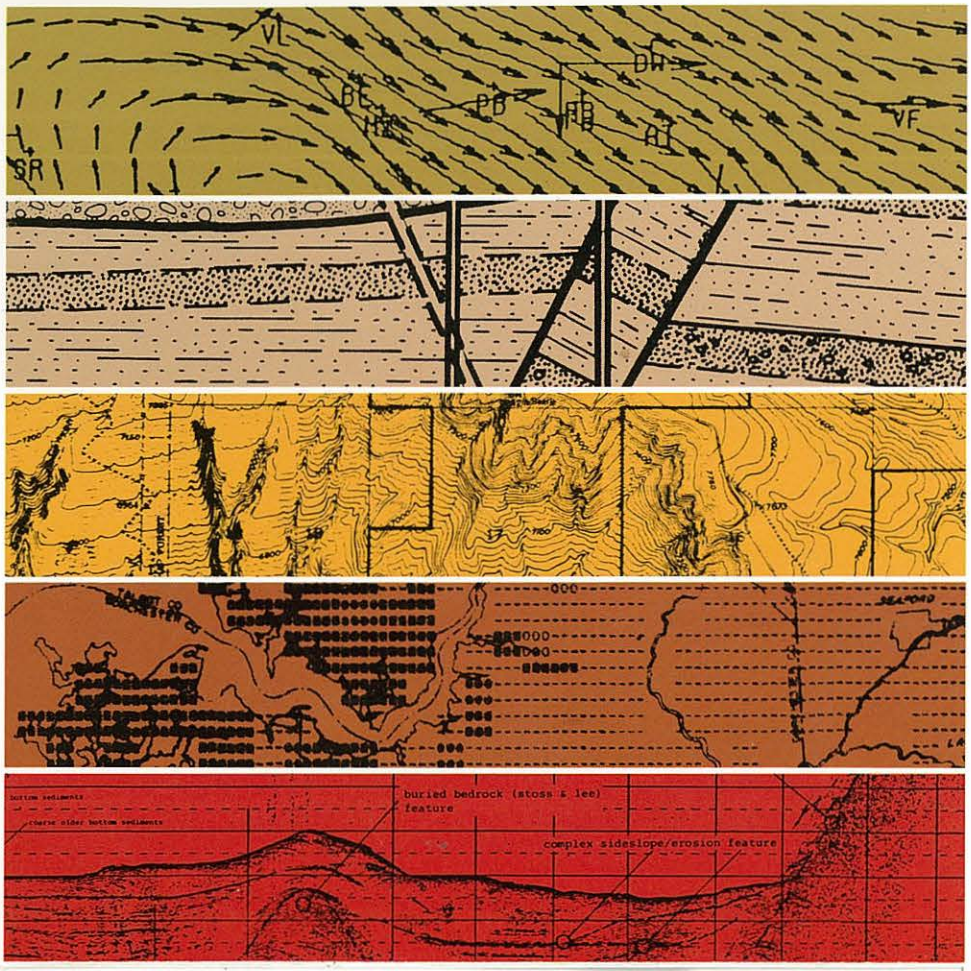

ASSESSMENT OF COAL RESOURCES OF NORTHWEST ALASKA - PHASE I

VOLUME I - TASK 1: FUEL UTILIZATION IN NORTHWEST ALASKA AND SUMMARY OF COAL RESOURCES

December 1980

Dames & Moore

Dames & Moore
in Association With
Resource Associates of Alaska, Inc.

ALASKA POWER AUTHORITY

ASSESSMENT OF COAL RESOURCES OF NORTHWEST ALASKA - PHASE I

VOLUME I - TASK 1: FUEL UTILIZATION IN NORTHWEST ALASKA AND SUMMARY OF COAL RESOURCES

December 1980

Dames & Moore

Job No. 12023-003-20

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

INTRODUCTION

In early August 1980, the Alaska Power Authority issued a request for proposals to assess the extent and quality of, as well as the socioeconomic practicability of developing, the coal resources of northwestern Alaska. The principal motivation for conducting this study is the desire by the Alaska Power Authority to learn whether northwestern Alaska communities, which presently rely on costly and often difficult to obtain petroleum-based fuels to satisfy their space heating and electricity requirements could, instead, economically utilize local coal resources. Toward this end Dames & Moore in conjunction with its subcontractor, Resource Associates of Alaska, proposed to the Alaska Power Authority a scope of work to accomplish this research.

As outlined in its proposal of 13 August 1980 and subsequent 11 September 1980 Plan of Study, Dames & Moore has divided the work into two principal phases. Phase 1 consists of two major tasks:

- Determine existing fuel utilization rates and patterns by villages within the study area, and
- Identify coal resources in northwest Alaska that may be suitable substitutes for petroleum-based fuels in village electrical and heating applications.

Phase 2 research entails an assessment of the feasibility of mining, transporting, and utilizing Phase 1 candidate coal resources. To conduct Phase 2, five tasks have been developed:

- Develop criteria regarding power plant or space heating fuel requirements from a quality (Btu) and quantity (annual tons of coal) standpoint.
- Select coal prospects which, based on available data, meet these criteria.
- Develop alternative transportation modes from supply to demand points.

- Develop the alternative supply/demand scenarios relevant to villages or regions, and assess their feasibility and practicability in light of socio-strategic and technical considerations.
- Select those areas known or believed to contain coal resources in which a reconnaissance drilling program would be worthwhile.

The results of Phase 1 research are presented in the report that follows. Task 1 research of Phase 1 was conducted by Dames & Moore. Task 2 data compilation and interpretation was performed by Resource Associates of Alaska; their results are presented in Volume II.

Description of Project Area

The study area encompasses a region of more than 100,000 square miles. As presented on Figure 1, the area includes the villages of the Seward Peninsula and Norton Sound coast south to Unalakleet, the Kobuk River Valley, Point Hope and Point Lay. Besides Unalakleet, Point Hope, and Point Lay, the study considers Shaktoolik, Koyuk, Haycock, Elim, Golovin, White Mountain, Council, Teller, Brevig Mission, Solomon, Wales, Mary's Igloo, Shishmaref, Selawik, Shungnak, Kobuk, Ambler, Kiana, Noorvik, Buckland, Kivalina, Noatak, Cape Lisburne, and Nome. Topography is variable within the project area and ranges from sea level along the coastline to over 4,700 feet in the DeLong Mountains.

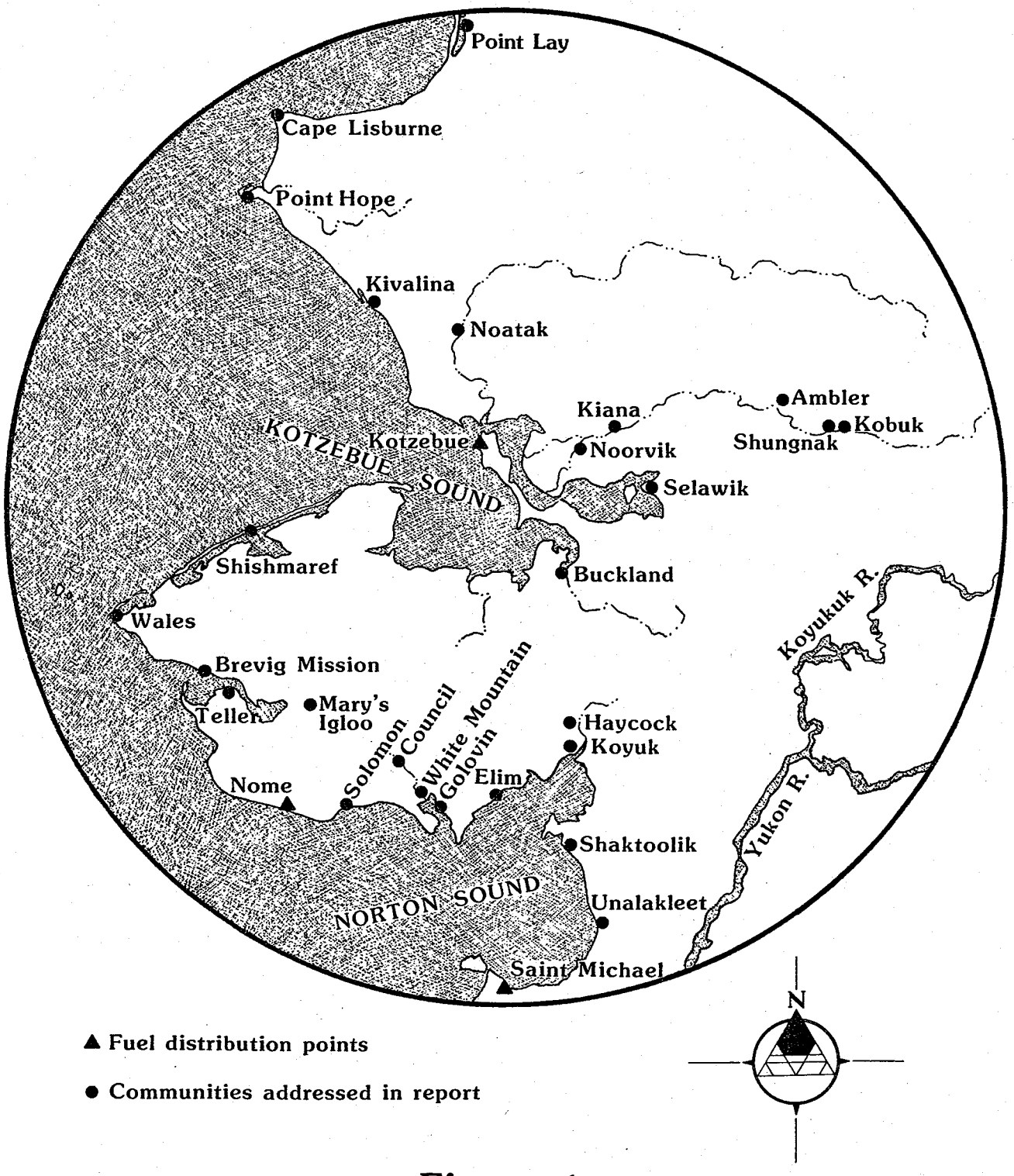

Figure 1
Location Map

FUEL UTILIZATION

Purpose and Scope

The primary goal of Phase 1, Task 1 was to assemble information relevant to the current fuel use in study area villages. To the extent that information was available, Dames & Moore examined the demand for petroleum-based fuels by the villages, the system presently procuring and distributing fuels, and the capacity of village storage facilities. Factors affecting the cost of petroleum-based fuels to the villages were considered as well.

Methodology

To obtain the required data, Dames & Moore economists interviewed representatives of State, Federal, and local power supply agencies, village electricity utility boards, petroleum fuel producers and distributors, and individuals in each village. Additionally, literature relating to the historical operations, fuel requirements, and costs of power generation in northwest Alaska were collected and analyzed.

Summary

Through this investigation, Dames & Moore reached the following conclusions:

- Shortfalls in fuel supply have occurred in many of the villages in the study area (Tritremal, personal comunication 1980). During the winter of 1978-1979, for example, numerous villages in northwest Alaska experienced fuel shortages because of such diverse factors as the early freeze-up or low flow of navigable rivers, the low priority assigned by transport companies to fuel deliveries (via-a-vis other types of shipments to canneries or to construction projects), and to low fuel storage capacity in the village.

- Total annual petroleum fuel consumption by 27 villages within the study area in 1979-1980 was approximately 5.2 million gallons or an equivalent of more than 100,000 52-gallon drums. Of this quantity, 3.2 million gallons were used for heating and 2.0 million gallons for electricity generation (Table 1).

- The general attitude among consumers seems positive toward finding an alternative fuel source for the area that will provide adequate, reliable heat and power (Rusnell, personal comunication 1980). There is also a growing dissatisfaction among some consumers with what is understood to be an unresponsive bureaucratic structure in the fuel delivery and power development systems in northwest Alaska.

Fuel Oil Consumption

The largest consumer of fuel oil in most villages is the State or Federally operated school. The village school commonly maintains the greatest capacity for bulk fuel storage. Typical bulk fuel oil storage capacities for villages in the study area range from none in small villages like Council to 630,000 gallons at Unalakleet and higher at Nome. Individual consumers usually purchase supplies through a local store, which purchases directly from a wholesalers' central distribution point. The Alaska Village Electric Cooperative (AVEC) owns and operates electrical generation equipment and maintains a supply of fuel oil in its member villages. Table 1 shows the annual fuel oil use by each of the study area villages for the year 1979-1980.

Supply Infrastructure

The Rural Alaska Community Action Program (RurAL CAP) was created in 1975 to provide seed money for bulk fuel storage facilities and to provide interest-free loans to communities experiencing fuel shortages. When short-falls of fuel in individual villages occur, RurAL CAP loans transportation

TABLE 1

ANNUAL FUEL OIL USE BY VILLAGE IN GALLONS 1979-1980

Village	Population	Heating:*	Electricity	Total	Fuel Oil Storage Capacity
Unalakleet	600	295,000	180,518	475,518	650,000
Point Hope	408	150,000	49,000	199,000	240,000
Point Lay	73	25,000	14,000	39,000	50,000
Shaktoolik(4)	200	35,000	37,000	72,000	77,000
Koyuk	160	35,000	16,000	51,000	67,000
Haycock	6	2,704	5,408	10,816	-- (1)
Elim(4)	215	10,500	25,400	53,030	40,500
Golovin	118	3,500	3,500	7,000	-- (1)
White Mountain	98	20,000	31,600	51,600	10,000(2)
Council	35	2,000	4,000	6,000	None
Teller	219	25,000	-	25,000	--
Brevig Mission	144	12,045	- (2)	12,045	19,400
Solomon	12	10,836	10,836	21,672	None
Mary's Igloo	5	2,704	5,408	10,816	--
Shishmaref(4)	309	50,000	76,000	126,000	157,325
Selawik(4)	525	248,768	68,952	317,720	100,501(1)
Shungnak(4)	181	40,000	59,814	99,814	127,626
Kobuk	61	17,576	- (1)	17,576	-- (1)
Ambler(4)	250	40,000	38,945	78,945	190,000
Kiana(4)	314	60,000	77,235	137,235	181,665
Noorvik(4)	532	90,000	84,167	174,167	209,850
Buckland	174	58,000	-	58,000	96,700
Wales(4)	134	26,500	24,000	50,500	58,200
Kivalina(4)	209	40,000	46,000	86,000	131,600
Noatak(4)	291	14,000	37,500	51,500	41,000
Cape Lisburne(3)	83	14,000	37,500	51,000	--
Nome	2585	1,405,475	1,040,000	2,445,475	--
		3,238,538	1,982,395		5,225,407

[1]Discrepancies in figures between total fuel usage and bulk storage capacity may be accounted for with bi-annual fuel purchases and fuel stored separately in drums.

[2]Not including school

[3]Air Force Base

[4]AVEC member

Sources: Alaska Division of Energy and Power Development, 1979.

Telephone inquiries with village representatives familiar with local fuel supply and demand characteristics.

AVEC, 1980a.

* Actual amounts used may vary with weather conditions. Temperatures for Seward Peninsula were essentially normal, averaging 3.2°F above normal.

cost differentials for emergency fuel supplies. This emergency fuel is purchased from Chevron Inc. at Dutch Harbor and distributed from that point by either air carrier or the Bureau of Indian Affairs (BIA) charter ship, North Star.

Another integral part in the statewide energy infrastructure is AVEC. AVEC is a non-profit organization serving residents of 48 communities throughout western Alaska. The Rural Electrification Administration (REA) is the principal Federal loaning agency for the cooperative and is instrumental in determining certain AVEC policies and procedures. The AVEC mission is to provide electricity for villages and other enterprises in Alaska that never have had a cost-stable source of power.

AVEC purchases fuel in bulk from Chevron Inc. and re-sells the supply to participating villages according to pre-determined needs. The supply to individual villages is normally adequate, although fuel shortfalls are not unknown. If a shortfall is recognized, AVEC may purchase supplies from the local school or the village store. Individual consumers make their needs known through the local utility board and the village delegate who is selected to attend the annual Cooperative meeting at Anchorage in March of each year.

The Cooperative has been faced with a number of problems. For example, there has been a movement in some villages toward allowing the schools to generate their own elecricity rather than having to purchase it from AVEC. The entire system is sized to supply the school, and without the school's portion of fuel oil included in AVEC fuel orders, electricity rates would approximately double to other consumers (Hodson, 1980). Payment collections continue to be a problem in a number of villages. There are also problems of equipment failure and safety enforcement (AVEC, 1980b).

Distribution System

Chevron Inc. has been the traditional distributor of fuel oils to northwest Alaska from Ketchikan north to Kotzebue and west to Dutch Harbor.

This is due primarily to Federal regulations creating barriers to market entry and the costs involved in entering the market.

The port of origin for this fuel is Richmond, California; however, the primary bulk deliveries originate in Dutch Harbor. The bulk fuel is barged once a year from Dutch Harbor north to the three primary distribution points: St. Michael, Nome, and Kotzebue. Individual consumers purchase their fuel supplies FOB from these distribution points and then contract with one of the two major barge companies for transportation to the village. Black Navigation serves the Lower Yukon out of St. Michael and Arctic Lighterage operates out of Kotzebue and serves the more northern region. Villages located off major waterways are supplied by air carrier or cat train.

Fuel is also transported by the Bureau of Indian Affairs (BIA) supply ship, North Star, which operates out of Seattle. The BIA purchases bulk supplies of fuel from Chevron Inc. at Dutch Harbor and distributes the fuel north to Barrow (Rusnell personal communication, 1980).

Thirty known villages in rural Alaska experienced fuel shortages during the winter of 1978-1979 (Tritremal personal communication, 1980). Causes of the shortages differed. In many cases, however, the barge company's inability to deliver the annual fuel supply left some villages without fuel as early as October in 1978. Alaska villages must pay for their entire fuel supply when the order is placed, usually in the spring. Since the summer months present the only opportunity to secure any type of cash income in the villages, cash for fuel orders is available only at the end of the summer. By late fall the barge companies are usually overcommitted and tend to give priority to shipments for canneries or construction projects. Low water and early freeze-up often make rivers unnavigable and many times barges are not able to complete their schedules. Without an adequate fuel supply, villages then have to utilize limited cash to bring in fuel by air charter. Unless the villages call on RurAL CAP, the cost of this emergency fuel can be triple that of continually delivered supplies.

The most immediate problem in the fuel distribution system for northwest Alaska is the high cost of transportation. Cost is dependent on the number of times fuel is handled and the method of delivery. Koyuk, for example, is charged $1.60 per gallon for fuel oil and $0.377 per kilowatt (kw) for electricity (Otton, 1980). Those villages served by air carrier or farther up river in shallow water will suffer higher fuel costs. Buckland pays $2.06 per gallon for fuel and $0.85 per kw for electricity. There is also a need in most villages for greater bulk storage capacity and greater reliability in the delivery system. The barge lines that supply villages up river are not regulated by the Interstate Commerce Commission, and therfore not subject to minimum performance standards. In the past this may have contributed to unreliable service. Additionally, there is the common problem that many villages are operating generators too large for their needs. This leads to inefficient generator use, increased mechanical difficulties, and higher fuel costs. Conversely, there is a problem in some villages where the existing power plant has proved to be too small for the demand.

SUMMARY OF COAL RESOURCES

Task 2 of Phase 1 entailed evaluation of the coal resources of the study area. The principal objective of this task was to identify, through a comprehensive review of appropriate geologic literature, field notes from Resource Associates of Alaska exploration personnel, and geologic maps, as well as through discussions with knowledgable individuals, the location, extent, and quality of coal resources occurring within northwest Alaska. Volume II of this report discusses this topic in detail.

Upon completion of this review, the coal resources believed to have the greatest potential for development as fuel sources for the villages in the study area were ranked according to their overall suitability as targets warranting future exploration. Table 2 presents a synthesis of the evaluation and analysis presented on Plate IV, Volume II, and lists the most viable candidates for future investigation.

During the course of this investigation, 49 coal occurrences were evaluated within the project area strictly in light of available data. Given the limited scope of this effort, restricted level of funding, and uncertain access to coaliferous properties due to the onset of winter, no field investigations were undertaken to verify the information contained in publications or obtained from other geologists or residents. A field spot check of candidate coal resources should be conducted as part of Phase 3, preparatory to selection or initiation of an exploration drilling program.

The following determinations have been made:

- Of the 49 coal occurrences investigated, 36 were considered suitable candidates for the conduct of additional exploration work, ranging from spot checking of previously identified localities to more extensive mapping programs.

TABLE 2

NORTHWEST ALASKA COAL PROSPECTS RANKED
ACCORDING TO APPARENT RELATIVE POTENTIAL

Catagory	Area of Occurrence[1]	Number of Occurrence[2]	Name of Occurrence[1]
	2	C	Point Lay
	6	-	Deadfall Syncline
	2	B	Point Lay
I	2	A	Point Lay
	1	B	Point Lay
	7	A	Cape Beaufort
	8	-	Corwin-Thetis Mines
	18	H-H	Chicago Creek
	19	-	Kiwalik Basin
	20	-	Buckland Basin
	21	-	Koyuk Basin
	1	A	Point Lay
	22	A,B,C & E	Death Valley-Tubutulik
	10	A	Point Hope
	9	C	Point Hope
II	9	B	Point Hope
	7	B	Cape Beaufort
	23	-	McCarthys Marsh
	22	D & F	Death Valley-Tubutulik
	16	B	Elephant Point - Mangoak River Coal
	17	-	Serpentine River
	24	-	Kuzitrin Basin
	18	I & J	Chicago Creek
	12	A	Kobuk River
	12	B	Kobuk River
	12	C	Kobuk River
	12	E	Kobuk River
	27	-	Unalakleet
	28	-	Unalakleet River
	13	-	Hunt River
	14	A	Ambler River
III	14	B	Ambler River
	18	K	Chicago Creek
	26	-	Koyuk River
	12	F	Kobuk River
	28	-	Unalakleet River

[1] Refer to Plate 1, Volume 2.
[2] Refer to Plate 4, Volume 2.

- There is very little hard data (either quantitative or qualitative) on the coal occurrences within the study area. What information is accessible is either outdated or does not specifically address itself to coal resources. Consequently, the total coal resource base of northwestern Alaska is unknown, and by and large remains virtually unexplored.

- Nearly all of the coals occurring within the project area are of lignitic to bituminius grade and are of Mississippian, Cretaceous, or Tertiary age--the majority appearing to fall into the two later age groups. Mississippian coals are generally bituminous to semi-anthracitic in grade, Cretaceous coals are mostly subbituminous to bituminous, and Tertiary coals are primarily lignitic.

- Given the data generated through the Task 2 investigation, several coal occurrences are believed to warrant further investigation. The most promising occurrences are divided into three categories according to their apparent relative potential (Table 2).

  Category I includes those occurrences that have a measured section of at least 10 feet total thickness, generally have indicated resource estimates, and generally have analytical data available. Category II have either measured sections or occurs as float, some have indicated resource estimates, and some have analytical data.

  Category III usually occurs only as float; where measured sections are identified, aggregate thickness is generally less than 4 feet; and generally no analytical data is available.

BIBLIOGRAPHY

Alaska Power Authority, 1980. Alaska Energy Profile, unpublished.

Alaska Division of Energy and Power Development, 1979. Community Energy Survey, Anchorage, Alaska.

Alaska Division of Energy and Power Development, 1980a. Alaska Residential Energy Conservation Program, DEPD, Anchorage, Alaska.

Alaska Division of Energy and Power Development, 1980b. Energy Incentives for Individuals and Small Businesses in Alaska, DEPD, Anchorage, Alaska.

Alaska Department of Transportation, 1979. Inventory and Condition Survey of Public Facilities, Anchorage, Alaska.

Alaska Department of Transportation and Public Facilities, 1980. Inventory and Condition Survey of Public Facilities, DOT, Anchorage, Alaska.

AVEC, 1980a. 1979 Fuel Costs Analysis as of December 31, 1979, unpublished.

AVEC, 1980b. Annual Report, AVEC, Anchorage, Alaska.

AVEC, 1980c. Alaska Village Electric Cooperative, A Guide Book for Members, AVEC, Anchorage, Alaska.

Berger, L., 1980. Western and Arctic Alaska Transportation Study Phase I, Draft, 5 Vol.

Fryer, 1980. Bering Strait Energy Reconnaissance, Bering Strait REAA School District, Anchorage, Alaska.

Kaiser Engineering, 1979. Technological Economic Feasibility of Surface Mining Coal Deposits in N.W. Alaska, Bureau of Mines, Anchorage, Alaska.

North Slope Borough, 1980. North Slope Borough Fuel Data, unpublished.

Retherford Associates, 1978. Waste Heat Capture Study for the State of Alaska, DEPD, Anchorage, Alaska.

Retherford Associates, 1980. Assessment of Power Generation Alternatives for Kotzebue, Alaska Power Authority, Anchorage, Alaska.

RurAL CAP, 1979. Citizens Participation Conference, RurAL CAP, Anchorage, Alaska.

RurAL CAP, 1980. Citizens Participation Conference, RurAL CAP, Anchorage, Alaska.

RurAL CAP, 1980. RurAL CAP's Energy Advocacy Objectives and Related Alaska State Legislation in 1980, RurAL CAP, Anchorage, Alaska.

Smith, P.J., 1979. RurAL CAP 1979 CSA Cross Intervention Fuel Loan Program, RurAL CAP, Anchorage, Alaska.,

U.S. Army Corps of Engineers, 1978. Westbound Commerce, Computer Analysis, unpublished.

U.S. Department of Interior, Bureau of Indian Affairs, 1979-1980. Schedule for Distribution of Bulk Oil, B.I.A., Seattle, Washington.

PERSONAL COMMUNICATIONS

Brennan, D (AVEC), 1980. Personal communication to S. Parker, Dames & Moore, emergency procedures for fuel short-falls in AVEC villages, AVEC, Anchorage, Alaska.

Hodson, Lloyd (AVEC), 1980. Personal communication to S. Parker, Dames & Moore, the role of AVEC in Alaska village, AVEC, Anchorage, Alaska.

Otton, Melvin (Mayor, Koyuk), 1980. Phone communication to S. Parker, Dames & Moore, fuel distribution, supply and demand in Koyuk, Alaska. Anchorage, Alaska.

Rusnell, Dale (DEPD), 1980. Personal communication to S. Parker, Dames & Moore, fuel distribution in N.W. Alaska, DEPD, Anchorage, Alaska.

Tritremal, E., (Rural CAP), 1980. Personal communication to S. Parker, Dames & Moore, emergency procedures for fuel shortfalls in villages, Anchorage, Alaska.

U.S. Department of Interior, Bureau of Indian Affairs, 1980. Personal communication to S. Parker, Dames & Moore, B.I.A., Fuel Distribution in Alaska.