	----	4.1	69.5	1.5	24.6	.3
12	DH 72-15	43 - 46.1	5	50	15	NW¼SW¼	22	G	K 6440	-----	3.2	A	12,360	3.2	33.1	51.1	12.6	4.9	69.6	1.3	11.3	.3
												B	12,770	----	34.2	52.8	13.0	4.7	71.9	1.4	8.7	.3
												C	14,670	----	39.3	60.7	----	5.4	82.6	1.6	10.0	.4
13	DH 72-15	104.4-107.4	5	50	15	NW¼SW¼	22	G	K 6441	-----	2.7	A	12,160	3.6	31.5	51.8	13.2	4.8	69.2	1.2	11.3	.3
												B	12,610	----	32.6	53.7	13.7	4.6	71.7	1.3	8.4	.3
												C	14,610	----	37.8	62.2	----	5.3	83.1	1.5	9.7	.4
13	SS 69-30	2.9	6	51	2	NW¼SW¼	48	F	J36264	.786	.0	A	12,010	8.4	29.8	57.6	4.2	5.3	70.1	1.4	18.8	.2
												B	13,100	----	32.5	62.9	4.6	4.7	76.5	1.5	12.5	.2
												C	13,730	----	34.1	65.9	----	5.0	80.2	1.6	12.9	.3
13	SS 69-Lagoon E	3.3	6	51	6	SE¼SW¼	84	P	J36247	.655	.0	A	8,220	18.8	29.4	43.2	8.6	4.9	51.8	1.1	33.4	.2
												B	10,120	----	36.2	53.3	10.5	3.5	63.7	1.3	20.7	.3
												C	11,310	----	40.4	59.6	----	3.9	71.2	1.4	23.2	.3
14	AH 73-34	4.5- 8.8	5	50	10	NW¼SE¼	18	P	K27201	.695	---	A	------	6.3	27.5	54.9	11.3	---	----	---	----	---
												B	------	----	29.3	58.7	12.0	---	----	---	----	---
												C	------	----	33.3	66.7	----	---	----	---	----	---
14	SS 69-24	4.3	6	51	8	SE¼NW¼	48	F	J36260	.660	.0	A	9,950	15.3	29.0	51.6	4.1	5.0	60.4	1.3	28.8	.4
												B	11,740	----	34.3	60.9	4.8	3.9	71.3	1.5	18.0	.5
												C	12,330	----	36.0	64.0	----	4.1	74.9	1.6	18.9	.5
15	DH 72-27	21.0- 30.2	5	51	29	SW¼SE¼	29	G	K 6444	-----	2.2	A	12,070	6.8	30.4	53.2	9.7	5.1	69.1	1.4	14.6	.2
												B	12,950	----	32.6	57.1	10.4	4.6	74.2	1.5	9.2	.3
												C	14,440	----	36.4	63.7	----	5.2	82.8	1.6	10.2	.3

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
B. Cape Beaufort Area, Continued																						
15	AH 73-36	7.5- 13.5	5	51	10	SE¼NE¼	18	P	K27202	0.637	0.0	A	9,980	10.2	29.5	50.7	9.6	4.6	60.5	1.3	23.7	0.3
												B	11,110	----	32.8	56.5	10.7	3.9	67.3	1.4	16.3	.4
												C	12,450	----	36.8	63.2	----	4.4	75.4	1.6	18.2	.4
16	SS 69-22	6.9	6	51	2	SW¼SW¼	52	F	J36258	.708	.0	A	10,500	13.5	32.8	49.6	4.1	5.5	62.2	1.6	26.3	.3
												B	12,140	----	37.9	57.3	4.8	4.6	71.9	1.8	16.6	.3
												C	12,750	----	39.8	60.2	----	4.8	75.5	1.9	17.5	.3
16	DH 72-19	48.2- 55.5	5	50	22	NE¼NW¼	25	G	K 6443	-----	5.6	A	13,060	3.9	33.8	54.3	8.0	5.2	74.1	1.6	10.9	.2
												B	13,590	----	35.2	56.5	8.3	5.0	77.2	1.6	7.7	.2
												C	14,830	----	38.3	61.7	----	5.5	84.2	1.8	8.4	.2
16	AH 73-29	6.3- 13.0	5	50	32	SE¼NE¼	30	P	K27197	.718	.0	A	11,370	11.8	30.0	51.8	6.4	5.4	65.6	1.3	21.1	.2
												B	12,900	----	34.0	58.7	7.3	4.6	74.4	1.5	12.0	.2
												C	13,910	----	36.7	63.3	----	5.0	80.3	1.6	12.9	.2
16	SS 69-Lagoon G	4.8	6	51	6	SW¼SW¼	90	P	J36248	.600	.0	A	8,720	17.9	36.3	43.0	2.8	5.5	54.0	1.5	35.9	.3
												B	10,620	----	44.3	52.3	3.4	4.2	65.7	1.8	24.5	.4
												C	10,990	----	45.8	54.2	----	4.4	68.1	1.8	25.3	.4
17	SS 69-21	6.2	6	51	2	SW¼SW¼	52	F	J36257	.705	.0	A	10,310	6.7	28.3	47.4	17.6	4.6	59.6	1.3	16.7	.2
												B	11,050	----	30.3	50.8	18.9	4.2	63.9	1.4	11.4	.2
												C	13,610	----	37.4	62.6	----	5.1	78.7	1.8	14.1	.3
18	SS 69-27	3.5	6	51	8	NE¼SW¼	48	P	J36262	.624	.0	A	7,540	25.1	32.1	36.6	6.2	5.7	47.6	1.1	39.1	.3
												B	10,080	----	42.9	48.8	8.3	3.9	63.5	1.4	22.5	.4
												C	10,980	----	46.7	53.3	----	4.3	69.3	1.6	24.4	.4
18	SS 69-20	4.3	6	51	2	SW¼SW¼	52	F	J36256	.840	.0	A	13,090	5.1	37.6	53.8	3.5	5.7	74.1	1.7	14.6	.4
												B	13,790	----	39.6	56.7	3.7	5.4	78.1	1.8	10.6	.4
												C	14,320	----	41.1	58.9	----	5.7	81.1	1.9	10.9	.4
19	SS 69-19	4.9	6	51	2	SW¼SW¼	52	F	J36255	.755	.0	A	12,210	8.0	32.5	57.2	2.3	5.4	71.0	1.7	19.3	.3
												B	13,270	----	35.3	62.2	2.5	4.9	77.2	1.9	13.2	.3
												C	13,620	----	36.2	63.8	----	5.0	79.2	1.9	13.6	.3
19	DH 72-20	72.5- 77.1	5	50	15	SE¼SE¼	26	G	K 6970	-----	3.8	A	7,980	3.3	25.1	30.8	40.9	3.8	45.2	1.2	8.8	.2
												B	8,250	----	25.9	31.8	42.3	3.5	46.7	1.2	6.1	.2
												C	14,300	----	44.9	55.1	----	6.1	80.9	2.1	10.5	.4
19	DH 72-20	77.5- 81.0	5	50	15	SE¼SE¼	26	G	K 6971	-----	2.9	A	6,330	3.0	21.4	24.1	51.6	3.1	35.8	1.0	8.3	.2
												B	6,520	----	22.0	24.8	53.2	2.8	36.9	1.1	5.8	.2
												C	13,930	----	47.1	52.9	----	6.1	78.8	2.2	12.4	.4
20	SS 69-23	5.2	6	51	2	SW¼SW¼	50	F	J36259	.722	.0	A	11,330	9.9	31.7	54.5	3.9	5.2	66.6	1.5	22.4	.4
												B	12,580	----	35.2	60.5	4.3	4.5	73.9	1.7	15.2	.4
												C	13,150	----	36.8	63.2	----	4.7	77.3	1.7	15.9	.4
20	SS 69-31	8.3	6	51	8	NE¼SW¼	45	P	J36265	.708	.0	A	8,060	23.3	33.3	37.7	5.7	5.5	50.5	1.1	37.0	.2
												B	10,510	----	43.4	49.2	7.4	3.8	65.8	1.4	21.4	.2
												C	11,360	----	46.9	53.1	----	4.1	71.1	1.5	23.1	.2
20	SS 69-Lagoon I	8.3	6	51	6	SW¼SW¼	90	P	J36249	.572	.0	A	9,150	16.0	33.1	45.8	5.1	5.0	56.2	1.2	32.2	.3
												B	10,890	----	39.4	54.5	6.1	3.9	66.9	1.5	21.3	.3
												C	11,590	----	42.0	58.0	----	4.1	71.2	1.5	22.8	.3
21	SS 69-Lagoon J	2.8	6	51	6	SW¼SW¼	80	P	J36250	.596	.0	A	6,770	18.3	32.6	34.5	14.6	4.9	42.9	1.4	35.9	.3
												B	8,290	----	39.9	42.2	17.9	3.5	52.5	1.7	24.1	.3
												C	10,090	----	48.6	51.4	----	4.2	63.9	2.0	29.5	.4

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
B. Cape Beaufort Area, Continued																						
22	SS 69-Lagoon K	2.2	6	51	6	SW¼SW¼	75	P	J36251	0.588	0.0	A	8,670	18.1	36.2	41.5	4.2	5.3	53.5	1.5	35.1	0.4
												B	10,580	----	44.2	50.6	5.2	4.0	65.3	1.9	23.1	.5
												C	11,160	----	46.6	53.4	----	4.2	68.8	2.0	24.5	.5
23	SS 69-Lagoon L	4.7	6	51	6	SW¼SW¼	75	P	J36252	.566	.0	A	8,020	18.7	33.7	39.4	8.2	5.2	50.0	1.5	34.8	.3
												B	9,870	----	41.4	48.6	10.0	3.9	61.5	1.9	22.3	.4
												C	10,970	----	46.1	53.9	----	4.3	68.4	2.1	24.7	.5
24	SS 69-Lagoon M	3.7	6	51	6	SW¼SW¼	75	P	J36253	.598	.0	A	7,800	21.3	34.6	37.6	6.5	5.7	48.1	1.4	38.2	.1
												B	9,910	----	44.0	47.7	8.3	4.2	61.1	1.8	24.4	.2
												C	10,810	----	47.9	52.1	----	4.6	66.6	2.0	26.6	.2
26	DH 72-18	60.9- 65	5	50	22	SW¼NE¼	28	G	K 6442	-----	6.1	A	11,170	3.3	30.3	44.6	21.7	4.6	62.7	1.6	9.1	.4
												B	11,560	----	31.3	46.2	22.5	4.4	64.8	1.6	6.3	.4
												C	14,910	----	40.4	59.6	----	5.7	83.6	2.1	8.1	.5
C. Deadfall Syncline Area																						
	AH 73-1A	4.5- 8.0	4	48	12	NE¼SW¼	10	P	K27174	.687	---	A	------	7.6	23.0	52.4	17.0	---	----	---	----	---
												B	------	----	24.9	56.7	18.4	---	----	---	----	---
												C	------	----	30.5	69.5	----	---	----	---	----	---
	AH 73-1B	8.0- 12.0	4	48	12	NE¼SW¼	10	P	K27175	.696	---	A	------	6.7	23.1	36.6	33.6	---	----	---	----	---
												B	------	----	24.8	39.1	36.1	---	----	---	----	---
												C	------	----	38.8	61.2	----	---	----	---	----	---
	AH 73-1C	12.0- 16.0	4	48	12	NE¼SW¼	10	P	K27176	.650	---	A	------	5.6	22.3	40.1	32.0	---	----	---	----	---
												B	------	----	23.7	42.4	33.9	---	----	---	----	---
												C	------	----	35.8	64.2	----	---	----	---	----	---
	AH 73-1D	16.0- 17.5	4	48	12	NE¼SW¼	10	P	K27177	.637	---	A	------	5.3	24.3	37.2	33.2	---	----	---	----	---
												B	------	----	25.7	39.3	35.0	---	----	---	----	---
												C	------	----	39.5	60.5	----	---	----	---	----	---
	AH 73-1[8]	4.5- 17.5	4	48	12	NE¼SW¼	10	P	K27178	.668	.0	A	8,620	6.3	23.5	43.3	26.9	3.7	51.5	.9	16.8	.2
												B	9,190	----	25.1	46.2	28.7	3.2	54.9	.9	12.1	.2
												C	12,890	----	35.2	64.8	----	4.5	77.0	1.3	17.0	.2
	AH 73-2	2.7- 7.5	3	48	36	SE¼SE¼	10	P	K27180	.626	.0	A	------	17.9	25.9	37.9	18.3	---	----	---	----	---
												B	------	----	31.5	46.2	22.3	---	----	---	----	---
												C	------	----	40.6	59.4	----	---	----	---	----	---
	AH 73-3	3.0- 9.8	3	48	36	NW¼SE¼	10	P	K27179	.634	.0	A	9,000	14.1	27.9	45.7	12.3	---	----	---	----	---
												B	10,480	----	32.5	53.2	14.3	---	----	---	----	---
												C	12,230	----	37.9	62.1	----	---	----	---	----	---
	AH 73-4	3.0- 13.5	3	47	14	SE¼SW¼	18	P	K27181	.590	.0	A	10,390	13.4	29.9	51.3	5.4	5.3	61.9	1.4	25.8	.2
												B	12,000	----	34.5	59.3	6.2	4.4	71.4	1.6	16.2	.2
												C	12,800	----	36.8	63.2	----	4.7	76.2	1.7	17.2	.2
	AH 73-5	4.3- 12.8	3	47	23	N½NW¼	18	P	K27187	.713	.0	A	9,380	12.7	25.9	48.4	13.0	4.5	57.0	1.1	24.3	.1
												B	10,750	----	29.7	55.4	14.9	3.5	65.2	1.2	15.0	.2
												C	12,630	----	34.9	65.1	----	4.1	76.7	1.4	17.6	.2
	AH 73-6	4.2- 12.0	3	47	16	SW¼SE¼	18	P	K27188	.665	.0	A	9,430	14.3	28.4	47.8	9.5	4.9	57.2	1.0	27.2	.2
												B	11,000	----	33.2	55.7	11.1	3.8	66.8	1.2	16.9	.2
												C	12,380	----	37.3	62.7	----	4.3	75.2	1.4	18.8	.3

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis: Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis: Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
C. Deadfall Syncline Area, Continued																						
	AH 73-8	4.5- 19.2	3	47	24	SE¼SW¼	10	P	K27189	0.611	0.0	A	9,370	13.7	28.5	47.6	10.2	4.8	56.7	1.0	27.1	0.2
												B	10,860	----	33.0	55.2	11.8	3.8	65.8	1.2	17.2	.2
												C	12,310	----	37.4	62.6	----	4.3	74.6	1.3	19.6	.2
	AH 73-10A	5.2- 7.5	3	46	18	W½SW¼	8	P	K27182	.685	---	A	------	13.8	25.3	52.8	8.1	---	----	---	----	---
												B	------	----	29.4	61.2	9.4	---	----	---	----	---
												C	------	----	32.4	67.6	----	---	----	---	----	---
	AH 73-10C	7.5- 11.2	3	46	18	W½SW¼	8	P	K27184	.654	---	A	------	14.0	28.1	52.4	5.5	---	----	---	----	---
												B	------	----	32.7	60.9	6.4	---	----	---	----	---
												C	------	----	34.9	65.1	----	---	----	---	----	---
	AH 73-10B	11.2- 14.2	3	46	18	W½SW¼	8	P	K27183	.671	---	A	------	12.3	30.3	52.7	4.7	---	----	---	----	---
												B	------	----	34.5	60.1	5.4	---	----	---	----	---
												C	------	----	36.5	63.5	----	---	----	---	----	---
	AH 73-10[8]	5.2- 14.2	3	46	18	W½SW¼	8	P	K27185	.670	.0	A	10,400	12.5	28.5	53.5	5.5	4.8	62.7	1.3	25.4	.3
												B	11,880	----	32.6	61.1	6.3	3.9	71.7	1.5	16.3	.3
												C	12,680	----	34.8	65.2	----	4.2	76.5	1.6	17.4	.3
	AH 73-23A	4.5- 7.9	3	47	25	NW¼SE¼	14	P	K27194	.680	.0	A	9,300	13.7	29.8	46.2	10.3	4.9	56.5	1.1	27.0	.2
												B	10,770	----	34.5	53.6	11.9	3.9	65.4	1.3	17.3	.2
												C	12,230	----	39.2	60.8	----	4.4	74.3	1.4	19.7	.2
	AH 73-23B	7.9- 10.9	3	47	25	NW¼SE¼	14	P	K27195	.574	.0	A	------	11.7	29.6	43.6	15.1	---	----	---	----	---
												B	------	----	33.6	49.3	17.1	---	----	---	----	---
												C	------	----	40.5	59.5	----	---	----	---	----	---
	AH 73-24	3.8- 10.0	3	47	23	NW¼SE¼	18	P	K27196	.670	.0	A	9,070	16.0	28.3	45.6	10.1	5.0	54.7	1.0	29.0	.2
												B	10,790	----	33.7	54.3	12.0	3.8	65.0	1.1	17.9	.2
												C	12,270	----	38.2	61.8	----	4.3	73.9	1.3	20.2	.3
	AH 73-25A	4.0- 8.0	3	47	23	NW¼SE¼	18	P	K27190	.617	---	A	------	18.3	27.1	43.5	11.1	---	----	---	----	---
												B	------	----	33.2	53.2	13.6	---	----	---	----	---
												C	------	----	38.4	61.6	----	---	----	---	----	---
	AH 73-25B	8.0- 12.0	3	47	23	NW¼SE¼	18	P	K27191	.603	---	A	------	9.0	22.4	36.0	32.6	---	----	---	----	---
												B	------	----	24.6	39.6	35.8	---	----	---	----	---
												C	------	----	38.3	61.7	----	---	----	---	----	---
	AH 73-25C	12.0- 17.3	3	47	23	NW¼SE¼	18	P	K27192	.572	---	A	------	14.2	28.2	49.1	8.5	---	----	---	----	---
												B	------	----	32.8	57.3	9.9	---	----	---	----	---
												C	------	----	36.4	63.6	----	---	----	---	----	---
	AH 73-25[8]	4.0- 17.3	3	47	23	NW¼SE¼	18	P	K27193	.597	.0	A	8,160	13.7	25.6	41.4	19.3	4.5	49.9	.9	25.2	.2
												B	9,450	----	29.7	48.0	22.3	3.4	57.7	1.0	15.4	.2
												C	12,160	----	38.2	61.8	----	4.4	74.3	1.3	19.8	.2
	AH 73-27*	4.2- 17.0	3	47	16	NE¼SE¼	20	P	K27186	.674	.0	A	10,100	15.6	29.2	51.1	4.1	5.3	60.5	1.3	28.6	.2
												B	11,970	----	34.6	60.5	4.9	4.2	71.8	1.5	17.4	.2
												C	12,590	----	36.4	63.6	----	4.4	75.4	1.6	18.3	.3
D. Kukpowruk Area																						
	SS 67-1	5.0	1	44	28	SW¼NW¼	15	F	159804	.787	6.0	A	13,720	2.5	42.3	52.1	3.1	5.6	77.5	1.4	12.2	.2
												B	14,080	----	43.3	53.5	3.2	5.4	79.5	1.5	10.2	.2
												C	14,540	----	44.8	55.2	----	5.6	82.1	1.5	10.6	.2

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulf
D. Kukpowruk Area, Continued																						
	SS 67-2	5.0	1	44	28	SW¼NW¼	15	F	I59805	0.837	2.5	A	12,640	2.6	36.1	53.8	7.5	4.9	73.1	1.2	13.2	0.
												B	12,980	----	37.0	55.3	7.7	4.7	75.1	1.2	11.1	.
												C	14,060	----	40.1	59.9	----	5.1	81.3	1.3	12.1	.
	SS 67-3	5.0	1	44	28	SW¼NW¼	15	F	I59806	.946	1.5	A	13,560	2.9	31.3	62.0	3.8	4.8	78.2	1.2	11.8	.
												B	13,960	----	32.2	63.9	3.9	4.6	80.5	1.3	9.5	.
												C	14,530	----	33.5	66.5	----	4.8	83.7	1.3	10.0	.
	SS 67-4	4.0	1	44	28	NE¼NW¼	15	F	I59807	.792	1.5	A	12,690	2.7	35.4	51.3	10.6	5.1	71.3	1.3	11.4	.
												B	13,040	----	36.3	52.8	10.9	5.0	73.3	1.4	9.1	.
												C	14,630	----	40.8	59.2	----	5.6	82.3	1.5	10.3	.
	SS 67-5	2.9	1	44	20	SE¼SE¼	10	F	I59808	.835	.5	A	12,300	4.4	32.6	53.1	9.0	5.0	70.4	1.2	13.1	.
												B	12,860	----	34.1	55.5	10.4	4.7	73.6	1.3	9.5	.
												C	14,350	----	38.0	62.0	----	5.3	82.1	1.4	10.7	.
	SS 67-6	3.6	1	44	20	SE¼SE¼	10	F	I59809	.810	.5	A	10,850	3.8	30.2	46.7	19.3	4.5	62.1	1.2	12.6	.
												B	11,280	----	31.4	48.6	20.0	4.3	64.6	1.2	9.6	.
												C	14,110	----	39.2	60.8	----	5.3	80.7	1.5	12.2	.
	SS 67-7	3.5	1	44	20	SE¼SE¼	10	F	I59810	.775	.5	A	11,750	5.9	32.1	51.0	11.0	5.0	67.3	1.2	15.1	.
												B	12,490	----	34.1	54.2	11.7	4.6	71.5	1.3	10.5	.
												C	14,140	----	38.6	61.4	----	5.2	81.0	1.5	11.9	.
	SS 67-8	3.3	1	44	17	NE¼SE¼	5	F	I59811	.795	2.0	A	12,240	3.2	34.7	50.2	11.9	5.0	69.4	1.4	12.0	.
												B	12,650	----	35.8	51.9	12.3	4.8	71.7	1.5	9.3	.
												C	14,430	----	40.9	59.1	----	5.5	81.8	1.7	10.6	.
	SS 67-9	5.3	1	44	8	SW¼SE¼	5	F	I59812	.780	2.0	A	13,220	4.9	36.2	56.0	2.9	5.4	75.4	1.6	14.4	.
												B	13,910	----	38.0	59.0	3.0	5.1	79.3	1.6	10.7	.
												C	14,340	----	39.2	60.8	----	5.2	81.8	1.7	11.0	.
	SS 67-10	5.6	1	44	8	SE¼NW¼	5	F	I59813	.745	2.0	A	12,250	5.3	36.0	52.7	6.0	5.3	71.8	1.6	15.0	.
												B	13,220	----	38.0	55.7	6.3	5.0	75.7	1.7	10.9	.
												C	14,110	----	40.5	59.5	----	5.3	80.8	1.8	11.7	.
	SS 67-11	5.2	1	44	8	SE¼NW¼	9	F	I59814	.710	.0	A	12,460	6.2	35.2	54.6	4.0	5.3	72.1	1.5	16.7	.
												B	13,280	----	37.5	58.2	4.3	4.9	76.9	1.6	11.9	.
												C	13,880	----	39.2	60.8	----	5.2	80.3	1.7	12.4	.
	SS 67-12	9.1	1	44	6	SE¼SW¼	9	F	I59815	.730	.0	A	10,160	5.8	28.9	45.7	19.6	4.5	58.5	1.0	16.1	.
												B	10,790	----	30.7	48.4	20.9	4.1	62.1	1.1	11.5	.
												C	13,630	----	38.7	61.3	----	5.2	78.5	1.4	14.6	.
E. Kokolik-Elusive Creek Area																						
	SS 75-11	3.2	1	39	5	NW¼SW¼	4	F	K56221	-----	.5	A	12,280	8.7	32.5	55.3	3.5	5.3	71.2	1.5	18.2	.
												B	13,450	----	35.6	60.6	3.8	4.7	78.1	1.7	11.3	.
												C	13,990	----	37.0	63.0	----	4.9	81.2	1.8	11.7	.
	SS 75-12	2.0	1	39	5	SW¼NW¼	3	P	K56222	-----	---	A	8,330	25.5	31.5	38.4	4.6	5.8	51.2	1.4	36.8	.
												B	11,170	----	42.2	51.7	6.1	3.9	68.7	1.8	19.2	.
												C	11,900	----	45.0	55.0	----	4.2	73.1	1.9	20.5	.
	SS 75-41	4.8	1	39	2	SW¼NW¼	5	P	K56223	-----	---	A	9,200	22.6	28.5	46.0	2.9	5.7	55.6	1.5	34.1	.
												B	11,880	----	36.8	59.5	3.7	4.2	71.9	1.9	18.0	.
												C	12,340	----	38.2	61.8	----	4.3	74.6	2.0	18.8	.

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
E. Kokolik-Elusive Creek Area, Continued																						
	SS S75-43	5.5	1	36	16	NE¼NW¼	15	P	K56236	-----	---	A	10,650	13.9	30.2	52.8	3.1	5.3	63.6	1.3	26.4	0.3
												B	12,380	----	35.0	61.4	3.6	4.3	73.9	1.5	16.3	.4
												C	12,840	----	36.4	63.6	----	4.5	76.7	1.6	16.8	.4
	SS 75-45	5.2+	1	39	11	NW¼SE¼	20	P	K56224	-----	---	A	9,310	20.9	29.0	46.3	3.8	5.6	56.2	1.2	33.0	.2
												B	11,770	----	36.7	58.5	4.8	4.2	71.1	1.5	18.1	.3
												C	12,370	----	38.5	61.5	----	4.4	74.6	1.6	19.1	.3
	SS 75-47	4.2	1	39	14	NE¼NE¼	23	P	K56225	-----	---	A	9,790	18.9	28.1	48.5	4.5	5.4	58.8	1.2	29.7	.4
												B	10,260	----	34.7	59.7	5.6	4.1	72.4	1.4	16.1	.4
												C	12,770	----	36.7	63.3	----	4.3	76.7	1.5	17.0	.5
	SS 75-55 Upper	6.2	1	40	13	NE¼NW¼	22	F	K56226	-----	---	A	10,180	9.7	27.8	46.9	15.6	4.8	59.6	1.0	18.8	.2
												B	11,280	----	30.8	52.0	17.2	4.1	66.0	1.1	11.4	.2
												C	13,630	----	37.2	62.8	----	4.9	79.7	1.4	13.7	.3
	SS 75-55 Lower	3.9	1	40	13	NE¼NW¼	22	F	K56227	-----	2.0	A	12,660	6.5	35.2	52.4	5.9	5.4	71.9	1.2	15.4	.2
												B	13,540	----	37.6	56.0	6.4	5.0	76.9	1.3	10.2	.2
												C	14,460	----	40.2	59.8	----	5.3	82.1	1.4	10.9	.3
	SS 75-56	3.3	1	40	13	NE¼NW¼	22	F	K56228	-----	.5	A	11,410	5.2	32.7	47.2	14.9	4.9	65.7	1.0	13.2	.3
												B	12,040	----	34.5	49.8	15.7	4.6	69.3	1.0	9.1	.3
												C	14,280	----	40.9	59.1	----	5.4	82.2	1.2	10.8	.4
	SS 75-57 Top	5.4	1	36	23	NE¼SE¼	4	F	K56229	-----	.5	A	12,650	6.7	38.1	51.9	3.3	5.4	72.5	1.5	17.1	.2
												B	13,560	----	40.9	55.6	3.5	5.0	77.8	1.6	11.8	.3
												C	14,060	----	42.4	57.6	----	5.2	80.6	1.7	12.2	.3
	SS 75-57 Bottom	4.2	1	36	23	NE¼SE¼	4	F	K56230	-----	---	A	10,850	12.1	31.3	51.8	4.8	5.3	63.9	1.5	24.3	.2
												B	12,330	----	35.6	58.9	5.5	4.5	72.6	1.7	15.4	.3
												C	13,050	----	37.6	62.4	----	4.8	76.8	1.8	16.3	.3
	SS 75-65	5.4	1	36	24	NE¼NE¼	2	F	K56231	-----	---	A	10,170	12.8	31.7	48.2	7.3	5.2	60.4	1.8	25.1	.2
												B	11,670	----	36.3	55.3	8.4	4.3	69.3	2.1	15.7	.2
												C	12,740	----	39.6	60.4	----	4.7	75.6	2.3	17.2	.2
	SS 75-66	4.1	1	35	19	SE¼NE¼	2	F	K56232	-----	1.5	A	12,460	6.1	35.1	51.8	7.0	5.4	70.8	1.8	14.8	.2
												B	13,270	----	37.4	55.1	7.5	5.0	75.4	1.9	10.0	.2
												C	14,350	----	40.4	59.6	----	5.4	81.5	2.0	10.9	.2
	SS S75-71	3.0	1	39	13	CE½E½	9	P	K56237	-----	---	A	8,390	5.7	40.0	38.6	15.7	4.8	50.7	1.4	27.2	.2
												B	8,890	----	42.4	41.0	16.6	4.4	53.7	1.5	23.6	.2
												C	10,670	----	50.8	49.2	----	5.3	64.4	1.8	28.2	.3
	SS 75-86	5.3	1	35	9	SW¼SE¼	8	F	K56233	-----	2.0	A	12,620	6.5	35.0	52.7	5.8	5.5	71.8	1.5	15.1	.3
												B	13,500	----	37.4	56.4	6.2	5.1	76.8	1.6	9.9	.4
												C	14,390	----	39.9	60.1	----	5.4	81.9	1.7	10.6	.4
	SS 75-95	6.3	1	39	1	SW¼SW¼	17	P	K56234	-----	.0	A	11,520	11.9	30.0	55.8	2.3	5.4	67.7	1.6	22.7	.3
												B	13,080	----	34.0	63.4	2.6	4.6	76.9	1.9	13.7	.3
												C	13,420	----	34.9	65.1	----	4.7	78.9	1.9	14.2	.3
	SS 75-99	1.3	1	39	1	NW¼NW¼	10	F	K56235	-----	.5	A	12,350	8.4	34.3	52.9	4.4	5.4	71.0	1.4	17.5	.3
												B	13,480	----	37.5	57.7	4.8	4.9	77.6	1.5	10.9	.3
												C	14,170	----	39.4	60.6	----	5.1	81.5	1.6	11.5	.3
	SS 75-102	1.5	1	39	12	SW¼SW¼	9	F	K56238	-----	---	A	8,150	5.0	25.0	32.8	37.2	4.0	46.1	1.0	11.3	.4
												B	8,570	----	26.3	34.5	39.2	3.6	48.6	1.1	7.1	.4
												C	14,100	----	43.3	56.7	----	5.9	79.9	1.8	11.7	.7

Table 1.--Coal analyses from northwestern Alaska--Continued

Coal bed	Sample no.	Depth interval[1] (in feet)	Location UPM, Alaska T.S.	R.W.	Sec.	Qtr.	Degree of dip	Sampling conditions[2]	USBM no.	Average vitrinite reflectance[3]	FSI[4]	Sample condition[5]	Btu/lb	Proximate analysis Moisture	Volatile matter	Fixed carbon	Ash	Ultimate analysis Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur
E. Kokolik-Elusive Creek Area, Continued																						
	SS 75-105	3.1	1	39	13	SE¼SE¼	12	P	K56239	-----	0.0	A	10,540	14.1	30.9	52.6	2.4	5.3	63.0	1.4	27.6	0.3
												B	12,280	----	35.9	61.3	2.8	4.3	73.4	1.6	17.6	.3
												C	12,630	----	37.0	63.0	----	4.4	75.5	1.6	18.2	.3

[1]Auger or drill interval or coal bed thickness (adjusted for partings according to procedures in Bass, Smith, and Horn, 1970, p. 6-7).
[2]E, excellent; G, good; F, fair; P, poor.
[3]Determination by P. D. Rao.
[4]Free-swelling index.
[5]A, as-received; B, moisture-free; C, moisture- and ash-free.
[6]Analysis run on 1.5 sp. gr. float-fraction.
[7]Analysis run on 1.5 sp. gr. sink-fraction.
[8]Composite analysis of entire section.

Conversion factors:

Meters = (feet) x (.305)
kJ/kg = (Btu/lb) x (2.326)

Thickness of Coal

For drill and auger holes, the depth intervals shown in Table 1 (column 3) represent thicknesses uncorrected for dip (column 8). Surface exposures were measured directly, and thicknesses shown are true thicknesses.

Partings

The drill cuttings and auger samples include all partings less than 1.5-2 inches (3.8-5.1 cm) in thickness, which could not be excluded due to the sampling methods. The whole core analyses shown in Table 1 include all partings in the depth intervals shown.

PHYSICAL CHARACTERISTICS OF COAL

Float-Sink Results

Extensive analytical work was done on the cores by C. C. Boley of the Bureau of Mines' Grand Forks Energy Research Laboratory (now ERDA Grand Forks Energy Research Center). The cored coal was analyzed without partings (not shown in Table 1). Further analyses were made on sample splits resulting from a flotation-specific gravity separation which is considered to simulate conventional coal cleaning practices. Analyses of the -1.5 specific gravity-float fractions and the +1.5 specific gravity-sink fractions of coals from samples DH 72-3C, 72-10C, 72-7C, and 72-8C are shown in Table 1 following the whole-core analyses for each depth interval.

Based on Boley's data, computations were made on the percentage of 1.5 float material from the cored intervals (Table 2).

Table 2.--Summary of the float-sink results on core samples from beds 7 and 8 in the Cape Beaufort Area, northwestern Alaska

	Cored Interval (in feet)[1]	Thickness (in feet)[1]	1.5 Sp. Gr. Float (in percent)
Bed 7	DH 72-3C (135.3-143.3)	8.0	68.6
	(143.3-151.3)	8.0	46.7
	(151.3-152.9)	1.6	86.7
	Thickness weighted average----------		60.3
Bed 7	DH 72-7C (43.0-49.7)	6.7	77.4
	(49.7-57.9)	8.2	35.4
	(57.9-59.9)	2.0	83.2
	Thickness weighted average----------		57.7
Bed 7	DH 72-10C (52.2 -57.85)	5.65	75.9
	(57.85-61.05)	3.20	48.9
	Thickness weighted average----------		66.1
Bed 8	DH 72-8C (96.9-103.4)	6.5	68.7
	(103.4-109.8)	6.4	82.7
	Thickness weighted average----------		75.6

[1]Meters = (feet) x (.305)

Core holes DH 72-3C, 72-7C, and 72-10C, roughly 1 mile (1.6 km) apart along the strike of the bed, sampled the same coal bed at Cape Beaufort. Only the upper 8.85 feet (2.7 m) of the bed was cored in DH 72-10C. The total thickness in 72-10C is probably similar to that in 72-3C and 72-7C.

Core hole DH-8C sampled a more homogeneous coal about 90 feet (27 m) stratigraphically below the one described in the preceding paragraph.

A small -100-mesh fraction of each core sample was excluded in the sink-float process (3.2-6.9 percent). For purposes of the tabulation shown in Table 2, this percentage was considered to be part of the "sink" fraction, so the "float" percentages shown are probably slightly conservative.

Discounting the bony middle interval in Bed 7 described above, the float-sink results suggest that a product comprising about 70-75 percent of the total tonnage mined with a heating value of 12,700-13,200 Btu/lb (29,500-30,700 kJ/kg) would be recovered after conventional preparation of the coal.

Unfortunately, core samples could not be obtained throughout the stratigraphic section. Analyses of cutting samples from lower in the section indicate a substantial increase in Btu value and promising coking possibilities.

Coking Possibilities

Free-swelling index (FSI) determinations were made on 138 samples (column 12 in Table 1). Surface samples and auger cuttings showed little or no swelling characteristics except for outcrop samples from the 20-foot (6.1-m) bed on the Kukpowruk River (SS 67-1, 67-2, and 67-3).

Drill cuttings from several coals in the middle one-third (roughly) of the Corwin section at Cape Beaufort (2000-5000 feet; 610-1524 m above the base) exhibit free-swelling characteristics comparable to western coking coals (samples DH 72-18, 72-19, as received; 72-20 float fraction).

Sample DH 72-19 was coked in late 1973 and evaluated by the Grand Forks Laboratory. Boley compared the product to Sunnyside (Utah) coke and to coke from the Kukpowruk River 20-foot (6.1-m) coal, which had been extensively investigated by the Bureau several years before (Warfield and Boley, 1969). Judged by all parameters except coke size, sample DH 72-19 was slightly superior in quality to both the Kukpowruk and Sunnyside coals.

It should be noted that the coke from DH 72-19 was made from the sample without prior treatment, it was made more than a year after collection, and the method of collection was such that expected sample quality would be lower than for a truly representative mine-face or core sample. Considering these factors, the results of the coking and coke-quality tests are probably conservative. The initial FSI on DH 72-19 was 5.6. After a year of airtight storage prior to coking, the FSI dropped to 3.4. This suggests that low FSI's (3 to 4) do not necessarily rule out a coal's coking potential.

Vitrinite Reflectance

P. D. Rao of the University of Alaska Mineral Industry Research Laboratory has made vitrinite reflectance measurements on 88 of the samples. The average reflectance (R_o) is shown in column 11 of Table 1.

Vitrinite reflectance is a fairly reliable indicator of coal rank. Most of the samples exhibit R_o's within the 0.6-0.8 percent range,

indicating a high-volatile B bituminous rank. Those falling below 0.6 percent have oxygen contents of 25 percent or more, indicating extreme weathering. The sampling conditions were very poor for most of these.

Several of the Kukpowruk samples have average reflectance values exceeding 0.8, which correlate their ranks based on chemical analyses. The values for two of the samples from Cape Beaufort also exceed 0.8. One of these, SS 69-20, is somewhat high, but within the range corresponding to the rank based on the chemical analysis. The other, SS 69-7, has an R_o of 1.23, which is clearly anomalous with respect to the chemical analysis and the reflectance values for overlying and underlying coals.

SUMMARY AND CONCLUSIONS

To date, the data collected indicate the presence of a very large resource of bituminous coal of high-volatile A, B, and C rank in the northern foothills of the DeLong Mountains and the western Brooks Range. There is probably a much narrower range in the quality of coal than is indicated due to the variable sampling methods and conditions.

The analyses of unweathered drill-hole samples taken under similar conditions throughout the stratigraphic section at Cape Beaufort do indicate a progressive increase in heating value and coking potential of coals toward the base of the section.

The quality of coal in the Kukpowruk River area seems anomalously high since there is no evidence of deeper burial or greater tectonically induced thermal effects as compared to other parts of the region. In fact, considering the depositional and tectonic history of the region, it is surprising that the coals at Corwin Bluff have lower heating values and higher oxygen content that beds sampled under similar conditions in areas of less intense tectonism farther east and north.

Analysis of uniformly collected, unweathered samples suggests the Cretaceous coals in the western Arctic foothills would range in rank from high-volatile B and C bituminous in the upper part of the section to high-volatile A and B bituminous in the lower part, and that a substantial percentage of the coal is comparable to western coking coal such as Sunnyside (Utah) coal.

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